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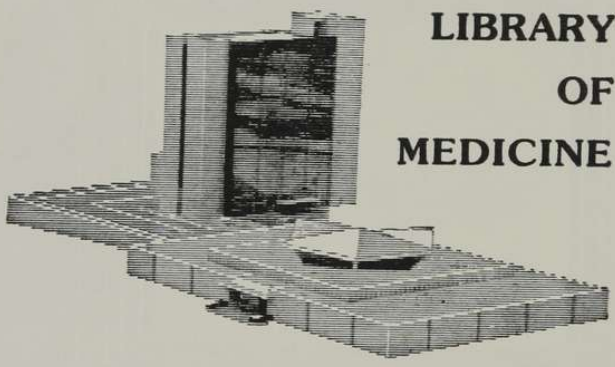

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BY

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PROFESSOR OF SURGERY IN THE NEW YORK HOMŒOPATHIC MEDICAL COLLEGE; SURGEON TO THE HOMŒOPATHIC HOSPITAL ON WARD'S ISLAND, TO THE HAHNEMANN HOSPITAL, AND TO THE NEW YORK COLLEGE AND HOSPITAL FOR WOMEN; MEMBER OF THE AMERICAN INSTITUTE OF HOMŒOPATHY; FELLOW OF THE NEW YORK MEDICO-CHIRURGICAL SOCIETY; MEMBER OF THE NEW YORK STATE HOMŒOPATHIC MEDICAL SOCIETY, OF THE HOMŒOPATHIC MEDICAL SOCIETY OF THE COUNTY OF NEW YORK, AND HONORARY MEMBER OF THE HOMŒOPATHIC MEDICAL SOCIETIES OF MASSACHUSETTS AND CONNECTICUT, ETC., ETC.

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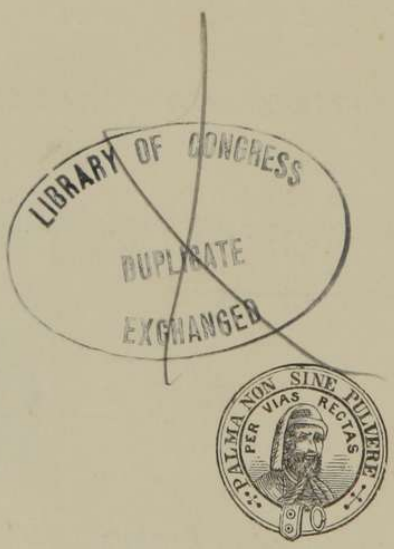

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TO

THE FACULTY

OF THE

NEW YORK HOMŒOPATHIC MEDICAL COLLEGE

This Work

IS RESPECTFULLY INSCRIBED

BY

THEIR COLLEAGUE,

THE AUTHOR.

PREFACE TO THE SECOND EDITION.

In July, 1855, the author of the present volume, experiencing with his fellow-students the want of a text-book upon Surgery, which would be adapted to the requirements of our school, compiled and arranged a work which he hoped might in a measure, supply a great deficiency in Homœopathic literature. Being then but a recent graduate, the book was very imperfect, not only in description and diagnosis, but in treatment. Bearing constantly in mind, since that period, the importance of Surgical science to the Homœopathic as well as the Allopathic student, the author has bestowed a considerable portion of his time to Surgery, and has endeavored, in the publication of the present volume, to furnish a reliable textbook for the students of our Colleges as well as a volume of reference for the Homœopathic practitioner.

* * * * * * *

Of late years, so much attention has been directed to the subjects of Ophthalmology, Otology, and Odontology, that their consideration has been entirely omitted in this volume. Separate treatises, full, comprehensive, and exhaustive to the present time upon each of these departments of Surgery, have been presented to the profession. Indeed, such exclusive attention has been given them, that they have become specialties; therefore, to have introduced into a work of this kind so large an amount of material as those subjects embrace, would have unreasonably increased its size. Consequently those who purpose making the eyes, ears, and teeth special subjects of study, in the many volumes devoted to their consideration, can readily obtain all the desired information.

These facts, together with the avowal that the author makes no pretensions to either of these sciences, will be a sufficient explanation for the absence of chapters on the subjects specified.

During the preparation of this volume, the author is gratified to acknowledge very many favors from professional and other friends. The chapter upon "Tumors," with the exception of those portions on Cystic, Enchondromatous, and Myeloid formations, and some treatment, was prepared by Dr. W. T. Laird, of Watertown, New York. The chapter

on "The Microscope" was written by G. S. Allan, D.D.S., Professor of Histology in the New York Homœopathic Medical College.

* * * * * * *

The woodcuts, exclusive of those representing instruments, have all been prepared expressly for this work, and the author has endeavored in many instances to substitute for the traditional illustrations, some that are not so well known, of which about one hundred and fifty are copied from the steel plates of Von Pitha and Billroth's Atlas. Some of the illustrations are from original drawings and photographs, and others from Paget, Wales, Druitt, Gross, Bigelow, Hamilton, Seguin, and other published works.

* * * * * * *

New York, 21 West Thirty-seventh Street.

PREFACE TO THE THIRD EDITION.

In presenting this, the third edition of his work on Surgery, to the profession, the author desires to say that he has endeavored, by alterations, amendments, and additions, to render it more acceptable than either of its predecessors.

The book has been re-arranged, many portions of it have been entirely re-written, and while much new matter has been added, a great deal that appeared in the former volume has been omitted.

Among the chief additions may be noted: a new chapter on "Inflammation and the Repair of Tissues," one on "Tumors," and another on "Ovarian Diseases and Ovariotomy." Dr. John H. Thompson has given an interesting chapter of the "Varied Methods of Dressing Wounds," and Dr. John Butler a complete monograph on "Electrolysis." To both of these gentlemen the author desires to express his thanks in this place.

Among other entirely new subjects which have been introduced are the following: Plastic surgery; the effects of cold; subungual exostosis and onychia maligna; rupture of muscles and tendons; muscular atrophy; Dupuytren's contraction; Esmarch's bandage; Dittel's elastic ligature; nerve-stretching in tetanus and neuralgia; lymphangitis; lymphadenoma; lymphatic fistula; symmetrical osteo-myelitis; innocent and malignant tumors in bone; genuthrotomy; gonalgia; disease of the sacro-iliac synchondrosis; dislocations and fractures of the pelvis; the plaster of Paris jacket; salivary calculus and fistula; quinsy; pharyngitis; post-pharyngeal abscess; phosphorus necrosis; parotitis; œsophagitis and rupture of the œsophagus; extirpation of the larynx; aspiration of the thorax; apnœa and artificial respiration; hepatitis and diseases of the gall-bladder; perityphlitic abscess; gastrotomy; extirpation of the spleen; imperforate anus and rectum; linear rectotomy; extirpation of the rectum; hermaphrodites; nephritis and calculous nephralgia; elephantiasis of the labia and vascular excrescence of the meatus. Besides this, there have been many revisions and additions

made to the chapters appearing in the second edition, which can readily be seen by a perusal of the book.

About forty new woodcuts have been added, which are taken mostly from the recent works of Bryant and Holmes. The thanks of both the author and publishers are also due to Messrs. Stohlmann & Pfarre and to Messrs. John Reynders & Co. for the use of woodcuts representing the best patterns of surgical instruments and apparatus for deformities.

The author cannot but feel gratified that the previous edition of this work, with its numerous imperfections, and surrounded as it was by so many unforeseen adverse circumstances, has met with such ready sale; and while he thanks the profession for the leniency of their judgment, he trusts he has made for them a more satisfactory and complete "System of Surgery."

299 Madison Avenue, New York,
January 3d, 1879.

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A SYSTEM OF SURGERY.

CHAPTER I.

INTRODUCTION—INFLAMMATION—INHIBITORY NERVES—CONNECTIVE TISSUE—LEUCOCYTES—ACTION OF THE CAPILLARIES—HYPERÆMIA—ACTIVE CONGESTION—CHANGES IN THE TISSUES—CHANGES IN THE BLOOD—SYMPTOMATOLOGY—INFLAMMATORY FEVER—THE TERMINATIONS—REPAIR—IMMEDIATE UNION — FIRST INTENTION — GRANULATION — CICATRIZATION — FATTY DEGENERATION—TREATMENT, GENERAL AND LOCAL.

FROM the time of Hippocrates to the present day, the profession has been endeavoring to satisfactorily account for the varied elementary and structural changes which take place during the different stages of inflammation. The physician, the chemist, the microscopist, and pathologist, with persevering industry and the most earnest desire to arrive at correct explanations of the many appearances presented during the different stages of the process, have not yet arrived at unanimity of opinion. An approximation to a more correct understanding of many of the changes in the vessels, the blood, and the tissues, has been reached since the introduction of the microscope; but yet there are very many points altogether shrouded in conjecture.

Erasistratus taught, and his theory was supposed for years to be the true one, that in inflammation the arteries contained blood, otherwise, that is, in a normal condition, these vessels circulating air. This doctrine was overthrown by the humoral pathologists, who classified the process in accordance with the fluid supposed to be contained in the capillaries, thus: If there was an increased flow of blood, a phlegmonous inflammation was produced; if the yellow bile predominated, the erythematic or erysipelatous; if black bile, the scirrhous, and if phlegm the œdematous, thus giving rise to the well-known axiom "*ubi irritatio ibi fluxus.*" Then came the curious doctrine of the Methodists, of insensible corpuscles blocking up insensible pores.

After years, Stahl calls forth the "*anima,*" the life-giving principle, and designates inflammation as a condition of *spasm.* Hoffmann, Cullen, and others, conceived *this* to be the true pathology of the condition, and were loud in their praises of the so-called discovery, which was believed for a length of time, but was contradicted by Boerhaave, who brought forward again a doctrine, not far removed from that of Erasistratus; and so, one theory has followed another with contradiction, argument, and experiment, down to the present day, when, with all our boasted facilities, our knowledge is just about as uncertain as it was in the times of old. So uncertain

indeed is this point, that in *Holmes's System of Surgery** (article Inflammation), Mr. John Simon writes as follows: "The process of inflammation, as regards the intimate nature of those circulatory and textural changes by which it is constituted, is at the time of the issue of this second edition matter of the utmost controversy; or, perhaps, I should rather say all previous doctrines upon the subject are just now in the very crisis of a reconsideration of which the morrow cannot be foreseen," and, therefore, the subject is not discussed. At the end of the fifth volume, J. Burdon Sanderson has gone very fully into the detail of our knowledge as understood by recent investigators. This gentleman finds that the application of stimuli causes a dilatation of the capillaries with an increase in the blood flow, and so defines the first stage of the inflammatory process. Some again declare that the blood-globules are crowded together in the inflamed parts by the viscidity of the blood *itself*, thus reverting to the doctrines of old.

Others again attribute the action of the capillaries, and the stasis of blood, to what are termed "*inhibitory nerves*," thus bringing the cerebro-spinal system into the field to battle for the spasm of the capillaries, and so indeed we grope on in darkness and ask in vain the questions: Is the increased flow of blood in the capillary vessels, which is said to be noticed in the first stage of inflammation, due to a spasm or to a paralysis of the coats of these vessels? Are we sure of the method of innervation of the blood-vessels said to produce an acceleration or retardation of the blood? Can we now, in this our nineteenth century, define with certainty, or draw a line distinctly, between the process of repair which nature evokes to cure the varied lesions to which the body is liable, to which she applies for the safeguard of her temple and the purification of her courts, from that process which terminates in disease, overthrow, and death? How do we positively define the inflammation which cures from the inflammation which kills?

Who can positively say whether these changes have their seat in the vessels or in the textural elements of a part? Is there an unusual cell production, and if so, does or does not this increased cell life cause disease or death, or the construction and repair of tissues?

So far as my reading goes, even with all the lights that microscopy has endeavored to throw upon this question, there are at present no less than four doctrines, each with its own upholders, which are adduced to explain the pathology of the inflammatory process.

The oldest, perhaps, of these newer methods, is "the coagulable lymph theory." This coagulable lymph is supposed to contain all the formative elements. In the blastema, floating hither and thither, are found molecules which aggregate and form nucleoli, which arrange themselves into nuclei. A cell-wall then forms, thus constituting rudimentary elements, which ultimately are changed into the varied tissues.

From the experiments of Goodsir and Redfern, together with the persistent and patient labors of Virchow, the school of "cellular pathology" has its origin, and numbers many illustrious names among its adherents. This method is called by Sir James Paget "the local production theory," and embraces the cleavage of the nuclei, or "a process of endogenous germination," thus rendering the inflammatory process one in which the vessels themselves take little part.

Recklinghausen then places his eye to the microscope, and stands amazed, as in the field, he discovers among the stable connective tissue cells a moving corpuscle. Again he examines, and again he sees the peculiar cell, with its peculiar motion, wandering hither and thither with its stretching and retracting arms, passing into and without the vessels.

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* Vol. v, p. 72., "The Process of Inflammation."

This discovery, combined with the labors of Williams, Addison, Waller, and Cohnheim, brought forth the celebrated "migration theory," adopted and promulgated by Stricker and Billroth, which would teach us that the process, instead of being independent of the vessels, has its seat *in* them; they not only being the channels from which exudes the cell-stimulating liquor sanguinis, but from which pass and repass, with insinuating amœboid movement, the "leucocytes," which constitute in part at least the bond of union in the repair of tissue, and assist to mould into shape the new formations.

Here are three theories, the fourth being that promulgated by the "germinal pathologists," among whom Lionel Beale stands prominently foremost. These declare that invisible particles in the blood escape from the vessels *without* a rupture of their coats, and that by their proliferation and subdivision the agents for the new formations are developed.

At present, however, as the growing favor of the "migration theory" appears to claim for it the preference, and as it explains in some degree the varied appearances presented in the progress and terminations of the inflammatory process, I have adopted it here. I must say, however, that casting a retrospective glance over the history of medicine, the more I become acquainted with the subject of inflammation, as taught by the old writers, and observe the changes of opinions and the metamorphoses of theories which have taken place, I am not by any means sanguine of the permanency of the present explanations, and have little doubt that hereafter other unknown discoveries in microscopy will shatter the conclusions which are now under special consideration, or at all events materially modify them.

INFLAMMATION.

For the better appreciation of what is to follow, the student should be made to understand the meaning of certain terms and certain processes which are familiar to the more recent pathologists, and which are necessarily frequently employed while treating of the inflammatory process.

"**Inhibitory Nerves.**"—The nervous system is now supposed to play a most important part in the establishment of inflammation, and it is necessary to consider for a moment the action of those nerves known as the "*vaso-motor.*" If an injury is inflicted on any portion of the body, the "*centripetal*" or "afferent" nerves convey the impression to the cerebro-spinal axis, and by the vaso-motor centre (the precise seat of which is at present unknown) is reflected through the "*centrifugal*" or "efferent" nerves, to the vessels, which causes certain changes to take place in them, which will be hereafter noticed. A fact, however, must be borne in mind, viz., that if there be a division of the spinal attachment of any portion of the ganglionic cord, the effect is similar in regard to the vessels, as though the great sympathetic nerve itself were divided, which would seem to prove that the ultimate origin of these nerves is in the cerebro-spinal system. It must also be remembered that these nerves can be affected by a reflex action of the afferent spinal nervous system.

"**Connective Tissue**" is that structure pervading all portions of the body, composed of cell element and intercellular structure. It is in reality, whether in hard or in soft structure, the skeleton of the tissues, and may be divided into the vascular and non-vascular. This tissue, according to Virchow, presents a corpuscle which receives the name of the "connective-tissue corpuscle," and is considered by most histologists as "a fixed and stable element."

"The connective tissues," according to Stricker,* "are developed from

* A Manual of Histology, by Prof. S. Stricker, p. 53.

the middle germinal layer, in which blood and muscle also originate. The typical connective substances are recognized histologically by the circumstance that they contain extensive and continuous layers of material (intercellular substance) which, when compared to the cellular structures distributed through its substance (protoplasma), or the morphological elements in other tissues, always appears as a mere passive substance, *and one which participates but slightly* in the processes characteristic of life. . . . . The connective tissues frequently pass by substitution or genetic succession into one another; they appear, therefore, to be morphologically equivalent; so that, in many instances, certain organs or parts of organs, belonging to animals nearly allied to one another, are formed sometimes of one, sometimes of another of these tissues."

"**Leucocytes**;" "wandering cells," "exudation corpuscles," "connective tissue derivatives," "migration corpuscles." These terms are synonymous. The first step that was made toward the more intimate acquaintance with the action of these leucocytes, was the discovery made some years back by Dr. C. J. B. Williams, that in inflammation there appeared to be a great disposition of the white blood-corpuscles to arrange themselves, and to adhere to the walls of the irritated capillaries. Addison, in 1843, and Waller, in 1846, not only confirmed the views of Williams, but demonstrated the actual passage of these corpuscles through the coats of the capillaries. Cohnheim and Recklinghausen then, after much research and experiment, founded the well-known and now generally accepted "migration theory," viz., that the white blood-corpuscles (leucocytes) pass in some mysterious manner through the coats of the vessels, being possessed of that peculiar motion termed "amœboid," which is seen in the amœba and other rhizopods. These so-called "wandering cells" stretch out and retract their arms in a most peculiar manner, and so migrate, often to a considerable distance, from the vessel from which they emerge. These corpuscles, by means of their mobility and flexibility, have the power of surrounding minute bodies, and are, as understood by Mr. Sanderson, "masses of contractile living protoplasm." It may be noted here that "pus-corpuscles," "lymph-corpuscles," "white blood-corpuscles," and rudimentary cell-forms in general, possess this power of movement, and indeed are identical.

For more than half a century, pathologists have taught that inflammation consisted, first, in an increased action of the capillary vessels, with increased rapidity of the blood stream, followed by a relaxation of the coats of these vessels, with complete *stasis* and exudation of liquor sanguinis, and even now, when the action of the vaso-motor nerves has been more thoroughly examined, there has not been much advance in the actual certainty of our knowledge regarding the action of the capillaries. On this subject Dr. Sanderson thus pointedly says: "Our knowledge of the innervation of the bloodvessels, is, notwithstanding the progress which has been made in the last few years, too imperfect to enable us to harmonize all the facts. But the impossibility of constructing a complete theory on the subject does not prevent us from drawing some inferences, which will be of use in enabling us to understand what happens in inflammation, at all events better than we should do without it. From what has been stated, it is tolerably clear, that whatsoever difference there may be in other respects, there is one effect in exciting the sensory nerves distributed to any part, which is pretty constant, viz., increased activity of the circulation, so that whether the actual quantity of blood existing in the part at any given moment be greater or less, the quantity of blood which passes through it in a given time is certainly greater."

After a careful consideration of those conditions which seem to be neces-

sary for healthy nutrition, it would seem that inflammation may be defined as "a peculiar perversion of nutrition and secretion," and although this may be taken as in the main correct, yet we must be careful not to confound it *with hypertrophy*, which may result from extraordinary functional activity, calling for a larger than normal supply of nutritive elements.

There are, again, still other conditions in which the bloodvessels may become temporarily turgid with blood, although inflammation (properly so-called) may be absent. Thus "*active hyperœmia*," "*local congestion*," "*vital turgescence*," are terms used to explain an overloaded condition of the bloodvessels, which may be necessary in some organs at certain times for the proper performance of their functions, and at others when a mechanical obstruction may interfere with the return of the blood-stream. We find this in the mamma during lactation, in the uterus during pregnancy; thus giving an increased blood-supply to meet an increased demand, or when a mental emotion may overload the capillaries in various parts of the body; or, again, in certain dropsies arising from mechanical gravitation of blood or postural peculiarity.

Hyperæmia may also be caused by a division of the sympathetic, thus depriving the capillaries of their nervous force, a fact going to prove the innervation theory.

Let us now suppose that an irritation be caused on the surface of the body; we first have the transmission of this irritation through the afferent or centripetal nerves to the vaso-motor centre, thence by means of the efferent or centrifugal nerves to the bloodvessels, which first causes a contraction of their coats and an acceleration of the stream, which is followed by a slackening of the circulation caused by a loss of tone of the capillaries. The leucocytes ("wandering corpuscles") arrange themselves around the walls of the vessels, which narrowing the calibre of the tubes causes a still greater retardation of the current until it oscillates and then ceases, and the condition known as *stasis* results. During the period that this stagnation takes place there is an exudation of the liquor sanguinis and the migration of the white blood-corpuscles through the coats of the vessels. The blood itself is also altered in the surrounding vessels, it appearing to consist of the migratory cells, packed together in agglomerated masses, which by some is attributed to the cohesiveness of the corpuscles themselves, and by others to a lack of tone found in the vessels.

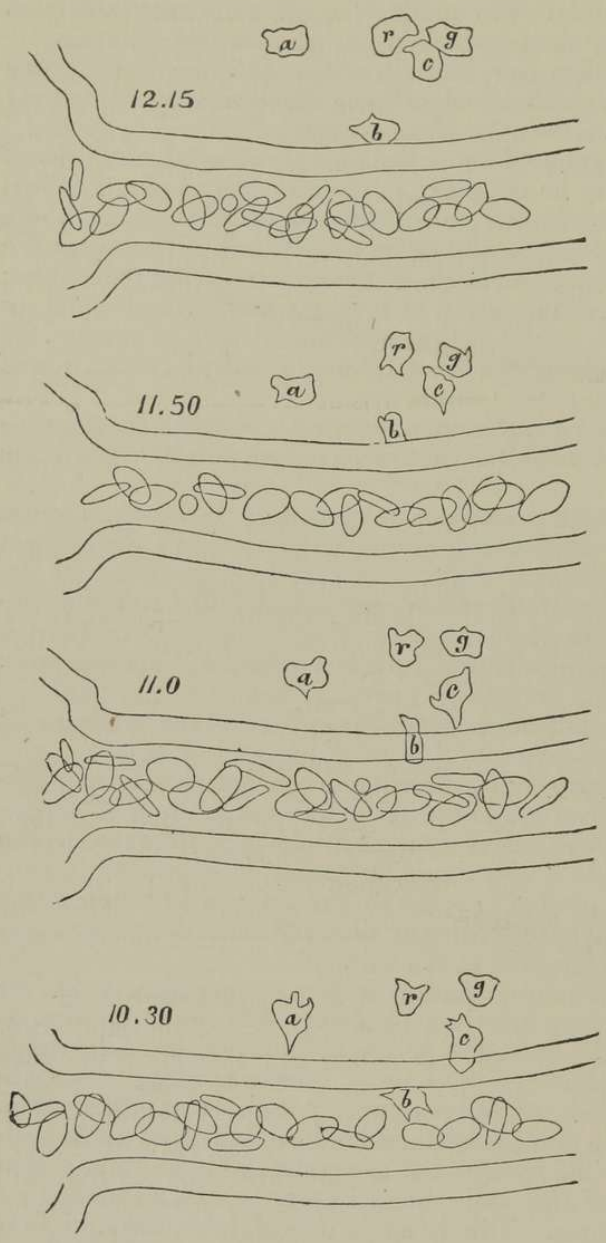
It is a matter of considerable discussion among pathologists, as to *how* these white blood-corpuscles escape through the coats of the capillaries. It is supposed by some that the walls are porous and thus allow the passage of the leucocytes; others contend that these vessels possess "a certain activity of life," and that shortly after injury, indeed, according to Prof. Stricker, on the second day an alteration occurs in the walls of these radicles, and that from the actual pressure of the white globules from within and a fatty degeneration of the walls themselves, an opening is made for the passage of the leucocytes. This is again denied by others; all that it is necessary for us to know at the present is that the passage takes place. In the annexed cut, Fig. 1, Cohnheim's experiment is seen.

L. Purves, to investigate the place where the white blood-corpuscles pass through the wall of the vessel in Cohnheim's experiment on inflammation, injected a solution of silver into the vessels of a frog prepared after the manner of Cohnheim.

The colorless corpuscles without exception wander out between the boundaries of the epithelioid cells. They never pass through the substance or through the nucleus of an epithelioid cell. According to the author,

the red corpuscles only pass out by those channels which have been previously made for them by the colorless corpuscles.

FIG. 1.



Cohnheim's experiment, showing the emigration of the leucocytes out of a vein in the mesentery of a frog. The times of the successive observations are marked on each figure, and the individual leucocytes are distinguished by different letters. *r* and *g* denote two leucocytes which were external to the vein at the commencement of the observation. *a* was only just attached to the outside of the wall of the vein at the commencement, and was free from it at the second observation. *c* had almost passed through the wall at the first observation, was only just attached at the second, and was free at the third. *b* had commenced to adhere to the interior of the wall of the vein at the first observation, had partially penetrated it at the second, was adhering to its outer wall at the third, and was becoming pedunculated and preparing to detach itself at the fourth.—From an experiment made for Mr. Holmes by Mr. J. R. W. Webb.—(HOLMES.)

Changes in the Tissues. Œdematous Infiltration.—The tissues are rendered more succulent and soft by the quantity of the watery blood matter which is exuded; this condition has received the name of "œdematous *infiltration*," and in the connective tissue are found masses of white blood-corpuscles, and in some cases *entire blood elements*. These exudations contain, in certain cases, large proportions of fibrin, which, under certain conditions, may become in part coagulated, giving rise to the condition known as *fibrinous dropsy*, differing from the mere effusion of serum, which is produced by an obstruction of venous return, either by mechanical or other means, constituting anasarca or ascites.

Effusion of Blood and Changes in the Fluid.—In some cases, in the surrounding tissues we find that besides the masses of white blood-corpuscles already mentioned, there are red blood-globules, which fact is attributed by some to a rupture of the coats of the capillaries, but, as already mentioned, Cohnheim asserts that these make their exit through the same apertures that have given passage to the colorless corpuscles.

Blood, if it is present early, no doubt comes from the capillaries, if

late it is conceded to be from the newly developed bloodvessels in the exudation.

Changes in the Mass of Inflammatory Blood.—Another peculiar change in the body, is that in the mass of inflammatory blood, which mainly is found in the increased quantity of fibrin, which varies from two to ten grains per thousand. It is probable, however, that when there is so large an increase, that a portion thereof may consist of white blood-globules, there being great difficulty in separating them from the fibrin itself.

It has been ascertained by carefully conducted experiments, that the blood of a person affected with inflammation is overloaded throughout with fibrogenous material, as well as at the site of the pathological change, and to this, which as will be shown further on is an old theory, inflammatory fever is attributed. With the increase of fibrin it must be remembered that there is found to be a diminution of albumen and a larger quantity of water.

Blood from a person suffering from a high degree of inflammation, forms a much denser "*crassamentum*," or "*clot*," or "*cruor*," than is found in healthy vital fluid. When this clot has been allowed to stand for awhile, the upper surface is covered with a whitish film which is composed chiefly of fibrin and white blood-corpuscles, and receives the well-known term "*buffy coat.*" Many times the superior surface becomes concave, and then the blood is said to be "*cupped.*"

We have, therefore, thus far:

Changes having their seat in the vessels (contraction and relaxation) produced by the vaso-motor system.

Changes produced in the blood-stream consequent upon the action of the vessels.

Changes in the relative quantity and arrangement of the white blood-globules.

Changes in the texture of the surrounding parts by the effusion of the liquor sanguinis.

The symptomatology of the process should now be appropriately considered.

The most prominent symptoms that denote the presence of inflammation are the well-known ones of pain, heat, swelling, and redness.

Pain is the most characteristic symptom of inflammation, and is caused by the compression of nervous filaments, from the encroachment of the swelling upon them, which acts as a mechanical force; consequently, the pain increases as the tumefaction advances, particularly if the surrounding textures are firm and unyielding. The function also of the sentient nerves is perverted, and they become, themselves, one of the seats of inflammatory action. Moreover, at each throbbing impulse of the heart and arteries, the *nervi vasorum* of the distended and elongated vessels add something to the general amount of pain. But such causes, as well as their results, are liable to vary. The pain present in inflammation is not uniform. It is, as has been before mentioned, in a great measure influenced by the elasticity of the textures in which inflammation occurs. Thus, when a bone is affected with the disease, it is more painful than when the skin is attacked. The intensity of the inflammatory action, and the sensitiveness of the affected part also, to a great extent, influence the amount of pain.

The student must bear in mind that there are other varieties of pain besides the inflammatory. With the agonizing pain of spasm, there is no inflammation present; in neuralgia, also, there is severe pain without the slightest trace of inflammatory action.

The differential diagnosis is as follows:

In inflammation pain begins slight, but continues gradually to increase.

In neuralgia or spasm, the pain begins generally with severity.

In inflammation, pressure invariably aggravates the suffering.

In spasm, colic, or neuralgia, the suffering is often relieved by pressure.

In inflammation there is but one slight intermission, in the other diseases there may be a distinct and even a periodical intermission.

In neuralgic diseases there is often a sudden intermission of the suffering; if this occurs in inflammation, it is always a suspicious symptom.

As a rule we find the most pain at the focus of the inflammation; but this, it must be borne in mind, is not always the case; for when parts are nearly allied to one another in function, although separate in location, the pain may be felt at a distance from the seat of inflammatory action. In inflammation of the brain the most of the pain may be referred to the spine; in the hip, to the knee; in the bladder, to the kidney; and in the liver, to the right shoulder.

Heat.—"The symptoms and consequences of inflammation," wrote Mr. Liston,* "and amongst others heat, are modified by the distance of the affected part from the centre of the circulation. All actions, healthy as well as morbid, proceed with more vigor in the superior extremities—the head, the neck, and the trunk—than in the more remote parts of the body; for in the former the blood is transmitted more speedily, if not in greater quantity, and is not so liable to be impeded in its return." This is evidently true, as ascertained by the thermometer. The normal temperature of the body, at the heart and upper parts of the trunk, varies from 98½° to 100°, at the extremities about 93°,† but there is a rise of the mercury from the heat of an inflamed part, the patient complains of extreme heat, burning, and throbbings, and the thermometer may indicate a rise of four or five degrees.‡ This can be readily accounted for. During the inflammatory process the nerves of sensation, partaking in the general abnormal action, become perverted; indeed, increased sensibility is one of the signs of inflammatory action. This accounts for the *sensation* of heat so frequently noticed and complained of by the patient; and if we also remember that a very fruitful source of animal heat is referred to the changes that take place in the blood circulating in the capillaries; and as these changes are carried on with great rapidity in inflammation, we can readily imagine that the heat of the part which is the seat of the abnormal action may be elevated.

Heat must also be connected with other symptoms to assist in the diagnosis of inflammation, for we all know and are every day told of burnings in different portions of the body, when there is not the faintest trace of any inflammatory action.

A great many facts lead to the opinion that animal heat is the product of increased sensibility,—whenever the vital powers are much excited it is found in augmented quantity—the temperature of the hen's breast during incubation, although divested of feathers, is much increased—emotions of the mind, as anger, hope, and joy, also develop it—although it is rather a sensation than a real increase of caloric; experiments having shown that the temperature in the mucous canals of animals is nearly the same in a healthy or inflamed state. If the blood is accumulated unduly in a part, there is found an increase of heat; and if a part is unusually heated, there will be found an additional quantity of blood.

With regard to the fact already noted, that an inflamed part actually generates heat, Mr. John Simon has given us some most carefully conducted

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* Liston's Elements of Surgery.

† Cyclopedia of Practical Medicine, p. 738. ‡ Loc. cit.

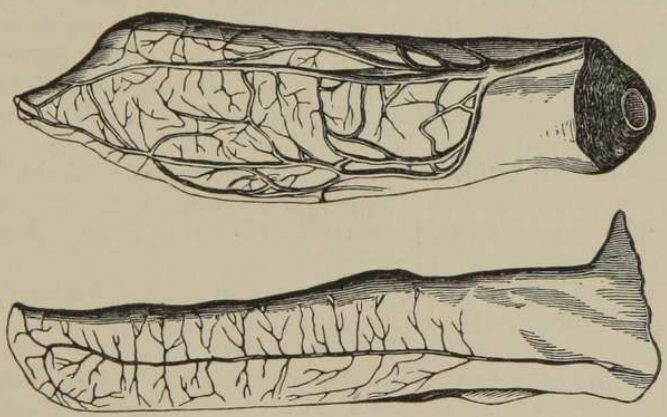
thermo-electrical observations.* He finds, "1st. That the *arterial* blood supplied to an inflamed limb is less warm than the focus of inflammation itself. 2d. That the *venous* blood returning from an inflamed limb, though less warm than the focus of inflammation, is warmer than the arterial blood supplied to the limb; and, 3d, that the venous blood returning from an *inflamed limb* is warmer than the corresponding current on the opposide side of the body." When this heat is reduced by perspiration or other critical phenomena, there will be less of that disorder (hereafter to be mentioned) known as *inflammatory fever*, and *vice versa*.

Swelling.—This effect arises from several causes; first, the effusion of coagulable lymph and serum; secondly, the increased quantity of blood in the vessels; thirdly, the deposition of new matter; fourthly, the interruption of absorption, particularly noticed by Soemmering.

The swelling is, for the most part, confined to the cellular texture, and is commonly the greatest where the inflammation commences; but this symptom, when viewed alone, cannot by any means indicate the disease, others must be conjoined with it. In the simplest form of œdema no inflammation is present.

The **redness** is evidently caused by the increased quantity of blood contained in the capillaries, and the introduction of the red globules into those radicals, which previously would not permit their admission. The color of the blood, also, in inflammation assumes a deeper tint, but there are some instances in which the inflammatory process may have been present to a certain extent, and the parts be paler. This, however, is not generally the case. The enlargement and engorgement of the capillaries were made plainly distinguishable by Mr. Hunter. He says: "I froze the ear of a rabbit and thawed it again; this occasioned considerable inflammation, an increased heat, and thickening of the part. This rabbit was killed when the ear was in the height of inflammation, and the head being injected the two

FIG. 2.



ears were removed and dried. The uninflamed ear dried clear and transparent, the vessels were distinctly seen ramifying through its substance, but the inflamed ear dried thicker and more opaque, and its arteries were considerably larger." The different size of the capillaries is seen in Fig. 2.

But redness is not absolutely essential to inflammation, which may take place slightly in the cornea, for instance, without it, and also in the arachnoid membrane of the brain.

* Holmes's System of Surgery, 2d ed., vol. i, p. 18.

The *speedy* appearance of the redness destroys the opinion advanced by some that the red vessels are a formation of the inflammatory process.

Throbbing.—This depends upon the obstruction to the passage of the blood through the capillary vessels, and is not owing to its increased rapidity of action. Throbbing, with a little attention, can generally be ascertained. The larger vessels are incited into stronger action, which again is communicated to others, till the whole system may become involved.

The throbbing is particularly distinct in cases of paronychia.

There are many instances, however, when some of the local manifestations of inflammation cannot be appreciated, but the constitutional symptoms—quick full pulse; dry furred tongue; high colored urine, thirst, etc.—may, perhaps, lead to the detection of the disease; "but," says Mr. Fergusson, "some of these even are not entirely to be depended on, seeing that they may be present without the existence of inflammation; whilst again, that disease may be in full vigor, and yet the symptoms may be such that *the most experienced may be deceived.*" Again, he says, referring to the same subject, "exceptions to these observations must be familiar to every one who has seen even a *little* practice."

Symptoms, however, of the most unequivocal character, indicating the existence of inflammation in some internal part of the body, may exhibit themselves, yet a post-mortem examination may not detect its existence. This is owing to the capillaries having emptied themselves into the veins after death, or in consequence of the actual contraction of the vessels themselves, which is known to occur during the dying moments of the individual. This fact is well worth remembering, as a correct diagnosis may have been formed, and yet the physical evidence of it may be wanting.

Inflammatory Fever. — Some authors class inflammatory fever with pyæmia, septicæmia, and traumatism in general, making, however, a classification between the simple variety (that appearing immediately) and the more alarming and profound symptoms which result after poisonous materials have found their way into the circulatory system.

Every surgeon, however, knows that at certain times, especially in those persons having a nervous temperament, in a very short period after an inflammation has appeared, all the symptoms of a high degree of fever are developed. This has been explained by many as resulting from a general overheating of the blood.

The more, however, I think over the subject, the more I am disposed to believe that the views expressed long ago by John Fletcher* are correct, and that inflammatory fever, properly so called, is due to a general disturbance of the vaso-motor system and a general disturbance of vital force. It must be remembered that when Fletcher wrote, the *inhibitory nerves* had not received attention, and that his conclusions were arrived at by reasoning, observation, and analogy. He thus writes:

"It must be abundantly obvious that it is the first stage of fever which is (as in inflammation) that of increased action, at least with regard to the extreme vessels of the surface of the body (the essential seat of the morbid change), and the second that of diminished action with respect to these vessels; and this, whether the exciting cause be stimulant or sedative. It is true—the increased excitement of these vessels being always attended by a diminished excitement of the rest of the body, and the diminished excitement of these vessels by an increased excitement of the rest of the body—it is difficult to divest one's self of the notion, that the cold stage of fever is

* Elements of General Pathology, p. 176. Ed. J. J. Drysdale, M.D., and J. R. Russell, M D. Edinburgh, 1842.

one of deficiency of action, and the hot stage of increase of it; and it was this which gave occasion to Dr. Armstrong to call the three stages of continued fever (corresponding to the cold, the hot, and the sweating stage of an intermittent) by the names of the stage of oppression, that of excitement, and that of collapse—names which, it must be remembered, apply *only to the state of the body in general*, and not of the capillary vessels of the surface, which, during the stage of oppression, are in a state of preternatural excitement; during that of excitement, in a state of corresponding collapse; and during that of collapse, in a state of reaction. 'Whenever,' says Dr. W. Phillip, 'increased temperature, swelling, and redness appear, the capillary vessels are debilitated, and preternaturally distended.' Now, in the hot stage, the whole surface is affected with increased temperature, redness, and swelling. The deduction is obvious, and the analogy of fever, in every respect, with inflammation, is too manifest to require further comment. In fact, inflammation and fever differ only in their seat and in their degree; the seat of inflammation being anywhere, and more or less circumscribed, and its degree commonly considerable; whereas, the seat of fever is in the whole surface of the body, and its degree commonly slight. It is here, however, meant that the degree of inflammation, in any given number of capillary vessels, is commonly slight in fever compared to that of inflammation, properly so called; but the number of them much more than compensates for the slightness of the inflammation of each, and the constitutional affection is, of course, great in proportion."

Inflammatory fever has been divided into the *sthenic* and asthenic; the former generally appearing in robust young people, the latter in the aged and poorly nourished. It presents the usual stages of erethism, beginning with the usual coldness or chill, as already explained, and followed by frequent, full, and hard pulse, hurried respiration, flushed face, dry mouth, hot head, restlessness, and often delirium. The tongue is coated, the breath bad, the secretions deranged, and the temperature rises to 103° or 104°. These symptoms subside, with critical discharges from nose, kidneys, lungs, or skin; or if the focus of the inflammation continue high, the nervous system becomes prostrated, and other symptoms of traumatism develop themselves. These will be treated of in their proper place.

The Terminations of the Process.—Inflammation has been made to cover processes which were apparently directly opposed to each other. It embraces the healing of wounds and their disastrous suppuration and ulceration; the mending of a broken bone, and the process which prevents the formation of callus. In the consideration of the subject Mr. John Simon, the author of the article on inflammation in *Holmes's System of Surgery*, thus writes: "As regards the difference between these actions (formative and destructive), when they occur in health and when they occur in inflammation, it may suffice to observe empirically, that the *appreciability* of the *opposed results* is in itself a differential mark of inflammation. In healthy tissues, during their normal self-mutation, the anatomist does not at any given moment find either palpable detritus to express their waste of material or multiplying embryonic forms to express their action of repair. The change of matter, the degeneration and removal of what is effete, and the substitution of what is useful, occur there so evenly and proportionably that separate steps are not marked in the process, nor can any contrast be found between the respective elements of declining and nascent tissues."

We therefore may arrange the terminations of inflammation under the following heads:

1. Resolution and metastasis.
2. Repair (development of new formations).

3. Degeneration, including
   a. Suppuration.
   b. Textural softening.
   c. Ulceration (molecular death).
   d. Mortification (death *en masse*).

Resolution, also described as **Delitescence** by some authors, may be either complete or incomplete. In this action the overloaded capillary vessels give off a slight transudation, which relieves them of their engorgement, and allows the agglomerated blood-corpuscles to move slightly in the overdistended vessels. Absorption, also, which had been temporarily suppressed, is again called into play, and the extra vascular deposits are removed; by these two actions the tone of the capillaries begins to be regained, and the heart continuing its action the circulation is gradually restored, and healthy nutrition again established. But the sudden disappearance of inflammatory action must always—as has been remarked of *pain*—be regarded suspiciously, as other parts are very liable to take on a similar action, and thus a *metastasis* is established, perhaps the organ more recently attacked being of a far more important character than the one primarily affected.

Although resolution cannot always be expected, still it frequently does occur; and when this is the case, it is the most desirable termination of the inflammatory process; at all events, the first treatment should be directed to the establishment of resolution, which, if it does not prove sufficient for this end, may mitigate some of the after consequences of inflammation. It frequently happens, however, that by the appropriate treatment the *tendency* of parts to take on inflammatory action may be removed, and thus the patient may be relieved of a considerable amount of suffering and the probable tedium of a long and debilitating confinement, and the physician from the harassing and perplexing complications that so frequently present themselves as the sequelæ of inflammation.

REPAIR.

Inflammatory New Formations.—To account for the varied new formations which are developed by the inflammatory process in the repair of the tissues, many theories are at present under consideration. To explain them Bennet founded his "*Coagulable Lymph Theory*" on the fact that all the new tissues were formed from the blood plasma exuded from the coats of the vessels. Goodsir, Virchow, and Redfern taught that new formations could be developed from the tissues themselves; while Beale referred all new formations to the subdivisions of the minute germs of living matter, not especially, however, from the nucleoli or nuclei, but from invisible particles found in the blood.

Whichever of these theories may be correct it is impossible for us to determine at present, but we can form a fair conclusion that the development of new formations may take place by the cellular infiltration undergoing a variety of modifications. It may be metamorphosed into primary cellular tissue, then into granulation tissue, and thence again into connective tissue, which assumes more or less the conditions of healthy structure.

Adhesion.—A certain degree of inflammation was thought necessary to the restoration of injured parts; hence called healthy inflammation, and supposed to be an instinctive stimulus rather than a morbid action. Unhealthy inflammation, on the other hand, was said to consist of many species—influenced by the kind of disease or by the particular condition of the part in which the inflammation took place.

Sir Astley Cooper expresses the opinion of the profession of his time. He says: "Inflammation is a restorative process; no wound can be repaired without it; even the little puncture made by the lancet would inevitably destroy life if this salutary process did not prevent it." John Hunter, that leviathan in physiology, as Johnson was in literature, in his great work on *Inflammation*, has been supposed to hold the same opinion; but a more critical examination has led us to believe that even he supposed wounds might be healed *without* inflammatory action, to substantiate which passages from his writings can be adduced. For instance, when describing union by the first intention, he seems perfectly aware of the ability of wounds healing *without* inflammatory action, for he says the union in such cases is *without* pain or constitutional disturbance, and proceeds as if *nothing* had happened. Again, he says: "There is only a feeling of tenderness in the part, and that is entirely from the injury done, and not from the operation of union; also, that inflammation comes on as a necessary consequence of parts being too weak to unite by the first intention, or not having the power and disposition to heal."

Owing to Mr. Hunter's obscure phraseology, it is imagined by some that he has been made to support opinions adverse to the great physiological doctrines which he labored so much to establish. He considered inflammation as dependent upon increased circulatory action.*

As we descend in the order of vitality we find that inflammation is *not* necessary to a restoration of health. When vegetables sustain injury *no* such process is established, but the vacancy is filled by the regular and gradual growth of the plant.

In polyps and gemmiparous animals incision and division are the means of multiplying the species. The gray and green polypi have been united into one animal. The injuries of insects, likewise, are repaired similarly without inflammatory action. The oyster and mussel are said not to be susceptible to inflammation, and the same may be said of serpents, toads, salamanders, and others.

Of late we have a much more definite idea of the process of repair than formerly. Now we can say that in every individual case the inflammatory process is *not* necessary. The most perfect form of repair is that known as "*immediate union*," by which we understand that if parts, *immediately* after severance, are placed in direct apposition, that the capillary circulation may be established, and union takes place without inflammation, the conditions through which such results occur being those most favorable for healthy nutrition.

There are many other cases, however, where the symptoms of inflammation must and do present themselves; then we have a degenerative condition of the nutritive process, both in degree and in character, with a corresponding breaking down of the very tissues which have a tendency to be produced by the process.

In primary adhesive inflammation the older pathologists believed that the connective tissue of a wound or surface about to be healed was formed by the lymph exuded during the inflammatory process. According to Virchow, however, the changes are now ascribed to the rudimentary corpuscles or leucocytes which are generated by the cells on each side of the cut or wound. These multiply and become packed into the interspaces of the exuded fibrin, which is now merely a passive material. These corpuscles, however, undergo separate changes; in the one instance they enter into

* Lectures on the Principles of Surgery, by John Hunter, F.R.S., 1839, p. 149.

the new tissue about to be formed, and in other instances they become pus-corpuscles.

According to Billroth, Cohnheim, and others, the changes that take place in an incised wound are:

1st. Dilatation of the capillaries, which causes a retardation of the blood-stream.

2d. These wandering white blood-corpuscles migrate into the margins of the flaps, and may even pass into the connective tissue, which becomes much infiltrated with serum.

3d. The leucocytes are then in part converted into the stable and permanent connective tissue corpuscles, and the remainder either enter again into the circulation or degenerate or soften to form pus.

4th. Together with this an exudation of fibrogenous serum occurs, which assists to hold the corpuscles firmly.

The ultimate firmness of the new formation is produced, according to Schmidt, by a fibro-plastic substance, which arranges itself around the newly-formed corpuscles, forming for them a stratum in which further growth and proliferation may occur, and which also may be removed by absorption after the firmness of the parts is complete. During the healing process, also, the blood-clots are broken up and absorbed.

The healing process, just described, was attributed by many pathologists of old to the fibrin of the blood, which, according to the Hunterian theory, was supposed to be necessarily present in the healing of wounds by what was called *primum intentionem*, or first intention; and although there can be no doubt that blood-clots may themselves become perfectly organized, as is seen in the arteries after their occlusion, yet this method of organization is at present believed to be only noticed in the smaller coagulæ, and that, according to Billroth and some others, in the larger clots the organization only occurs on the periphery, while disorganization takes place in the centre of the clot.

If a wound does not heal by the first intention, it closes, and by another process, by which new tissue is formed, known as *granulation*.

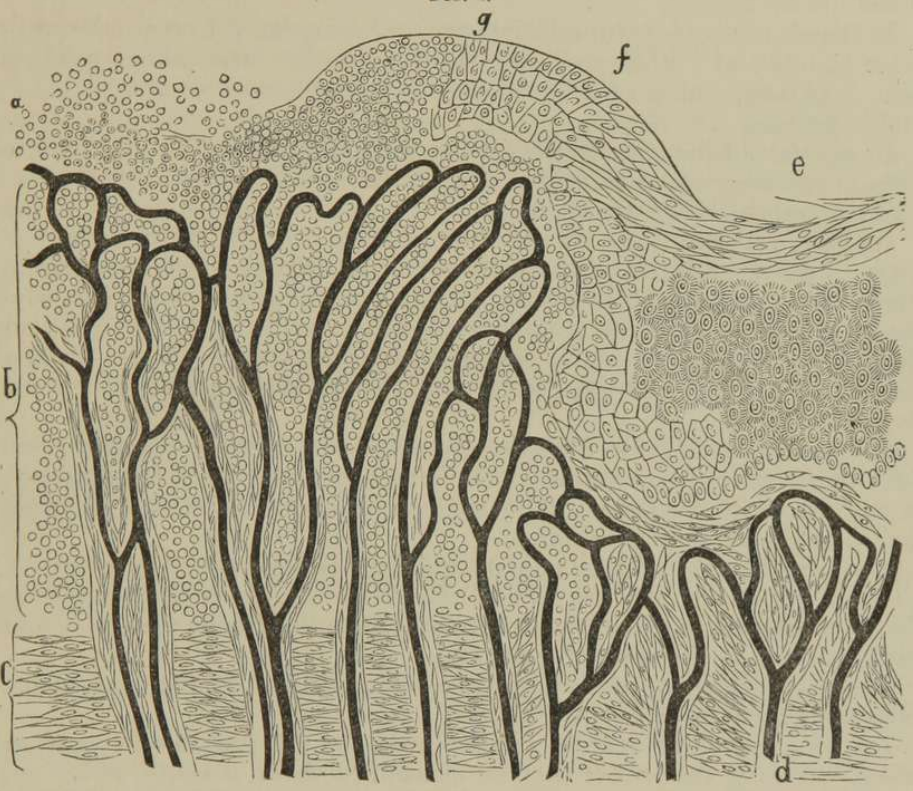
The exuded white corpuscles, or the fixed inflammatory corpuscles, become imbedded in fibrin from the liquor sanguinis, the serous portion of which drains away or may be absorbed; the capillaries assume a somewhat tufted form, and are looped and twisted upon themselves, and finally small, rounded, red, vascular points are seen scattered throughout the surface. These cells are then called *granulation-cells*, and become numerous, and fill up the cavity which is being healed. It must be remembered that new capillaries are also formed, which first are composed of a thin membrane containing nuclei, arranged frequently in a longitudinal direction, and arising from the sides of the permanent capillaries. These finally become fully formed, and transmit an extra supply of blood as long as it is needed; when they are of no further use they diminish and disappear.

Healthy granulations are not very sensitive, are of a bright red color, and ordinarily do not bleed easily; sometimes, however, they become sensitive, and bleed from the slightest touch, or they may become flabby, pale in color, and very luxuriant in growth; these are, of course, deviations from the normal or healthy process, and require treatment.

Finally, the granulation-cells gradually coalesce and become incorporated with each other. (See Fig. 3.) During this process it must not be understood that all the corpuscles take on the action we have described; on the contrary, there are many of them which undergo degeneration and softening, and become pus, and are thus carried away. After the granulations have reached the surface of the body, *provided they are healthy*, they still

further join themselves together, and become glazed over, and as the nodules next the healthy skin reach the surface they become dry and are paler, the epidermal cells become flattened upon themselves, and thus the process continues until cicatrization results. The annexed cut shows beau-

FIG. 3.



Vertical section through the edge of a granulating surface in process of repair (after Rindfleisch). *a*. Secretion of pus. *b*. Granulation tissue (embryonic tissue) with capillary loops, whose walls consist of a layer of cells longitudinally disposed; their thickness decreases as we approach the surface. *c*. Cicatrization beginning at the base (spindle-cell tissue). *d*. Cicatricial tissue. *e*. Fully-formed cuticle, its middle layer consisting of grooved cells. *f*. Young epithelial cells. *g*. Zone of differentiation.—(HOLMES.)

tifully the steps of the processes just described. Rindfleisch says: "The cicatricial tissue is far from being a connective tissue of ideally high quality. On the contrary, its fibres are stiff, inelastic, and misshapen; its cells are represented by shrunken, staff-shaped nuclei, and its vital capacity is proportionally reduced. Moreover, the cicatricial tissue exhibits an extreme proneness to contract in all its dimensions. . . . . It need hardly be said that this general diminution in bulk is a physical rather than a vital phenomenon. The removal of water has a great deal to do with it, for the white glistening tissue of a cicatrix is dry, compact, and harder to cut than any other variety of connective tissue."

The *scabbing process* may be called nature's mode of healing wounds. We often see the process in animals when they receive slight wounds, the blood, dirt, and other materials which collect on the outside form a thick scab, excluding the air; when the scab falls off, the wound beneath is healed. This process takes place, however, only in slight wounds where there is little or no suppuration. Dr. Hewson imitates this process in his earth treatment, and I must confess I have seen wonderful results from this application in recent wounds and burns. The process, however, does not appear

to be exactly understood. But it is probable that the pus and serum become inspissated, and that the healing process takes place beneath them.

Before proceeding to the consideration of the other more important terminations of the inflammatory process which demand separate treatment, a few remarks upon some of the further results of the inflammatory process remain to be noticed.

In *muscle* the true texture disappears, and is replaced by granules and a large quantity of "*oil drops*," even the striæ in the surrounding muscular fibre give way, and a semi-liquid, semi-solid substance, composed chiefly of oil, remains.

In *glands* and the *mucous membranes*, no matter where found, this tendency to softening and disintegration, and the appearance in the debris of vast amounts of oily material is found.

In *bone*, the first trace of the destructive process is generally noticed between the animal and earthy constituents of the osseous structure. The parts are disintegrated and discharged in larger or smaller particles, while the chemical constituents are also materially changed. In *ligaments* and the hard structure, again, is found liquefaction and tendency to fatty degeneration, and in *nerves*, the very nerve-tubules themselves filling with deposition of oil.

The conversion of cells into this oily substance, which ultimately causes fatty degeneration, is occasioned first by an accumulation of fatty particles in the interior of the cells, which being thus filled lose their translucency, and the cell-wall becomes thinned.

This degenerate body has been called by Gluge the "inflammatory globule," by others the "granule cell." The cell-wall, as the process continues, disappears, and the mass ("granule mass") breaks up and is more readily amenable to absorptive power.

This fatty degeneration is sometimes accompanied by the deposition of calcareous material in the corpuscles.

The *causes* of inflammation are divided into the predisposing and exciting. Among the former may be classed, plethora, debility, either general or local; intemperance, undue exertion of mind and body; the latter comprising irritants, pressure, heat or cold, excessive irritation, retention of secretions.

The *duration* of the inflammatory process varies according to the structure of the part—its situation, the temperament, age, sex, and habits of the patient. In organs of a high degree of vitality, the progress is more rapid than in those which are less highly organized. In the sanguine temperament it is more severe than in the phlegmatic, and in the intemperate it is more to be dreaded than in those who have led a regular and temperate life.

Treatment. — In the treatment of inflammation, often the different characteristics of the suffering are important, thus: Inflammation of the cellular, osseous, nervous, and muscular tissues is circumscribed and the pain throbbing. In morbid growths and in tubercle the objective symptoms are different, nor is there much pain nor increase of heat. In other varieties of abnormal growth the appearances again are dissimilar, and the pains are acute and lancinating. Inflammation of the lining membrane of the larynx is admitted to be quite different from inflammation of the lining membrane of the trachea. Inflammation, seated in the same tissue of the same organ, assumes at different times different characters, as is observed in cutaneous affections. How are these differences to be understood and encountered? Can they all be grouped together and treated as that pathological condition termed inflammation? If *systems* of medicine

and not the law of *simile* be true, they ought to be so understood and treated, and the successful result of such practice would confirm the truth of the systems. But they are not treated upon any general principle. In diseases of the dermoid system, the chief reliance is reposed upon what are termed specifics. An impartial mind can entertain no other idea than that the different subjective symptoms, as exhibited, for example, in different varieties of pain—such as tearing, burning, darting, lancinating, pressive, piercing, boring—are the result of essentially different morbid actions; each one, therefore, of necessity requiring its appropriate remedy. To these differences a critical attention must be given for the most successful application of means. It is unpardonable ignorance at the present time, when the bright rays of true medicine are illuminating our pathway with floods of light, to have an imperfect knowledge only of symptoms, and to confound all distinctions.

In some instances the *tendency* of parts to take on inflammatory action may be removed, and thus the patient may be relieved of a considerable amount of suffering and the probable tedium of a long and debilitating confinement, and the physician from the harassing and perplexing complications that so frequently present themselves as the sequelæ of inflammation.

The following are the medicines that appear best adapted to accomplish such a desirable end:

1. Cham., graph., hepar, petrol., silic., staphis., sulph. 2. Baryta carb., calc. c., lyc, nit. ac., rhus, sepia.

Should these not be sufficient, and the inflammatory action appears to be progressing, the medicines to be relied on are:

1. Acon., ars., bell., bry., hepar, merc., phos., silic., sulph. 2. Asa., arn., calc. c., china, graph , mang., natr. m., petrol., puls., rhus.

These, perhaps, it will be sufficient to name, although there are many others of minor importance that are serviceable in treating the concomitant symptoms of inflammation.

Aconite is peculiarly adapted to inflammations occurring either in the internal or external parts, when the pains are lancinating, or when there is much synochal fever. Also, for acute local congestions with erethism of the nerves; it appears to be, according to Noack and Trinks, best adapted to individuals of a plethoric habit, lively character, bilioso-nervous or sanguineous constitution, with dark hair and light complexion. This medicine is certainly one of the greatest so-termed antiphlogistic remedies, and is highly recommended by some practitioners of the old school. In one of the best surgical works of the present day, we read: "Aconite is a powerful antiphlogistic. It tends to relieve by cutaneous and other secretions, but its most important effect is to lower the heart's action and general circulation. In this respect, indeed, it is the most simple and yet the most powerful of sedatives. Small doses, such as a *drop* or *half a drop* of the strong tincture in *aqueous* solution, repeated every hour, every half hour, or every two hours, are quite safe and truly antiphlogistic; often under their use, the pulse will be found to come down *even* rapidly, the other febrile symptoms at the same time giving way." Again, from another modern surgery, we quote the following: "*Aconite* and *belladonna* are useful antiphlogistics in certain cases, as in the inflammatory stage of erysipelas, inflammation, rheumatism, etc. They should be employed with care, however, and given in small doses." Aconite is, indeed, serviceable in the *first* stage of almost every variety of inflammation where the pains appear particularly aggravated at night. In active congestion, also, this powerful medicine displays a remarkable degree of action, particularly in persons with bright redness of the cheeks, especially in young girls of a plethoric habit, disposed to congestions, being nervous or irritable, and leading sedentary lives.

Arnica.—We find it recorded that this *panacea lapsorum* is suitable for those stages of inflammation where the vital powers begin to become extinct, and where

there is a tendency to low grades of fever. Under such circumstances it is the contrary of aconite, which, as has been before mentioned, corresponds to the more acute variety; but the effects of arnica are most fully developed in those inflammations that are consequent upon blows and injuries of all kinds, but particularly in those that are contused, when there is hot, hard, and shining swelling of the affected part; when there is dry heat over the whole body, with general sinking of strength. The use of arnica, and other medicines adapted to the treatment of wounds, will be mentioned in a subsequent portion of this work.

Arsenicum is suitable to inflammatory conditions, involving in a very high degree the sensitive sphere, threatening gangrene, or paralysis of the nerves of the parts It is peculiarly suitable to individuals of impoverished, exhausted, and nervous constitutions; also, to the leucophlegmatic temperament, and to both acute and chronic inflammation.

Belladonna is especially adapted to persons of a plethoric habit of body, with tendency to congestion of blood to the head. As indicated by its pathogenesis, the various symptoms attending upon vertigo, with heaviness of the head, glowing redness of the face, dilated pupils, dimness of vision, etc. It is also suitable to scrofulous irritable individuals. What acon. is to inflammatory fever, bell. is to the inflammation itself, or the inflammatory action of the capillaries. If, after the inflammatory action has been subdued by acon., other symptoms remain (chiefly nervous), bell., is of infinite value; the more delicate the inflamed organ or tissue, the more suitable is this medicine; it is also very useful in alternation with merc for inflammations of the lymphatics and glands. Under this medicine we also find erysipelatous inflammations, with swelling, or even mortification of the parts—redness, inflammation, and swelling of the whole skin—red, hot swelling of the affected parts.

Bryonia.—This is a medicine of great value in inflammations of many organs and tissues of the body, when there are flying darting pains, with chilliness, or when the inflammatory swellings are tense, hot, and rather pale, with stinging during motion. In the dermoid tissues also, its action is powerfully displayed, and it is suitable to very many inflammations that occur in those structures. The temperament indicating bry., is the choleric or bilious—persons with brown complexions, brown or black hair, and irritable disposition. The pains are aggravated at night and by movement or contact.

Graphites is also useful in many varieties of inflammation of the skin, particularly *chronic* inflammations.

Camphora is useful in general or local asthenic inflammation, especially when of a rheumatic and erysipelatous character, with a weak soft pulse and shrivelled flaccid skin.

China.—As this medicine is particularly adapted to a state of asthenia or exhaustion of the vital powers of the organism, with relaxation of the solids and deficiency of animal heat, it is said to be extremely useful in asthenic, passive inflammation.

Hepar is especially suitable in the second stage of inflammation; it has a powerful influence over the suppurative process, and hastens it when advancing, and also tends to heal the part after the evacuation of the pus Mercurius, however, forwards the formation of matter more rapidly under certain circumstances, particularly in inflammation of the glands. Sulph. and silic. are also important medicines, particularly in chronic inflammations. Rhus tox.—Inflammatory swelling and redness, with increased burning and stinging.

Gelseminum.—This is a medicine of great value in those inflammations which have a tendency to attack the brain, and when there is great pulsation of the heart and arteries—in fact in inflammation of the vessels themselves, this medicine has been most serviceable.

Of course, it would be highly improper to administer any of the above-mentioned medicines merely for the few indications that have been mentioned, the *totality of symptoms* must be considered; but it would certainly be a work of supererogation; indeed, it would be impossible to mention in this chapter the medicines that are to be exhibited in every case of inflammation, for the disease, as is well known, occupies not only the attention of the surgeon, but constitutes a large proportion of those affections that are encountered by the ordinary practitioner in the daily performance of his duty.

Local Treatment.—In all cases, the first circumstance that must receive attention, is the removal of such exciting causes as happen to be present. Of course, we could not expect to treat successfully any case of disease while the exciting cause is still operating. A slight inflammation arising from a small splinter, cannot be cured until the extraneous body is removed.

In wounds, it is often found that foreign substances excite an unnecessary degree of inflammation; these should be taken away as speedily as possible; splintered pieces of bone often give rise to the abnormal action, and require removal. The head of a bone being out of its place may cause inflammation in the part in which it lies; it, therefore, must be returned to its natural position before inflammatory action can be subdued. There are very many other exciting causes that may be detected, and the sooner they are remedied the better.

Rest of the inflamed locality, if possible, should be absolute; when the muscles are affected, they should be placed in such a position that they may be entirely relaxed.

Position is all-important in the management of local inflammation; the part should be placed in such posture that gravitation will act as a sanguineous drain, and at the same time oppose further injection of the inflamed part.

The efficacy of a poultice in the treatment of inflammation is a disputed point in our school; some practitioners discard the use of such adjuvants entirely, while others have recourse to them frequently, and speak loudly in favor of such means.

There can be no doubt that poultices are often productive of much benefit, and assuage violent pain. However, if suppuration is not well established, I have known great relief occasioned by the simple application of cloths wrung out with hot water and applied to the affected part. These must be changed frequently, and always a dry bandage placed over the wet one. This method need only be tried once or twice to assure one of its efficacy.

Poultices made of warm bread and milk, or, when the pain is excessive, two parts of flaxseed to one of poppy-leaves, will be of great service, not only in hastening suppuration, but also in allaying severe pain.

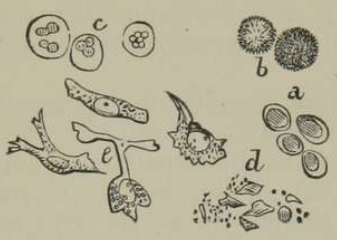
CHAPTER II.

SUPPURATION: PUS-CORPUSCLES—VARIETIES AND ANALYSIS OF PUS—FLUCTUATION—GENERAL TREATMENT—ABSCESS, ACUTE, CHRONIC, DIFFUSE, RESIDUAL: TIME OF OPERATION—TREATMENT—SINUS AND FISTULA.

IF resolution is not accomplished, or either of the methods of repair just mentioned, then the white corpuscles, which as we have seen are found in immense numbers, degenerate, and become "pus-corpuscles," or in some instances "the matter" may be degenerate granulation-cells or connective-tissue corpuscles. Pus-cells, when young, are small punctated bodies, which, as has been already remarked, possess the amœboid motion (Fig. 4),

especially at a high temperature. These young cells send out offshoots, which separate themselves, and rapidly proliferate, accounting for the extremely rapid formation of pus which is often seen after suppuration is once established. After a time, however, as they grow older, they assume the spherical form, and are about $\frac{1}{2500}$th to $\frac{1}{3000}$th of an inch in diameter.

Fig. 4.



Pus-corpuscles: *a*. From a healthy granulating wound. *b*. From an abscess in the areolar tissue. *c*. The same treated with dilute acetic acid. *d*. From a sinus in bone (necrosis). *e*. Migratory pus-corpuscles. — From Rindfleisch's *Pathological Histology*.

"Pus-globules, as seen out of the body, are but little different in appearance from leucocytes. The leucocyte, when treated with acetic acid, displays the appearance of a nucleus in its interior, that appearance being usually regarded as the result of a shrinking of the protoplasm of which it is composed. The pus-globule shows more distinct trace of a membrane, and is frequently many-nucleated when treated with acid, a condition which Rindfleisch regards as indicating a tendency to degenerate and break down. But the same author says that many of the corpuscles of pus display no difference whatever in character from the blood leucocytes, having only single nuclei, showing the same amœboid movements, and being in fact obviously the same things, both in structure and function. This should be borne in mind in connection with the fact that suppuration is not in most cases wholly a destructive process, but serves also as one of the usual modes of repair."—*Holmes*.

According to Virchow,* "suppuration is a pure process of *luxuriation*, by means of which superfluous parts are produced, which do not acquire that degree of consolidation or permanent connection with one another, and with the neighboring parts, which is necessary for the existence of the body." . . . Pus is *not* the *dissolving, but the dissolved, i. e., transformed tissue*. A part becomes soft and liquefies while suppurating; but it is not the pus which occasions this softening; on the contrary, it is the pus which is produced as the result of the proliferation of the tissues.

Besides these degenerate corpuscles, there is a general breaking down of the intercellular substance, and a complete metamorphosis of tissue; granulation-cells, molecular debris, fatty particles, and blood-corpuscles, all being commingled.

To the eye, pus is a yellowish-white creamy liquid, sometimes of a slight greenish tinge, with scarcely any peculiarity of odor, and heavier than water. According to chemical examination, the pus-globule is said to be a protein compound, consisting of the binoxide and tritoxide of protein, but these bodies are included in regularly organized cellules, and they float in a clear liquid called the *liquor puris*. This secretion is closely analogous to the serum of blood, and differs from it chemically only in the fact that its protean compounds are oxidized.

The **chemical constituents** of pus are alkali, water, albuminate, and three other albuminoid substances. These substances differ in their powers of coagulation and solubility. One of them requires from 48° to 49° C. and is insoluble in a 0.1 per cent. of common salt and in a dilute solution of soda. The second is insoluble in water, but dissolves in a 0.1 per cent. solution of hydrochloric acid. The third is soluble in the latter solution, insoluble in a solution of common salt. Besides, pus contains other sub-

* Cellular Pathology, p. 489.

stances, such as nuclein, albuminous constituents, cerebin, cholesterin, and lecithin, which belong to the pus-corpuscles, as well as phosphuretted fats and inorganic salts, the chief of which are chloride of sodium, phosphates and carbonates of the alkalies, phosphate of lime, and the oxide of iron.

The abnormal consituents are mucin, chondrin, gluten, chlorrhodinic acid, pyocyanin and pyoxanthosis (in blue pus), biliary acids, grape sugar, and urea. After exposure to the air, pus undergoes acid fermentation, and then contains leucin, formic, butyric, and valerianic acids.

According to Hoppe Seyler, pus-serum contains in one hundred parts, 90.96 per cent. of water; albuminoids, 7.02; lecithin, 0.10; fats, 0.04; cholesterin, 0.07; alcoholic extract, 0.06; water extract, 0.92; inorganic salts, 0.77.*

The whole amount of solid constituents in pus is 140 to 160 parts in 1000, of which only 5 to 6 per cent. consists of mineral substances.

Pus, as has already been described, is what has been termed by many writers *laudable* or healthy pus, and as such resists putrefaction for a length of time; but there are very many circumstances that may cause the matter to assume different characters. It is a bland fluid, and can wash the most delicate granulations without harming them. If, however, it is exposed to the air, it becomes vitiated; the albumen of the serum is converted into the hydrosulphate of ammonia; an offensive odor is given off, and then we have *unhealthy* pus.

Specific pus is that variety which contains some specific virus, as the syphilitic or vaccine.

Sanious pus is thin, acrid and bloody, and receives also the name of ichorous pus.

When it is mixed with serum it is called serous pus, and when it contains flocculi or cheesy particles, it receives the name of *scrofulous pus.*

The characters of the sero-purulent and muco-purulent explain themselves.

Such are the changes that may be noticed in suppuration, and, by understanding them, the student and young practitioner will often be able to trace more minutely the origin of the disease and render a more perfect diagnosis.

Pus is rarely absorbed, and in the generality of instances, if not assisted in its discharge by the surgeon, finds for itself an opening, leaving a scar, that ever after denotes that disease has once been present in the system.

When suppuration is fairly established, the more acute sufferings of the patient subside, the throbbing which was before frequent, disappears, and the sharp piercing pains become more dull and constant. Generally about the centre of the tumor a small conical eminence appears, that is most commonly of a paler hue than the surrounding textures; when such appearances present themselves the abscess is said to be *pointing.*

The *fluctuation* of a fluid can often be perceived beneath the integuments by careful examination with the fingers, but in some cases it so happens that the presence of matter may be so deepseated that this sensation cannot be appreciated by the practitioner. The attendant occurrences and the presenting symptoms cannot be too carefully studied when such a condition is suspected, for the discovery of the existence of deepseated matter is a circumstance of the highest importance, and one which involves the practitioner's reputation, and frequently the life of the patient.

Gentlemen of the highest reputation as surgeons have been, even after minute examination of a case, entirely mistaken as to the presence of

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* *Vide* Lancet, March 16th, 1878.

fluid. Several instances are recorded in this work (see the chapter on Abscess), in which three incidents in the life of Dr. Dease, of Dublin, are mentioned. In the first his great skill as a diagnostician was shown; in the second, the mistake; the third, the suicide.

Mr. Cooper says: "In no part of the surgeon's employment is experience in former similar cases of greater use to him than in the present; and however simple it may appear, yet nothing, it is certain, more readily distinguishes a man of observation and extensive practice, than his being able easily to detect collections of deepseated matter. On the contrary, nothing so materially injures the character and professional credit of a surgeon as his having in such cases given an inaccurate or unjust prognosis; for, in diseases of this kind, the nature and event of the case are generally at last clearly demonstrated to all concerned."

The only characteristic constitutional symptom that is said to denote the formation of matter, is that of shivering. On this subject, however, as there is some difference of opinion among the profession concerning its usefulness as an indication of formation of pus, Mr. Fergusson is quoted. "It is," says he, "in my opinion, less worthy of estimation than some seem to imagine—it frequently occurs in instances of disease where suppuration never ensues; it often occurs even in a state of health, and equally often when it does happen it may be overlooked. Shivering is a symptom which the surgeon is often deeply interested in, not so much, however, from the dread of suppuration, as that it denotes some peculiar condition of the system fraught with much danger to life—as, for example, if within the first ten days after a capital amputation, or after lithotomy, a patient is seized with shivering, there is much reason to anticipate a fatal result; and although this may not occur in all such instances, every practical surgeon must bear me out in the formidable estimation I have made of this symptom. But whether it has preceded suppuration or not, the surgeon will seldom be thus satisfied that matter has formed."

The more minute treatment of suppuration will be detailed under those diseases in which it occurs. A few remedies may however be mentioned.

The *sulphate of iron* has lately been used with great success in suppuration. An account is given of a child who was burned all over the body, and in a most terrible condition was brought to the Children's Hospital, at Lausanne. It is stated that the suppuration was so profuse, that the ward in which he was placed became absolutely uninhabitable. Upon placing him in a bath, containing two handfuls of sulphate of iron, the pain ceased immediately. The bath was repeated twice a day, and the patient allowed to remain in it fifteen or twenty minutes at a time. The suppuration became very much less, fetor vanished, and the child rapidly recovered.

Dr. Sidney Ringer recommends highly the sulphides of potassium, of sodium, or of calcium in the treatment of suppurative processes. After their administration the discharge may become thin and unhealthy, but afterwards assumes a "laudable" character. The dose is, for carbuncles, $\frac{1}{10}$th of a grain of sulphide of calcium, given every two hours.

In this place it is proper to speak of the marigold, and its power over suppuration.

Of all the varieties of topical applications which are recommended in the treatment of suppurations and lacerations, and of all the different medicinal substances which are supposed to possess an influence upon these processes, there is not one that is entitled to a higher place than the calendula officinalis.

The peculiar properties of this agent were some time back introduced to the homœopathic profession by Dr. Thorer, in the *British Journal of Homœ-*

opathy, and since that period many practitioners, through the periodicals, have noticed its effects.

There can be no doubt that when homœopathists begin to devote themselves more exclusively to surgery, this plant will be as highly in vogue after operations, in the treatment of wounds when *large and exhausting suppuration* is to be expected, in burns, in anthrax, etc., as the arnica has become in the treatment of bruises.

According to the Pharmacopœia, the flowers, buds, and young leaves are used, the juice expressed after maceration in alcohol, and the tincture thus obtained, when properly diluted, is used as a topical application. Dr. Thorer prefers what he terms the *aqua calendula officinalis*, and his directions for its preparation are as follows: "Fill one-third of a clean bottle with petals or leaves of the flowers, the remaining two-thirds with fresh pure spring water. Cork the bottle well and expose it for two or three days to the rays of the sun. The water is by this process rendered slightly aromatic. It is then poured off from the leaves into a bottle, which must be sealed, and placed in a lower temperature. While the liquid is being exposed to the rays of the sun it must be narrowly watched, and as soon as there are signs of incipient fermentation measures must be taken to arrest it."

This preparation is rather preferable to the dilute tincture, although the latter has proved very serviceable in the hands of many practitioners. When there is great suppuration, as in burns that have involved a considerable portion of the integument, the action of this medicine is wonderful. The most convincing case of this kind came under the notice of Professor Temple, of St. Louis, the details of which have already been given to the profession in the *North American Journal*. I would also mention here its usefulness in the treatment of anthrax after incisions, to assist in the separation of the slough. I have had under my care many cases of carbuncle. In one instance, the disease extended over the whole forehead. In another case, a large extremely painful anthrax appeared just over the tendon of the quadriceps extensor, and involved the tissues beneath to such a degree that an abscess formed underneath and threatened the joint. And in a third, three large and painful tumors developed themselves on the more usual site, the nape of the neck. The internal treatment was arsenicum for the intense burning, the part being constantly covered with a thick compress, saturated with a hot solution of calendula and water. The effect of the latter in hastening the generally tardy separation of the slough, in allaying pain, and more particularly in bringing the disease to a speedy termination, was surprising. Moreover, the solution of calendula can be poured into deep wounds with great benefit, and with much alleviation of pain. I have used it freely in almost every variety of surgical operations, after many kinds of amputation, in resections, removal of tumors, and in all classes of wounds. I have experimented with it side by side with the carbolic acid, now so much in vogue, and must give my testimony most decidedly in favor of calendula.

A young lady, suffering from a contraction of a cicatrix (from a burn), which drew down the eyelids toward the angle of the mouth, and partially everted the lower lid, was brought to me by a student of the college. By dividing the integument from the external canthus, towards the nose, for about an inch and a half with the fascia and superficial fibres of the orbicularis, the deformity was to a great extent relieved. The lids were then closed, and kept in apposition by straps of isinglass plaster. The wound, from the efforts of the parts to regain their normal position (although deformity was of some years' duration) opened fully an inch, and to this raw surface compresses saturated with calendula were applied. Rapid granu-

lation and cicatrization resulted, without the slightest tendency to erysipelas. I sincerely trust that more of our profession will give to this agent the trial it deserves in medicine and surgery.

A very satisfactory case of a severe wound of the shoulder, treated with calendula by G. W. Campbell, M.D., is recorded in the *American Homœopathic Observer*, vol. iii, p. 562. In this case amputation had been decided upon by other surgeons. In the same periodical, Dr. A. M. Cushing, of Lynn, Mass., relates, p. 563, a somewhat similar case, the injury, however, affecting the hand, in which amputation was considered absolutely necessary, but calendula, with hydrastis and sanguinaria, saved the parts. In the same journal, p. 477, Dr. C. H. Lee, of Ætna, testifies to the most excellent service rendered him by this agent in a severe lacerated scalp wound.

J. G. Gilchrist, M.D., thus speaks in favor of this substance as a vulnerary:* "My experience in general surgery, particularly in 'mill accidents,' for the last four years, has been pretty extensive, living as I do in a large manufacturing district, and after giving all of these medicines a fair trial, I have concluded in the treatment of *all kinds of wounds* calendula takes the highest rank."

Dr. J. H. McClelland, of Pittsburg,† records a case of caries of the ankle-joint, wherein calendula, both locally and internally, were of very great service to the patient.

Dr. L. H. Willard, in a report,‡ also mentions calendula as a favorite solution for external application.

ABSCESS.

When pus is fully formed, and collected into the parenchyma of a part, the condition is termed abscess, which, on account of the frequency of its occurrence and its numerous complications, is of great interest to the surgeon.

Lining the cavity that contains the pus, especially if the abnormal condition has continued for any length of time, is found a tissue having a membranous appearance and a membranous function, and possessing a power of maintaining the formation of pus; hence it is termed the *pyogenic membrane*. It is not constant in all abscesses, and may be a sign of imperfect formation of the abscess wall, but is endowed with very considerable capability of secretion, but as an absorbent surface it is comparatively feeble. In regard to this latter point, however, it may be useful to remember that the pus-globule, when extra-vascular and complete, is of comparatively large size, not soluble in its own serum, and therefore but little amenable to ordinary absorption; the serous portion of the pus may be taken up readily enough, but the solid part probably remains but little affected. And thus the feebleness of absorbent power may depend, not so much on defect of either structure or function in the pyogenic membrane, as on the nature of the fluid on which it has to operate.

Sudden suppression of purulent formation is always to be regarded as an untoward event. It is more liable to occur in the case of free and open suppuration than in an unopened abscess. It may be the result of some accidental occurrence, the nature of which we may be unable at the time to ascertain, or it may be caused by injudicious stimulation designedly applied to the part; but the suppression, no matter how it may be induced, is always likely to be followed by disastrous consequences.

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* U. S. Medical and Surgical Journal, vol. i, p. 121.
† Trans. American Institute of Hom., 1868, p. 79.
‡ Pittsburg Hospital Cases.

The process of *pointing*, and the great necessity of observing *fluctuation*, have been alluded to in the chapter upon suppuration; but there remains to be mentioned one of the most important circumstances connected with abscess, which, if neglected, may be attended with fatal results, or at least with great danger and trouble.

It sometimes happens that an abscess is situated directly in the course of an artery, and when such is the case the greatest care and discrimination should be exhibited in the diagnosis between the collection of pus and aneurism; the most experienced have been misled by circumstances, and deceived by appearances. Dupuytren himself, whose ability and surgical skill have always been regarded by the profession with the greatest esteem, failed in his diagnosis, and once plunged a lancet into an aneurism, mistaking it for an abscess.

The following is recorded of Dr. Dease, of Dublin: "He was called to see a case, supposed to be one of aneurism by all the physicians who had attended it, and upon careful examination determined it to be a large collection of pus overlying an artery. Taking the responsibility, in spite of the advice of those who consulted with him, he plunged his knife into the pulsating mass. There was a gush of matter, and the patient, who looked a short time before upon his case as hopeless, was entirely relieved. Much credit was justly the meed of Dr. Dease, and great gratification must he have felt at thus relieving the unfortunate sufferer. Some time after he was sent for to another case, which, like that just mentioned, had been regarded as an aneurism; and, as in the other, he decided that it was a collection of pus, and proposed relief in the same manner. This being assented to, he penetrated the tumor with his knife, when out rushed a torrent of blood, and with it the life of the patient. He had erred in his diagnosis. *It was an aneurism—not an abscess!* Dr. Dease returned to his home, and on the next morning was found upon the floor of his chamber with his throat cut from ear to ear by his own hand!"

The diagnostic signs between abscess and aneurism are:

From the earliest stage of abscess the tumor is hot, throbbing, hard, and incompressible; in aneurism the tumor is of natural temperature, and is soft and fluctuating.

The skin covering an abscess is inflamed and discolored; that which covers an aneurism is of natural color, or perhaps paler.

In abscess the formation of the tumor is much more rapid than in aneurism.

In aneurism the tumor is pulsating; in abscess it is fluctuating, but has no pulsation.

The enlargement in abscess cannot be diminished by pressure, in aneurism the contrary is the case. When, however, the diagnosis is sufficiently established, it may become a question to the surgeon whether the pus shall be evacuated by the lancet, or whether it would be proper to endeavor to produce absorption.

An *acute abscess* is one in which the inflammatory action runs a rapid course, suppuration is soon established and the matter evacuated, and the patient recovers. In this form of the affection the fever is high, the face flushed, and sometimes, but rarely, there is delirium. Those patients who suffer from acute or phlegmonous abscesses are generally dyspeptic, having some disorder of the stomach or liver. The character of the pus varies in this variety of abscess, sometimes it is flaky, sometimes sanious, and often laudable. If the inflammation has occurred in the neighborhood of secreting organs, and their texture has become implicated, then the discharge may be mixed with the peculiar secretion of the organ affected; there may be bile, semen, milk, as the liver, testicle, or mammæ are implicated.

In many cases, especially in those accustomed to high living and debauchery, or in those whose constitutions are broken down with exposure, hard labor, deprivation, want of air, light, or food, the pus from the abscess is not circumscribed by a pyogenic membrane, and burrows hither and thither in the muscular tissues, giving rise to what is termed *purulent infiltration*, or *diffuse abscess*. The prognosis in such instances is bad, the suffering intense, and the treatment rather unsatisfactory. The extensive infiltrations of pus set up a terrible constitutional irritation, and the patient may die worn out with hectic.

In the *chronic abscess*, or *cold* abscess, the symptoms are not as well marked as we find them in the acute or diffuse variety. The symptoms which note the commencement of a chronic abscess are always obscure. There is no fever, but a slight degree of pain; no heat of surface; on the contrary, the part appears to be colder, hence the name "cold abscess." The suppurative process is so slow that weeks and months elapse before fluctuation or pointing can be detected, during which time the general health of the patient is not much impaired. In this variety of abscess the pyogenic membrane is said to be more clearly developed than in the more acute suppurative process.

Residual abscess is the name given to the remains of a collection of pus, the fluid portions of which have been absorbed. In such a case there remains a tough or doughy texture, which has somewhat a "boggy" feel. They are said to be found most frequently after spinal abscesses.

The *local dangers* belonging to abscesses arise either from the encroachment of the tumor on arteries or veins, or its proximity to important cavities, into which the pus may be unexpectedly poured, or when fascia and bones become implicated. There are several cases on record in which the coats of an artery have been ulcerated through, and severe, if not fatal hæmorrhage has followed. A case of the kind was related to me by Dr. Zantzinger, in which upon opening a fluctuating tumor of the neck containing pus a large amount of blood was discharged *per saltum*. Mr. Liston also in opening an abscess found a gush of blood follow the incision.

Again, we have large abscesses which, if they open into the great cavities, would certainly be fatal. In abscesses of the liver, for instance, great care should be taken to prevent such an accident. I attended, in consultation with Dr. T. F. Allen, a gentleman who had an immense abscess in the abdominal parietes. This, if it had not been laid open, would undoubtedly have poured its contents into the peritoneal cavity. The patient could feel the "bag," or pouch, as he expressed it, whenever he moved in his bed.

Again, abscesses are dangerous when they are bound down by strong and deep fascia, as we find in the perinæum, or beneath the fascia lata of the thigh, in which case they are very likely to produce great devastation by the burrowing of the pus, or when the suppuration has taken place beneath the periosteum, and the bone is likely to be destroyed.

It is stated on the best authority that large abscesses have in a *few* instances disappeared, and that there is, in certain cases, a *physiological resorption of pus*. This, however, must be explained, and the experiments of Virchow have thrown much light upon the subject. "*Pus as pus is never reabsorbed*," and when purulent formations have disappeared, which undoubtedly is the case in some instances, they take place in the following manner: The pus-corpuscles are supplied with a great quantity of water, which is both external to them and intercellular. This fluid part is absorbed, leaving an inspissated form of pus, in which the corpuscles draw near to each other, and become very much shrivelled; these may act as solid bodies, and entering the circulation may give rise at a later period to

ulceration. In other instances a fatty metamorphosis of the cytoid corpuscles takes place, in which a mass composed of a milky substance, fat, and an albuminous substance is formed, sometimes even containing sugar, which can be taken up by the absorbent vessels.

Time for Operation.—There is no doubt in my own mind that the tendency of the surgery of to-day is to interpose operative interference too early, especially in large abscesses. If the suppuration be deepseated, or as has been already mentioned, vital parts are in imminent danger from the rupture of the sac, then the surgeon, so soon as he is certain that the pus has formed, may proceed to evacuate it. Delay may be dangerous to the vitality, not only of the part, but to the sufferer. Unless, however, some of the local dangers attendant upon abscesses threaten, "*delay*" should be preferable to speed. On this subject we have the high authority of Mr. Fergusson: "I am of opinion that in ordinary abscess—a bubo, for instance—if an opening is not made until the matter has approached near to the surface, the subsequent progress of the case is much more rapid and satisfactory, provided that a proper opening be made. I have seen a good deal of the practice of making early openings, and have invariably observed that more pain was thereby induced, and I have often fancied an additional amount of suppuration, whilst the after treatment has been remarkably tedious."

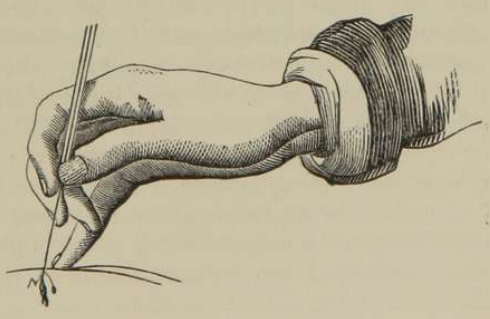
When it is deemed necessary to open an abscess, the incision should always be made where the integument is thinnest, or in other words where the abscess *points*, at which place often a discoloration is manifest.

The practitioner must also bear in mind that various aberrations of purulent collections take place in their progress to the surface, and that they often proceed in a direction opposite to that of gravitation, owing to the resistance of bones, fasciæ, and aponeuroses; which last oppose them in a most remarkable manner, and cause their extension in various directions, giving rise to the most severe local and constitutional sufferings.

A case of lumbar abscess came under my care after having been seen by many physicians in the East and the West, in which there was an opening just above the origin of the quadratus lumborum muscle, and two outlets in the *front of the chest*, on the left of the sternum. In making a post-mortem examination I found that the pus had burrowed in the intercostal spaces between the external and internal intercostal muscles, the fibres of which it will be remembered, for the most part, cross at right angles, and thus made for itself an anterior outlet.

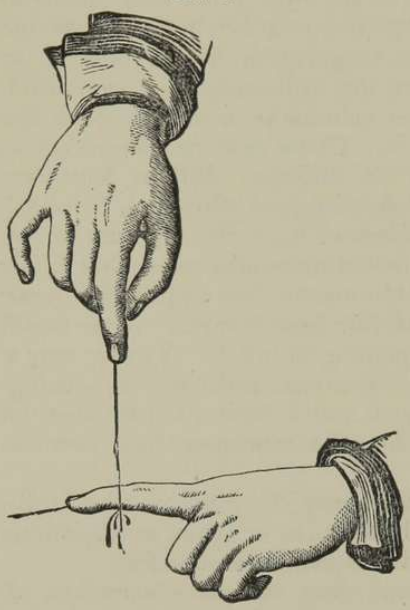
In most cases the opening should be made freely, and the matter liberated at one operation; but when the abscess is large, and the constitution of the patient feeble, the exposure of so large a surface and the speedy evacuation of a quantity of matter, might be dangerous in the extreme; it is then recommended to ascertain to what degree the sac may be diminished, by lessening gradually the quantity of fluid, by removing portions of it by means of the aspirator, or after the manner recommended by Abernethy. That is, by making a small oblique opening, and allowing as much of the contents of the cyst to flow out, as the natural elasticity of the walls will permit;

Fig. 5.



the wound will, perhaps, afterwards heal by the first intention, the aperture may close perfectly, the patient not be injured by the operation, and there will be much less fluid in the abscess; this procedure may be continued until the sac becomes sufficiently diminished in size to allow it to be laid open in the same manner as smaller abscesses. When a lancet is used, it should be held in the position represented in Fig. 5.

Fig. 6.



When the pus is deepseated, the forefinger of the left hand, and perhaps the middle also, being placed over the abscess with gentle pressure, the back of the knife should be caused to rest against the side of the forefinger (as seen in Fig. 6), the point should then be thrust through the skin, and the coverings of the matter divided as far as may be deemed expedient; the blade may then be turned slightly on its long axis, when probably the pus will spring up along its surface. These methods are recommended by Mr. Fergusson, who remarks, "In opening abscesses, whatever be the instrument used, I invariably prefer puncturing first and then cutting from within outward, to the method pursued by some, of making a sort of dissection, by successive incisions, through the skin and other textures."*

In *abscesses about the neck*, especially those chronic formations of pus beneath the deep cervical fascia, or when collections of deepseated pus are found in the abdominal cavity, or where such are even suspected, the aspirator is without doubt the instrument to be employed. Since the general application of this "suction method," if I may so term it, deepseated collections of pus in locations which render the knife always critical and hazardous, are deprived in a great measure of their danger. As a means of *diagnosis*, also, in abscess, the aspirator should never be forgotten; if one is not at hand, the *exploring needle* should be employed. Those now found in the ordinary pocket-instrument cases answer the purpose admirably.

But the homœopathic surgeon may be able, in many instances, to overcome the necessity of operating, by the administration of appropriate medicines, by the action of which the suppurative process may be hastened, and the abscess allowed to open spontaneously. This should always be effected if practicable, and the medicines that have been most efficacious in producing such a result are hepar, merc., and silic.

When there is much constitutional disturbance on account of the violence of the inflammatory action, acon. and bell. are to be used, either separately or in complicated cases in alternation; the doses to be repeated *pro re nata;* the proper antiphlogistic regimen also being observed.

Lachesis is pronounced an excellent remedy when there has been much distension of the skin, which has a bluish tinge, or where the structure has been destroyed by the magnitude of the abscess.

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* Practical Surgery, p. 88.

The medicines for abscesses are (1), Bell., hep., merc., sil., sulph. (2), Calc., lyc., phos., puls., sep.

For *Acute Abscesses:* Ars., asa., bell., bry., cham., hep., led., mezer., phosph., puls., sulph.

For *Chronic Abscesses:* Asa., aurum, calc., carb. veg., con., hep., iod., laur., lycop., mang., merc., merc. corr., nitr. ac., phos., sep., sil., sulph.

Arsenicum.—Intolerable burning pains during the fever, or when the abscess threatens to become gangrenous, or is accompanied with great debility. *Chills, fever, and consecutive sweat;* secretion of offensive matter during the second period; muscular prostration.

Asafœtida.—Abscesses discharging a *colorless serous pus;* violent pains on contact, and great sensitiveness of the adjoining parts; also when there is intermittent pulsations in the tumor, with darting-tearing pains, which are somewhat relieved by pressure.

Belladonna.—Pressure, burning, and stinging in the abscess; *cheesy* and *flocculent pus.* It is especially suitable for hepatic abscesses, and also covers very many of the constitutional symptoms that present themselves during the suppurative stage.

Bryonia.—The tumor is *either very red* or *very pale*, with tensive pain, with sharp, sticking, and lancinating pains, throbbings in the part, the symptoms being worse towards evening and at night.

Hepar.—When abscess occurs in lymphatic, phlegmatic individuals, with white delicate skin, blonde hair; especially when the pains are *pressive*, aggravated at night and by exposure to cold; when maturation is imperfect, although for this symptom Dr. Kaspar prefers *mercurius.** *Baryta carb.* and *carbo an.* are also powerful medicines for promoting suppuration when the tumor appears very hard; the former, by some authors, is regarded almost a *specific.*

Mezer.—For abscess of *fibrous parts*, and of *tendons*, or for abscesses arising from abuse of mercury, attended by stinging and throbbing pains.

Pulsatilla.—When the abscess *bleeds readily*, with stinging or cutting pains; or when an *itching*, burning, and stinging are experienced in the surrounding parts, especially if varices be present, or likewise if the abscess arise *after violent and long-continued inflammations.*

Rhus.—Especially for abscesses of the *axillary* or *parotid* glands, when the swelling is painful to the touch, or discharges a *bloody-serous pus*, with stinging and gnawing pains.

Mercurius.—*Slowly suppurating abscesses:* Continual thirst, coldness of the hands and feet, with internal chilliness during the febrile stage, with drawing pains in the abscess, and *all the symptoms excessively aggravated at night.*

Silicea.—Abscesses with stitching and throbbing pains. This remedy hastens suppuration, or restores it when it has become arrested in consequence of the suppression of nervous influence. The pus may be laudable or ichorous. It is also serviceable, after matter has been discharged, to promote granulation and cicatrization. **Calendula officinalis** is highly recommended by Dr. Thorer when the suppuration is profuse and exhausting, especially in traumatic abscesses.

Sulphur is especially suited for chronic abscess, and for a tendency to suppuration, dependent upon a psoric or scrofulous diathesis. When the pains are throbbing or stinging, or when after the evacuation of pus there is a tendency to ulceration. This remedy is frequently indicated to complete the cure of the disease.

The **Hypophosphate of lime** appears to exercise a great influence over the so-called "cold abscess." Its use in the treatment of purulent formations has been of great assistance to the surgeon. Dr. Searle, of Brooklyn, called the attention of the profession to this agent some years back, and I have reason to speak well of its efficacy. The dose, as recommended by Dr. Searle, is five grains of the first decimal trituration repeated every three hours.

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* Dr. Rummel is opposed to opening an abscess until the whole tumefaction is matured, and he prefers cold water fomentations, and upon them a thick warm covering. (We should prefer oiled silk to warm poultices.) Hepar sulph [30] has proved very useful, especially in suppuration of the glands, also in the syphilitic and gonorrhœal bubo. Sometimes under its use the suppurative process is rapidly followed by absorption, and the abscess disappears without being opened.—*Quarterly Homœopathic Journal*, vol. i, p. 139.

Some of the surgeons of our school are in favor of injecting medicinal substances into the abscess, partly for the purpose of destroying the pyogenic membrane, and partly in setting up a certain degree of inflammatory action. The solutions are composed either of hydrastis, carbolic acid, iodine, or nitrate of silver.

These practices, as a general rule, should be condemned. Proper medication and appropriate local treatment will cure these cases, in the majority of instances, without further interference. Dr. Marshall records an interesting case in which an old and obstinate abscess was cured by the internal administration of hepar sulph. and injections of a strong tincture of hydrastis.*

Pressure.—The importance of applying pressure in the treatment of extensive abscesses is strongly recommended by Mr. Solly,† who writes, "I am not aware how far the plan, which it is my object in this paper to advocate, is in general use or not, but I am so convinced of its value, that I shall venture to bring it forward. I refer to the careful application of pressure over the surface of extensive abscesses after their contents have been discharged, and the *early disuse of the poultice and its congener, warm-water dressing.* I always prefer cotton-wool to any other kind of pad, as it fits better with all irregularities of surface; and I find that a greater amount of deep pressure can be kept up by strips of plaster than by a roller. By these means the surfaces of the abscess are kept well in contact, they adhere together and the discharge soon ceases."

An excellent method of applying pressure in large abscesses, especially where there are many sinuses, is through the medium of compressed sponge. The pieces of sponge—which can generally be procured at any reputable pharmacy—are placed dry over the abscess, and held *in situ* by means of adhesive straps applied at right angles. Care must be taken to have a sufficient length of strap project beyond the margin of the sponge, that a firm hold may be had upon the surrounding integument. As the secretions are absorbed by the sponge, it naturally enlarges, and being held firmly in its place by the adhesive straps, considerable pressure is exerted upon the abscess and sinuses, and their walls, thus approximated, are much more likely to heal than when constantly distended by accumulations of pus.

SINUS AND FISTULA.

These terms are used synonomously by most surgeons, although, strictly speaking, a fistula should have *two* complete openings and a sinus but one. Again, a sinus conveys to the mind a somewhat *sinuous* track which has more or less length thereto. A fistula, in some instances, has scarcely any length, and merely consists of an opening, as we find in vesico-vaginal and recto-vaginal fistulæ. When from any glandular organ an unnatural passage is formed for the secretion, the term fistula is applied, the *kind* being designated by the organ affected, thus salivary fistula, biliary fistula, etc.

If a fistula has but one opening, instead of receiving the name sinus as it properly should, it is called *incomplete*, and it is this very jumble of terms that gives rise to much misunderstanding among students of medicine.

These canals are lined by a membrane, more or less organized, or imperfectly formed granulation-tissue, from which is discharged unhealthy pus, generally of a serous or flocculent character. The older the canal the more callous are its walls.

We find that there are also sinuses that owe their existence to the pres-

* Am. Hom. Observer, 1867, p. 244. † London Lancet, 1855.

ence of some local cause, as portions of dead bone, bits of wood, bullets, or other foreign material.

The *course* that a sinus takes is influenced by two causes: 1st, the position of the patient, thereby allowing the pus to gravitate in certain directions, and 2d, the density of the structures that intervene between the seat of the disease and the external outlet. It is singular how a sinus may meander through the textures, following the law of gravitation in the main, but passing through tissues giving it the least resistance. The main cause of all fistulæ is suppuration: an abscess is formed, it bags or pouches, separates tissues, and thus the canal is formed. The treatment will be mentioned when considering the diseases of those parts most likely to be affected.

CHAPTER III.

TRAUMATIC FEVER—SURGICAL FEVER—SEPTICÆMIA—ICHORRHÆMIA—PYÆMIA—HECTIC FEVERS—TREATMENT.

I DESIRE here to make an especial difference between the inflammatory fever, already mentioned as belonging to the inflammatory process, and traumatic fever, septicæmia, or surgical fever. In the former, the feverish condition is occasioned partly by the heat of the blood, both at the focus of the inflammatory action and also by that throughout the body; in the latter by the general toxic effect produced by the absorption of morbific elements by the veins or absorbent vessels.

In olden times pyæmia and phlebitis were considered as synonymous terms, but this theory is now untenable.

It was supposed that the veins surrounding the seat of injury absorbed the infectious material which was carried into the circulation, but Tessier proved in 1838, that in the majority of cases blood-clots were found above the site of pus, and Gosselin* and others, from careful dissections of bodies of those having died of pyæmia, could detect no pus whatever in the vessels. The microscope also proves that there are no more leucocytes in the blood of pyæmic patients than in others.

Mr. Spence,† in his late lectures upon surgery, makes the statement that the injection of healthy pus into the system is not found to produce those violent symptoms which were hitherto ascribed to it, and that therefore the term pyæmia is an incorrect one. This is a fact in the abstract, but it must not be inferred that the introduction of healthy pus is not followed by any abnormal manifestations, for from recent experiments made by Billroth, of injecting pure pus into the circulation, fever was invariably produced, and in some instances inflammation and suppuration. Weber and Schiff found purulent pleuritis, and Billroth subcutaneous abscesses after such injections. At present, however, it may be asserted that the pus serum, after undergoing a process of change or decomposition, contains the elements which produce pyæmia and septicæmia. Again, the presence of a thrombus or embolus may excite inflammatory action, and give rise to suppurative inflammation in the vessel, or the inspissated pus, which has already been alluded to, or flocculent particles may become poison to the circulation. It may be asserted that ichorrhæmia is a preferable term, as it is the ichor of the pus that is found most generally to produce the disastrous effects of the disease.

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* Clinical Lectures on Surgery, p. 242. † Vol. i, p. 32.

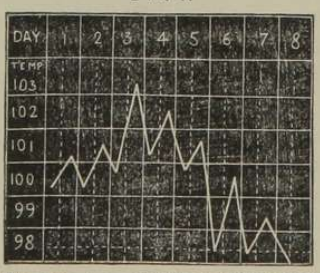
My friend, Professor Liebold, has given to the profession an excellent article on pyæmic fever, which will well repay the reader.* The disease whenever found is one of the gravest importance, and requires the most careful watching. In hospitals septicæmia is more frequent, and said to be more fatal than in private practice, and, like hospital gangrene and hospital erysipelas, is apparently contagious when occurring in crowded wards, or where many wounded are necessarily grouped together within a small space.

At present, however, a new era has dawned upon the treatment of wounds; cleanliness, ventilation, disinfection, and drainage are considered as essential. Nowadays, when hospitals are built upon the more improved plans, and the rules of antiseptic surgery rigorously followed, the appearance of septicæmia is not nearly so frequent as in former years; indeed, from very careful examination of statistics, it was lately stated by no less an authority than Sir James Paget, in a discussion at the Clinical Society of Great Britain, "that there was quite as great a frequency of pyæmia after operations in private as in hospital practice, and that not only with pyæmia, but with other accidents, as they are called, of operations, he had seen no reason to believe that hospitals are places of greater infection, as it is called, or of greater unhealthiness than is met with in private practice." And Mr. T. Holmes, in *St. George's Hospital Reports*,† from whose article on the "Amputation Book of St. George's Hospital," the above is taken, states as his opinion, that the "popular impression as to the frequency of pyæmia in our hospitals is extremely exaggerated."

Systemic Infection, may be either acute or chronic, the former appearing to rapidly overwhelm the constitution, the latter presenting all the symptoms of gradual poisoning, with deposits of pus-germs, tending to suppuration. In some instances, acute traumatic fever begins very soon after surgical operations, and rapidly terminates in death. Dr. Cheevers, in *Guy's Hospital Reports*, 1843, pointed out the astonishing fact, that of one hundred and fifty-three *post-mortem examinations*, made on persons who had undergone serious surgical operations, but nineteen died of those secondary affections which are more or less to be expected after every grave surgical performance, viz., suppuration, hæmorrhage, tetanus, or sloughing, while the balance, or one hundred and thirty-four, died of acute inflammatory action.

In the *acute* variety of the disease the symptoms are as follows: In a short time, sometimes within twenty four hours after an operation, the patient is seized with rigors. This is invariably a bad sign, and should at once put the surgeon upon his guard. Soon the pulse increases in frequency, until it reaches 130 or 140 beats per minute, the temperature rises to 103° to 105° (Fig. 7); the face flushes, the respirations are quickened, and considerable dyspnœa generally exists. Diarrhœa often presents itself, with vomiting. The tongue is dry, shining, and red at the tip. After a short time the peculiar symptoms of the different varieties of the fever may manifest themselves. The local inflammation may extend to the surrounding structures, or there may be disseminated centres of inflammation. The color and condition of the skin may vary, but in most cases it is covered with perspiration, which is often cold, but in some cases quite hot. The skin is leaden color, and there is

Fig. 7.



Thermographa of Traumatic Fever.

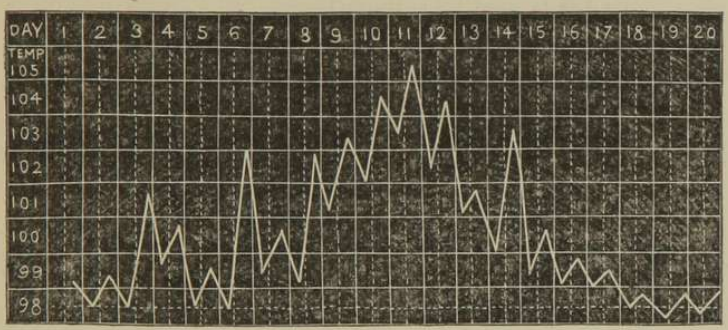
* Transactions N. Y. State Hom. Med. Soc., vol. viii, p. 571.
† Vol. viii, London, 1877.

great depression of the nervous system. Nausea and vomiting may be present, either early or late in the course of the disease, and are not favorable, especially if they occur after the first forty-eight hours.

In a very short time, perhaps on the second day, utter prostration, collapse, and death take place.

In the more *chronic* form of the disease, the symptoms progress more slowly. In this there is, like in other zymoses, a period of incubation, which, however, as a general rule, does not last more than three or four days. The patients are frequently seized with a severe chill, which occurring at regular intervals may lead to the supposition that intermittent fever is present. However, about this time the wound—if the case be of the traumatic variety—has assumed an unhealthy appearance; the pus has become thinner, more acrid, and even corrosive. Fever sets in, which has some slight intermission; the temperature rises to 104° or 105° (Fig. 8);

FIG. 8.



Heat line in pyæmia terminating in recovery.—(HOLMES.)

the tongue is furred and dry. There is considerable thirst, very great restlessness, and the system begins to show well-marked symptoms of toxæmia. The patient lies in a half-comatose state, from which, however, he may be aroused, and when he is so is perfectly collected, but soon relapses into a partially unconscious condition. During this time the breath has a most peculiar odor, and one which is *sui generis*. It resembles the odor of new-made hay. There is also a peculiar icterode expression of the face, sometimes more marked than others, and there are profuse sweats with horrible aching in the bones and in the joints, especially the large ones. Sometimes the patient locates the pain within some of the splanchnic cavities; at others, a distressing cough may be present, with *râles*, or it may be simply of an irritative character. The urine is scanty, high-colored, and often passed with much difficulty. As the disease advances, many symptoms of typhus fever manifest themselves; and blotches appear, of a dark or purple hue, on various parts of the body. Abscesses may also be numerous—rarely less than a dozen, but frequently as many as fifty, and are scattered over the body and throughout the different organs. It is said that the lungs are most frequently the site of the metastatic abscesses, and next, the liver and kidneys. Emaciation is rapid, and the poison in the system does its work speedily. Life terminates in about a fortnight, and dissection reveals the collections of pus aforesaid. I insert here the tables of Bryant and Steele, which are well worth careful consideration.

Analysis of 217 *cases of Pyæmia.*

"Of 217 cases—

68 or 31.3 per cent. were after compound fractures as a whole.
24 or 11 per cent. not amputated.
44 or 20.2 " amputated.
26 or 12. " were after amputation for disease.
28 or 12.9 " " after other operations.
21 or 9.6 " " after injury without operation.
60 or 27.6 " " after disease without operation.
12 or 5.5 " " idiopathic.
2 or .9 " " puerperal.

"Through the kindness of Dr. Steele, who has aided me in this statistical investigation, I am able also to give the following interesting facts respecting pyæmia:

"Out of 790 cases of compound fracture, 192 died, or 24 per cent.
68 of pyæmia, or 8.6 per cent.
Of 184 treated by amputation—
89 died, or 47.7 per cent.
44 of pyæmia, or 23.9 per cent.
Of 606 treated without amputation—
103 died, or 17 per cent.
24 of pyæmia, or 3.9 per cent.
Out of 324 cases of amputation of thigh, leg, arm, and forearm for disease—
126 died, or 38.8 per cent.
26 of pyæmia, or 8 per cent.

"Pyæmia is thus seen to be three times as fatal after amputation for compound fracture as for disease.

"Out of 29,434 surgical cases admitted into Guy's during 10 years, there were 1749 deaths, or 5.9 per cent.

"203 of these were from pyæmia, or 11.6 per cent.; about one in nine of the deaths being from this cause.

"But of the whole number of cases treated, pyæmia was fatal only in .68 per cent."

Treatment.—From considerable experience in this disorder, I have no hesitation in affirming that very often, if proper attention is paid to prophylaxis, the disease may be averted. The first point of importance is *quiet*. After a serious operation the surgeon must enjoin the utmost rest of mind and of body. This is oftentimes very difficult to obtain, especially in private practice. The friends and relatives are anxiously awaiting the result of the ordeal to which the patient is being subjected. They watch and listen with breathless anxiety; the stillness is oppressive to them; there is agony in the half-suppressed moan that issues from the operating room; when at last the door is opened, the surgeon makes his appearance, and informs them that the operation is completed, the patient survives, and is doing as "well as could be expected;" then, upon the impulse of the moment, the sufferer may be surrounded by excited, though thankful, relatives and friends, and amid the confusion and congratulations which ensue, the patient, weak from the ordeal which he has just undergone, may be seriously affected with nervous excitement. A change of position may produce hæmorrhage, or other untoward symptoms may be occasioned. Therefore, *quiet* must be enjoined by the surgeon, and only one person, or at most two at a time, be permitted to see the patient, and these must be admonished not only to control, as well as they may be able, any mental emotion which may arise, but also to remain but a few moments in the sick-room.

The next point is to rigidly attend to diet, which should be very simple, consisting of rice, barley, and fruit; the latter, however, being avoided if diarrhœa be present. *Ventilation* and *disinfection* must also receive their due share of attention.

During this time, *local treatment of the wound* or injury must be employed, and the best I know of is, first, thorough washing; second, the liberal application of carbolic acid spray; and third, the application of picked marine lint.

In the *medical management* of the malady, aconite is of great service. None but those who have witnessed the marvellous effects of this febrifuge can be aware of its power of controlling surgical fever. My own plan is to give it as follows: ten drops of *tinc. aconiti*, to be mixed in eight tablespoonfuls of clear fresh water, and of this solution, one teaspoonful to be given every thirty minutes until four doses are taken, and thereafter *pro re nata*.

I have never used higher potencies in this grave and rapid complication, but I am so well assured of the satisfactory action of *aconite*, when given as I have recommended, that I have no desire to try other medicines. When the symptoms indicate, belladonna, gelseminum, or veratrum alb. may be given. When the tissue affected begins to exhibit its peculiar symptoms, then, of course, other medicines are necessary. If the pleura is the seat of the disease, and aconite has not cut it short, bryonia, arnica, or pulsatilla may be used. If the lungs suffer, the medicines for pneumonia must be administered. If peritonitis supervene, it must of course be treated according to its symptoms; but the timely use of aconite will in very many instances prevent these local inflammatory actions from ensuing.

In the treatment of the *chronic* form, or regularly developed pyæmia, the first desideratum is to attend to the exciting cause; if possible, to remove the material which is being taken into the system. For this, if the wound be not open, it is better to cut out the sutures and loosen both bandages and straps, and, with Richardson's apparatus, send the spray of a carbolic acid solution, one part to twenty of water, into the recesses of the wound. This must be done twice or thrice each day. Great attention must be paid to ventilation and cleanliness, and the patient must have a wholesome diet, with stimulus of brandy or whisky, which may be given frequently. The medicine which is best in this disease is *rhus radicans*. Its pathogenesis corresponds with many of the symptoms of the disease. It has the chills and the sweats; it has the boils over the surface; it has the rheumatic pains; it has the swelling, and even suppuration of the joints and the typhoid symptoms, which belong to the rhus family. I was led accidentally to the selection of this medicine from having under my care a most interesting child who was poisoned, I think, after bathing on a hot July day, with this species of rhus. The symptoms were all those belonging to septicæmia; suppuration had taken place in the ankle, which was affected with severe synovitis. Besides the symptoms above mentioned, this patient had vesicles in the mouth and throat, constant itching and picking at the scrotum and penis; large and purple bullæ over the leg, which was immensely tumefied and red, together with a toxæmic appearance, which was remarkable in every respect.

Muriatic acid is another medicine whose pathogenesis would indicate its applicability to septicæmia. I have used this medicine, and have obtained from it apparently good effects.

Carbolic acid is a medicine which I have lately used with good results. I prepare a first decimal dilution of the drug with glycerin, and mix twenty drops thereof in two ounces of water, and give a tablespoonful every hour.

Large doses of brandy and quinine have also been highly lauded, but whether any material benefit has resulted from their use it is very hard to say.

Small doses of the same, however, frequently repeated, are no doubt absolutely necessary in the treatment. By this I mean five or ten grains of quinine and two ounces of brandy per diem are sufficient, and I am persuaded, after some experience, that much harm often follows too much stimulation.

Medicines which may be called for in the disease are, arsen., china, carbo veg., lach., phosph., and veratrum viride.

Good results may also sometimes be had by the inhalation of oxygen gas. In all large cities it can be obtained in iron cylinders, with the breathing-bag. If the practitioner in the country desires its use, it may be prepared in the ordinary manner.*

As a last resort in this most serious malady, the operation of transfusion may be performed.

In the *Transactions of the American Institute of Homœopathy*, for 1870,† Dr. N. Shneider has published a very interesting article on pyæmia, in which he narrates several cases. In one, after an amputation at the middle third of the tibia, severe symptoms showing themselves, aconite, arsenicum, cantharides, mercury, and china were employed, and the patient recovered after six months. In the second, the patient died; the treatment was aconite, ipecac., arsenic, and veratrum. In the third case, aconite, cantharides, china, and rhus were employed. In the fourth case the patient perished from secondary hæmorrhage.

Muriate of ammonia is also highly spoken of by some members of our school, and excellent results have been obtained from *veratrum viride.*

HECTIC FEVER.

The peculiarity of this variety of fever consists in its remissions from the middle of the morning until the afternoon; the reappearance of the symptoms at that time, their continuance throughout the earlier portions of the night, and the profuse sweating in the morning. From these very symptoms I have known, especially in malarial districts, such fever to be mistaken for the simple intermittents. Although this regularity of type does not always present, yet it is found in the majority of cases, and, indeed, there are at times two distinct daily or quotidian paroxysms.

The main points by which the one form of fever may be diagnosed from the other are: first, the exhaustion caused by the sweating and diarrhœa; second, the great emaciation of the patient; and, third, especially the severe forms of organic trouble which are always to be found, and generally presenting in profuse suppuration. Another peculiarity of hectic, consists in the fact, that though the febrile condition may continue for a considerable time, there is comparatively slight derangement of the assimilative powers.

Hectic may be diagnosed from typhoid fever by the absence of those symptoms indicating that the nervous centres are affected. Throughout the entire course of the disease the mental faculties do not fail, indeed, I have often observed an increased power and an exaltation of the senses as the physical condition is giving way.

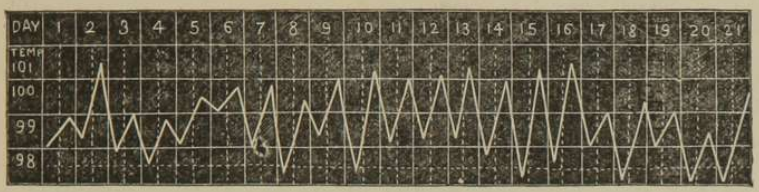
When hectic is fully established, every day there is a slight chilliness,

* For an interesting paper on oxygen gas as a remedy in pyæmia, *vide* New York Medical Journal, April, 1870, p. 165.

† Page 204.

or even in some cases perceptible shuddering; this is followed by a paroxysm of febrile exacerbation, with dry mouth, hot skin and breath, the latter, however, being devoid of the peculiar odor belonging to septicæmia; the palms of the hands and the soles of the feet burn, and the characteristic redness, bright, circumscribed, and scarlet, upon one or both cheeks, with a pulse about 110, and a temperature of 101°, indicate the fever at its height (Fig. 9). This febrile condition lasts a few hours, and is succeeded

FIG. 9.



Thermograph of Hectic.—(HOLMES.)

by the third or the sweating stage, called also by some the *colliquative*. Instead of the sweat, a diarrhœa may supervene, but whichever results, the patient is greatly debilitated. Between the paroxysms, however, the patient may, until the advanced stage, be comparatively comfortable, and at times may have some appetite. Finally, the emaciation becomes more rapid, the features assume the hippocratic cast, the entire system is exhausted, and the patient actually dies from prostration, the mental faculties continuing unimpaired to the last.

The treatment of *hectic* fever is unsatisfactory, because the surgeon is generally unable to remove the exciting cause. This, of course, is first to be attended to, and if success crowns the effort, and the system can be relieved of the constant source of irritation, the result is favorable.

Operative measures are, therefore, called upon, and often delay is dangerous. The removal of the affected part, even amputation or resection, has often been followed by an immediate improvement in the condition, and as I have elsewhere remarked, waiting to "tone up" the system as it is called is often to allow the patient to die. Every surgeon is aware, how, in certain cases, after hectic has been wearing away the life of the patient, the removal of the affected parts at once is followed by better appearances and a better general condition. It is also a fact, that patients who have suffered long from suppuration and hectic, bear the capital operations better than those who are in robust health. There is less shock to the nervous system; indeed, in some most severe operations, I have observed that none whatever has followed, the patient awaking from the anæsthesia with a refreshed and animated appearance.

The different medicines for hectic can hardly be noted here, as the causes from which it arises are most numerous. The symptoms must be studied, the pathology regarded, the organic disturbance receive careful attention in the selection of the medicines.

CHAPTER IV.

ULCERATION: SLOUGHING. ULCERS: SIMPLE — IRRITABLE — INDOLENT — VARICOSE. TREATMENT: LOCAL — STRAPS — BANDAGES — SKIN GRAFTING — DRY EARTH.

Ulceration is that process by which a solution of continuity is effected in a living solid; it is of much more frequent occurrence in the cellular and adipose tissues than in muscles, tendons, ligaments, nerves, or bloodvessels, and is not generally applied to abrasions affecting only the epithelium.

The Hunterian theory regarded such breach of continuity as effected by what was termed ulcerative absorption, or, in other words, that the absorbent vessels were chiefly concerned in the establishment of the process; modern pathologists, however, regard ulceration as the molecular death of a part, a gradual softening and disintegration of tissue, molecule by molecule; the effete matter being mixed with purulent and other secretions, and thus carried out of the system. This process is generally one of true inflammation, or connected in some degree with inflammatory action.

If the inflammatory process continues, suppuration, softening, disintegration, and detachment of the tissues in minute portions follow in succession in the abnormal action; the separated molecules become mixed with the pus, and are removed with the discharge of the matter; it would appear, therefore, that with such a process absorption would be but little connected.

It has already been mentioned that during the inflammatory process, absorption is arrested either *in toto* or partially, and is only renewed when resolution is taking place. If the process continue, and suppuration and ulceration follow, the absorption is still held in abeyance. Again, there is always a *discharge* accompanying ulceration, which need not exist if absorption were going on; and when we add to this that many structures of the body are peculiarly liable to ulceration, and particularly resistant of absorption, it may be seen that the old doctrine cannot hold sway before the new one of molecular death and disintegration.

There are several other circumstances which are opposed to the theory of ulcerative absorption, and indeed form conclusive evidence that the absorbents do not perform that action in ulceration that was attributed to them by Mr. Hunter.

Ulceration is a step beyond suppuration. The inflammatory process having reached its climax, in infiltration and partial softening of the textures, if ulceration supervenes the molecules become further softened, and carried away with the discharge from the part. This is effected easily from open surfaces, but when ulceration is progressing in an unbroken part, a small abscess or pustule is formed, and after its contents is evacuated the ulcerated surface is revealed.

The terms *acute, inflamed, chronic, phagedenic, sloughing ulcer*, are all modifications of the process of ulceration, the severity of which is in proportion to the grade of the inflammation and the vitality of the part.

If the inflammatory process is moderate, and the ulceration is established steadily, it may be termed *acute;* if, however, the degree of abnormal action is greater, the ulcer is said to be *inflamed*, on account of the unusual amount of pain, heat, swelling, and redness that surround the part; if the inflammation is of a still higher grade, the destruction of the tissues is still more rapid, and a *phagedenic* sore is produced; and if still the inflamma-

tory action progresses, partial death of the part is effected, and a *sloughing* ulcer is the result.

However, after ulceration has been established by inflammation, the latter may subside, and the ulcerated surface be repaired in a short period; but if the inflammation is sluggish, the ulceration proceeds slowly and becomes chronic in character.

The process by which an ulcerated surface is repaired, viz., *granulation*, and the covering of these granulations with cuticular formation, or the absolute healing of the part, viz., *cicatrization*, have been already considered.

The same causes that create inflammation are productive of ulceration. These actions are portions of the same process, commencing with vital turgescence, and terminating in gangrene.

Ulceration is the medium between suppuration and gangrene; in the former the action does not proceed far enough to disintegrate the textures; and in the latter the death of the part is effected in mass, and not molecule by molecule.

Sloughing.—Death of a part, an undoubted termination of inflammation, as well as of all other vital change, may be reached at once from intensity of action, deficiency of power, or a combination of both.

The difference between ulceration and sloughing consists simply in the fact, that in the former case the death is molecular, particle by particle being cast off; in the latter the part dies in a mass and is detached, the dead or decaying substance being denominated *slough* if the process has taken place in the soft parts, and *sequestrum* if the dead structure is bony. Sloughing occurs more rapidly or slowly in direct ratio with the intensity of the inflammatory action. The textures broken up by the processes of inflammation and ulceration are softened and infiltrated; there is no supply of blood, they die, and in obedience to the great law of nature are cast off.

The medicines for different forms of ulceration will be found in the sections upon ulcers.

ULCERS.

Those sores that are produced by the action of the ulcerative process—or, in other words, solutions of continuity, effected by ulceration—are termed *ulcers*.

All the textures of animal life are liable to be attacked, although some are more susceptible of invasion than others; but it is more particularly the formation of those sores that appear on the surface of the body that at present demands attention.

The arrangement into classes of the varied forms of ulcers simplifies much their description, and to a certain extent their treatment; but the classification differs with different authors. Dr. Gibson mentions three varieties, viz., simple, indolent, and irritable ulcers, arranging other ulcerated surfaces under the diseases that cause them. Sir Everard Home forms them into six classes:

1. Ulcers in parts that have sufficient strength to carry on the actions necessary for their recovery.
2. Ulcers in parts that are too weak for that purpose.
3. Ulcers in parts whose actions are too violent to form healthy granulations, whether this arises from the state of the parts or of the constitution.
4. Ulcers in parts whose actions are too indolent, whether this arises from the state of the parts or of the constitution.
5. Ulcers in parts which have acquired some specific action, either from a diseased state of the parts or of the constitution.

6. Ulcers in parts which are prevented from healing from a varicose state of the superficial veins of the upper part of the limb.

Mr. Miller mentions ten varieties, viz.: 1. Simple purulent or healthy sore. 2. The weak. 3. The scrofulous. 4. The cachectic. 5. The indolent. 6. The irritable. 7. The inflamed. 8. The sloughing. 9. The phagedenic. 10. The sloughing phagedæna.

Probably the most simplified method of classifying ulcers is that of arranging the whole into two divisions, the first comprising the simple, indolent, and irritable ulcer, and the second embracing those sores that have acquired a specific character from the diseases with which they may be associated—scrofulous, syphilitic, cancerous, etc.—leaving the consideration of these with the diseases themselves to be studied in their appropriate places. This appears also the more requisite because there are many *important symptoms* that may present themselves in any or all the varieties of ulcers, without regard either to name, classification, or the specific disease upon which they may be dependent.

Simple, or Healthy Ulcer.—This is, in truth, an example of healthy granulation following a wound or abscess, or of inflammatory disintegration of a part previously unbroken in its surface.

"The discharge is thick, creamy, easily detached from the granulations, almost inodorous, and not profuse—in fact, it is laudable pus. The granulations are numerous, small, acuminated, florid, sensitive, and vascular; if touched at all rudely, they bleed and are painful. The blood is arterial, neither too profuse nor abnormal in quality, and the pain is but the just appreciation of injury done to healthy tissues. The general sensation in the part when not injured is slight tenderness, or a feeling of rawness, rather than actual pain—not unfrequently a sensation of itching is present to a degree even troublesome. As soon as the granulations arrive at the surface of the skin, cicatrization commences, and proceeds steadily until the part is repaired."

The *treatment* of such sores is quite simple. The part should be kept at rest, and in a position that may relax those muscles upon which the ulcer is situated; and, above all, the strictest cleanliness enjoined. Milk and tepid water commingled in equal parts should be allowed to dribble over the sore from a sponge or piece of lint saturated with the liquid. This appears to be the best abstersive method, as the frequent passing of a sponge over the healing parts may prove a source of irritation, as well as causing a destruction of the delicate granulations, and the healing process thereby be retarded.

The simple ulcer generally heals rapidly, without the exhibition of any medicine. Sometimes, however, after cicatrization has progressed for a time, there appears to be a diminution of action in the healing process; if this be the case, a few doses of *silicea* 30th, repeated every twelve or twenty-four hours, will overcome the difficulty and complete the cure.

Irritable Ulcer.—This form of ulcer is generally preceded by an irritable state of the system, or if such be not the case, the constitutional may be produced by the local irritation.

The digestive function is frequently impaired in those persons afflicted with irritable ulcer, and consequently the sore is often found among those in the higher walks of life, who eat and drink to excess, or among debauchees.

The appearances presented by an irritable ulcer are as follows: The edges are ragged, undermined, and serrated; the bottom appears deeper in some points than in others, and the parts around are red, inflamed, and frequently œdematous; the discharge, which is always considerable, is a

thin, greenish, or reddish matter, which is frequently so acrid that it excoriates the surrounding skin, and is sometimes mingled with solid matter. Granulations are wanting, and in their place may be found a grayish film, or a dark-red spongy mass, which is acutely sensible, and bleeds at the slightest touch, the blood being of a dark grumous character.

The medicines that have proved most effectual in removing this form of ulcer are, *arsen., asaf., carbo veg., lyc., hepar, merc. sol., nit. acid, silic., mez., con., sulph., thuja, staphis.*

Arsenicum.—This is an admirable medicine for irritable ulcer, when it appears in individuals of exhausted, impoverished constitutions, or in those in whom there is a tendency to abdominal plethora; when the serrated edges of the sore are high, and when the pain is burning or tearing, the discharge is greenish, thin, acrid, and mingled with blood, the base of the ulcer is covered with a yellowish or whitish film, the pain is severe and is felt at night even while sleeping, and the surrounding parts are bluish, inflamed, and œdematous.

Asafœtida is adapted to nervous individuals or to those of a phlegmatic temperament, with a venous or hæmorrhoidal constitution; when the ulcer is extremely sensitive to touch, the margins deeply serrated, and of a bluish color, and elevated above the surrounding textures, the discharge is ichorous, thin, and perhaps fetid in character.

Carbo veg.—This medicine is to be exhibited when there is pressure and a sensation of tension around the ulcer, which is exceedingly irritable, and bleeds profusely at the slightest touch. The bottom of the sore has a bluish tinge, and there is an areola of the same color, extending to some distance around the part; the discharge is aqueous and corrosive, or may consist of degenerated pus. The remedy is peculiarly adapted to peevish and irritable individuals, or to those in whom there is predominant action of the venous system, as indicated by the bluish tinge of the whole body, particularly around inflamed surfaces.

Hepar sulph. is indicated when the pain in the ulcer is corrosive, with burning and throbbing sensations, particularly at night; stitching pains through the sore when laughing; excessive sensitiveness of the surface, which bleeds profusely when lightly touched. There is a disposition in such ulcers to become chronic, and the surrounding tissues to present an unhealthy appearance. It is beneficial when the patient is easily irritated, and when the accompanying fever is exacerbated at night.

Lycop., in individuals of mild or melancholy disposition, when the pains in the ulcers are worse at night, with stitching, tearing, and itching, or when there are burning and painful stitches in the sore. The pains are aggravated by remaining in a warm room, and ameliorated when in the cool air.

Merc. sol.—The indications for the employment of this medicine are, when the pains in the sore become intolerable at night in bed; when, instead of granulations, there is a spongy, bluish mass, which is sensitive and bleeds readily. The ulcers are extremely painful when touched, and discharge an acrid and corrosive ichor; the elevations are very irregular at the base, and there is present a sensation as if the part were corroded by insects, together with unequal quick pulse, sleeplessness, and dripping nightsweats, with great nervousness and excessive irritability.

Nit. acid must be employed when the patient is sad and desponding or impatient, irritable, and vehement; when there is coldness of the whole person at night, with profuse sweat; when the ulcer at the slightest irritation bleeds copiously. There is a thin, ichorous discharge mingled with blood, that corrodes the surrounding skin, together with shooting-stitching pains in and around the ulcer, with burning as from nettles; or there are itching and pricking in the parts around, or the pains may be so violent that the patient appears unable to tolerate his condition.

Silicea is useful to complete, after the healing process has commenced, the cicatrization; or when there is a disposition in the sore to become chronic; where there are stinging-burning pains in the surrounding parts, with aching-smarting pains in the sore. It is also indicated when there is a secretion of thick discolored pus, or of a thin acrid sanies, and when there is frequent formation of large flabby vegetations.

It may be often advantageous to commence the treatment of irritable ulcers with a few doses of *sulphur*, after which, the medicine best adapted to the case may be administered. If the constitutional symptoms presented are such as require treat-

ment, they must be encountered by the proper homœopathic medicine. If the above remedies are not sufficient to establish a healthy action in the sore, recourse must be had to some of the following: Phos., mez., acid. mur., lach., puls., con., sulph., bell., thuja, staphis.

In addition to the internal treatment, when the granulations are very exuberant and large, a local application of nitric acid, acid nitrate of mercury, or lunar caustic may be made once or twice daily, and the parts dressed with carbolated glycerin.

Indolent Ulcer.—This variety of ulcer is of much more frequent occurrence than either of those already described. It has received from several authors the appellation "callous," and is the fourth variety in the classification of Sir Everard Home. "Ulcers in parts whose action is too indolent to form healthy granulations, whether this indolence arises from the state of the parts or of the constitution."

The appearances presented are a complete contrast to those of the irritable sore, although in the first instance it may have assumed the characteristics of that variety of ulcer; indeed, a healthy or simple sore may pass through different stages, and ultimately become indolent, because cicatrization may have been opposed or protracted by its situation, or other adverse circumstances.

From such reasons it is obvious that the ulcer must be most common among individuals belonging to the laboring population, upon whose efforts depend the subsistence of their families, and who therefore are unable to make use of appropriate means, so necessary to be observed at the first appearance of the sore, that the ulcerated surface may be repaired. As long as the erect posture is practicable, the poor man must strive for the maintenance of his household; and even when the sufferings become aggravated, the cry of his little ones for bread, urges him to increased exertions, until finally a simple purulent ulcer, becomes inflamed and irritable, and at length assumes those appearances which are the sure characteristics of the indolent sore. But it is not among such alone that this variety of ulcer is found, nor does it so frequently arise from such continued exertion, consequent upon a laudable energy engendered by domestic affection, as from filthy and dissolute habits, or long-continued intemperance.

An indolent ulcer presents the following appearances:

The edges are elevated, protruded, smooth, and rounded, giving to the sore an appearance of deep excavation. The surface is smooth, glossy, pale, and generally void of granulations, although in some instances there is a feeble attempt at such formation; or it is covered partly with a pellicle, or crust, of a whitish or dark-gray color, so tenacious that it is inseparable from the ulcer without considerable force. Sometimes the sore is dry, but generally there is a profuse discharge of a thin and serous fluid, nearly destitute of fibrin; the surrounding integument is swollen and discolored.

The most striking characteristic of the indolent sore is the elevation of the margins, which are very callous, and present a whitish appearance, resembling "a dense high ring of cartilage." The pain is so slight that the patient frequently experiences but trifling annoyance, and is able to perform his usual vocation.

When an irritable ulcer has become indolent, the appearances vary from those described above. The granulations are large, round, pale, and flabby, extremely sensitive, and bleed from the slightest scratch, and sometimes rise into a fungous form above the skin. This is what is termed by some writers the "*fungous* ulcer;" by Mr. Home it would be denomi-

nated as "an ulcer in parts too weak to carry on the actions necessary for its recovery," or by others as the "weak sore." "This variety," writes Prof. Gibson, "may, and often does, accompany an ulcer with carious bone, sprouts from the mouth of a sinus, or covers the surface of many specific ulcers. From whatever source it springs, its characters are uniform, and its disposition so truly indolent that it cannot without impropriety be referred to any other head."

Varicose Ulcer.—There is another variety of indolent ulcer, which precedes or follows a varicose enlargement of the veins of the leg or thigh, which has been denominated the varicose ulcer; it generally makes its appearance on the inner side of the leg, and is often very difficult to cure. It resembles an indolent ulcer in a somewhat advanced stage; the edges of the skin, however, bounding the sore are not tumid; the part is blue or purple; the sore is seldom deep, usually spreads along the surface, and is oval in shape. The branches and trunk of the *vena saphena* are enlarged, and this varicose state prevents the healing of the ulcer. A varicose limb becomes very much swollen, the coats of the veins are often thickened, the vital power is much impaired, the temperature is diminished, the parts assume that dark-blue appearance to which we have already alluded, and are excessively prone to the inflammatory process, ending in ulceration, which is generally of a tedious nature. Sometimes we find that the *irritable* sore is accompanied with varicose veins. The pain appears to be deepseated, and extends up along the course of the veins, and is increased by maintaining the limb in the erect posture.

Treatment.—In the treatment of indolent ulcers, it is necessary that the utmost cleanliness be observed; and if the patient be one whose constitution has been impaired by unwholesome diet, exposure to a foul atmosphere, or by intemperance, these obstacles should be overcome by the substitution of nutritious, easily digested food, proper ventilation, and regularity of habits; in fact, as far as possible, every effort should be made to effect the removal of the predisposing cause.

The indolent sore is capable of cure under homœopathic treatment; indeed, in some instances, without having recourse either to the bandage, straps, or escharotics, and it is not absolutely necessary that the patient be put to bed,* although overexertion tends to retard recovery.

The restoration of continuity in the parts destroyed by the indolent sore is often very gradual, and attended with variations in the healing process. The ulcer may appear to be doing well, when, from some irritation, a retrograde action takes place; but if the practitioner have reason to believe the medicine correctly chosen, it must perseveringly be administered, always endeavoring not to interfere with its action by a too frequent repetition of the dose.

The surgeon, if the sore progresses slowly, is often strongly tempted to administer the medicine at too short intervals, and in a lower potency than that which he is employing; but when allowing himself to be thus led astray, disappointment is invariably the result. So long as there is a perceptible improvement in the appearance of the ulcer, the medicine must be continued, as there is nothing that more retards the progress of cure, than the repeated change of the means employed for the accomplishment of that purpose.

The medicines that are most serviceable in the treatment of indolent ulcers are ars., carb. veg., lyc., graph., phosph. ac., sang., sepia, silic., sulph.

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* See Whately's Practical Observations on the Cure of Wounds and Ulcers on the Legs, without Rest.

The medicines that appear most eminently useful, whose symptoms are most frequently similar to those presenting in indolent ulcers, and that are best adapted to the constitutions of those individuals, among whom the sore is most prevalent, are ars., and carbo veg.

Arsenicum is suited to individuals of exhausted constitutions, in whom all eruptions have a disposition to become chronic. There may be a tendency to general plethora of the whole system, or general emaciation. When the sore is consequent upon long-continued abuse of spirituous liquors. When the ulcers are of long standing, with burning and lancinating pain, or the sore is covered with a gray scurf, and surrounded by an inflamed margin, or when it is accompanied with shining hot swelling of the feet. When the ulcer is burning on the surface and in the edges, with tearing pain, particularly when the part becomes cold; also when the edges are raised high above the surrounding skin, and when the areola around is red and shining, the base bluish-colored, and having a scurf resembling lard. Further, this medicine is extremely useful, when the discharge consists of thin bloody pus, and the granulations are unhealthy, and the sore has a fetid odor, or the ulcer has slight discharge.

Carb veg is indicated when the constitution has been weakened by excessive losses, or when the sore appears upon cachectic individuals, the tone of whose system has been weakened by gastric affections arising from various excesses, when the margins of the ulcer are elevated, and when they are of a deep-blue color, the surrounding skin also assuming the same tinge, and is quite hard and painful to the touch; also when there is a heaviness of the limb, and the pus discharged from the sore emits a cadaverous smell.

These two remedies are indispensable in very many cases of indolent ulcers; indeed, cures have been accomplished by their administration without the exhibition of any other homœopathic medicine.

But though *ars.* and *carb. veg.* are adapted not only to many of the local manifestations presented by the indolent sore, but also to the constitutions of those individuals among whom it is most prevalent, the student cannot fall into a greater error than administering these medicines for every case of the kind for which he is called to prescribe, and neglecting others which are of great importance in the treatment of these particular cases.

Graphites is adapted to individuals having a tendency to corpulency, blonde hair, unhealthy skin, with disposition to chronic eruptions; when the ulcers appear covered with a scurf, with pain at night; the whole limb is affected when touched or moved, as if the bone would be dashed to pieces, even in those parts distant from the ulcer; itching and pressing in the sore, or there may be tearing or stitching pains; likewise when the scurf upon the ulcers smells like herring pickle, or when there is a fetid odor from the sore.

Phos. acid is a remedy for indolent ulcers, particularly when there is much itching, or when there is burning pain; for those that are inveterate or flat, with dirty-looking pus and indented base.

Phytolacca is very highly spoken of by many of our practitioners, and especially by Dr. Hale, who records a very interesting case,* in which a patient, after taking large quantities of mercury, iodide of potash, stillingia, and was cauterized without effect, was cured by phytolacca, 2d dil., 10 drops given three times a day, and phytolacca cerate kept constantly applied to the sore.

Sanguinaria.—In the pathogenesis of this medicine, we find "old indolent ulcers; ill-conditioned ulcers, with callous borders and ichorous discharge."

Sepia, lycop, silex, and sulphur are other medicines that have been employed with great advantage in the treatment of this variety of ulcer.

Lycopodium is very serviceable in some cases, when the ulcer is old, and has a tendency to become fistulous, with hard, red, shining edges, and swelling of the affected part.

Silicea is an admirable medicine when the ulcers have become putrid, particularly when they occur in old, psoric, cachectic persons, living in poverty and filth; when there is inflammatory redness extending for some distance around the sore; also for fistulous ulcers of a dingy appearance, with shaggy callous edges, extending through to the bone, or when the parts surrounding are hard, swollen, and bluish-red.

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* Western Hom. Observer, vol. v. p. 96.

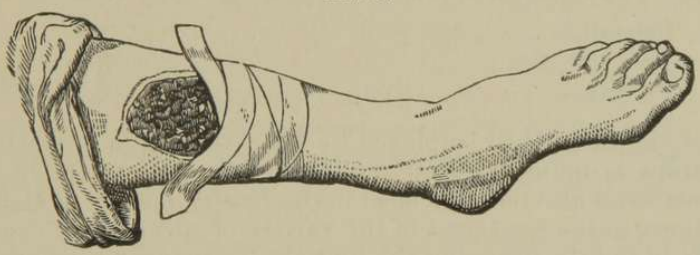
When proud flesh makes its appearance, or has attained considerable growth, which frequently is the case in this species of ulcer, the medicines most useful are, ars., petrol, sepia, silic, sulph.

When the ulcer is attended with or arises from a *varicose* condition of the veins, the following medicines are to be employed: arn., puls., lach, sulph, sil., or in some cases ars., carb v., acid-phosph.

Hamamelis Virginiana has been strongly recommended, and is often of great service.

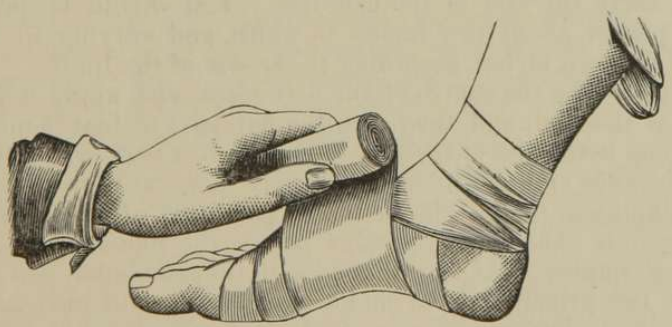
Purely medical means will, according to my own experience, fail in many instances unless accompanied with those surgical manipulations, which I wish to be borne in mind. 1st. A horizontal position of the limb; 2d. An *even* support given by a roller, applied from the foot to the knee; and 3d. In cases where the sore is rather of an indolent character, the application of adhesive straps. One and all of these means can be used as follows: I cleanse the sore with simple soap and water, and having raised the limb to a horizontal posture (having previously prepared adhesive straps of sufficient length to pass around the limb), I apply the first strap from left to right across the leg, the second from right to left, and so on ascend up the leg, allowing each of the straps to slightly overlap the preceding.

FIG. 10.



When the whole sore has been covered, a roller must be thus applied: Having made a couple of turns around the ankle joint, make several figure-of-eight reverses around the instep under the sole and back again to the ankle, and having almost covered the foot, ascend on the leg, making the circular and reverse turns from the ankle to the knee.

FIG. 11.



The bandage must be re-applied every second day, and the straps twice a week. I may remark that there are very few ulcers of the class which I here mention, but will be at least very materially benefited in a short space of time by this method of treatment. In fact, since I have adopted

this apparently simple procedure, and made the patient persist in it, I have succeeded very much better than while using merely medical means.

I have also used, in connection with this treatment, the application of the first trituration of *merc. dulc.* with which the excavation may be filled, and over which the straps may be applied. This has proved very eminently successful.

The sulphide of carbon has of late been much used in the treatment of indolent ulcers.* Its disagreeable odor may be counteracted by either iodine, essence of bitter almonds, or Peruvian balsam.

The formula is:

℞. Carbon sulphidi, ... fl. ℥ss.
Tinc. iodinii, ... fl. ℥j.
Essent. menth. piper., ... ♏iv. M.
Local use.

For sloughing, or gangrenous ulcers, Dr. Brinton of Philadelphia uses—

℞. Brominii, ... fl. ℥j.
Aquæ, ... ℥ij.
Potassii, bromidi, ... grs. xxx. M.

Dr. Dowse, of London, applies the following to old atonic ulcers:

℞. Chlorali, ... ℥iv.
Sol. chlor. zinc., ... ℥iv.
Aquæ, ... ℥xvi. M. fl.

Further on, the method employed by Mr. Critchett in preparing and applying straps is noticed. That gentleman gives most explicit directions, and the method is also recommended in the *British Journal of Homœopathy*,† as an adjunct to the treatment of the variety of ulcer under consideration. It consists in tightly strapping the limb, in the manner presently to be described—the use of straps being considered preferable to the application of the roller, as the bandage is liable to slip, or become loose.

Instead of the plaster (*empl. plumb.*) recommended by Mr. Critchett, the straps should be made from simple wax, or isinglass plaster, as such will not interfere with the medicine administered internally.

The following are the words of Mr. Critchett: "You must seat the patient opposite to you, and support his foot upon a small stool about a foot and a half in height, and so constructed as to receive the print of the heel, and leave the rest of the foot free. You should be provided with strips of plaster about two inches in width, and varying in length from twelve to eighteen inches, according to the size of the limb.

"You then take the centre of the first piece, and apply it low down to the back of the heel, and then with the flat part of both hands press the plaster along both sides of the foot. This plan is very preferable to taking hold of the ends and endeavoring to apply them, as it insures a perfectly smooth adaptation of the plaster to the part, and also because it enables you to regulate that very important point—the amount of tightness you may wish to employ. As you proceed with the remainder, you must always remember the principle is to make one portion fold over another; you must, therefore alternate them around the foot and ankle. Your second piece should be placed in a similar manner underneath the heel, and then carried upwards at a right angle to the last, so as to cover a portion of each malleolus. The third piece should be again applied to the back of the heel,

* Naphey's Surgical Therapeutics, pp. 211, 212. † Vol. vii. pp. 423–425.

overlapping the first by about one-third. The fourth piece, under the foot, and carried upwards, each piece being pushed along so as to allow it to take its own course; this must be continued until the foot and ankle are covered; the strips must then be carried in a similar manner up the leg, increasing in length as the calf increases, and extending as far as the knee, and in some few cases even above this."

Referring to this method of dressing, the editors of the *British Journal* remark: "Over this a bandage is to be applied in the usual manner. Small ulcers, situated in the hollow between the malleolus and the os calcis, require more pressure than the rest of the limb, which may be produced by applying small pieces of plaster in a crucial manner over the wound before putting on the strapping."

Twice a week, in the majority of cases, will be sufficiently often to renew this manipulation. If there be a profuse discharge, a piece of dry lint may be placed upon the sore.

Skin-Grafting in Ulcers.—This process is said to be of French origin, and has been largely practiced by Mr. Pollock, of St. George's Hospital, but later researches bear evidence that Prof. Hamilton, of New York, conceived the idea of skin-grafting many years since. I have practiced it in many cases with most excellent results. The method I employ will be found in the following case:

Mrs. H. was admitted into the Hahnemann Hospital, New York, some months since. The inside of the left leg, from above the centre of the calf to the heel, was covered with ulcers of five years' standing, varying in size from that of a half-dollar to that of a half-dime. The largest and deepest of these unhealthy-looking sores was situated just below the internal malleolus. The edges of the ulcers were jagged, uneven, and overhanging, with flabby and readily-bleeding granulations. The integument was purple and the patient was in a bad condition generally.

June 18.—I clipped with scissors several minute pieces of integument from the left forearm, and having thoroughly cleansed the base of the ulcers, inserted three grafts into the deepest parts of the largest sore, and in two of the smaller ones, one each. The small particles of skin were kept in position by a thin strip of isinglass plaster. On the second day there was not much alteration in the grafts; but on the third evening they appeared to be reddened, and healthy granulations were perceptible.

June 21.—After four days I proceeded to graft the remaining sores, depositing in the larger ones two or three "seeds of flesh," and in the smaller, but one. Some of these appeared to die away, but in all the ulcers healthy action came on, and in about three weeks the leg was healed. The skin, however, although very much more natural in color, has not assumed its normal appearance; but the sores healed in a comparatively short time.

July 25th.—Patient was discharged cured. Nov. 3d. Remains well.

It has been asserted that in certain cases the graft may be lost to view, but that in the course of a few days the granulations will become healthy and the cicatrization complete. Mr. Mason, however, who, in the *Lancet*, for October, reports nine cases—five still under observation—has not noted such variations; the graft in his cases always becomes the centre of healthy growth. In some cases, in some of the ulcers the minute portions of integument did indeed disappear; but in a day or two the ulcers began to assume a healthy character and healed quite rapidly.

Messrs. Stohlmann & Pfarre have manufactured a scissors to facilitate the operation of clipping the integument. (Fig. 12.)

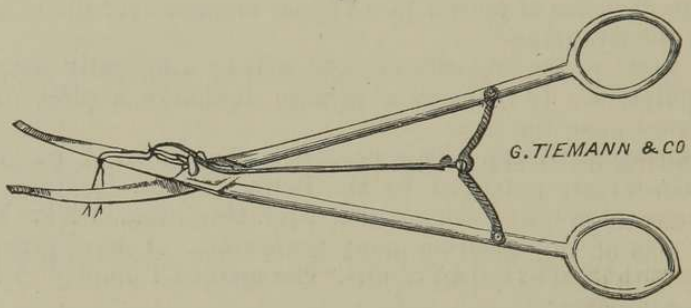
If such an instrument be not handy pass a pin through the integument,

raise it gently, and snip off the portion thus raised below the pin, which serves as a handle by which to apply the graft.

In the *Medical Times*, of Philadelphia, for Dec. 15th, 1870, is a description of the changes which take place in the grafts, by Mr. Dobson. It is as follows:

"At about the second day the cuticle begins to separate; by the fourth day only a faint pale spot marks the insertion, or there may be no evidence left of it at all; by the sixth day a faintly vascular tuft of granulation

FIG. 12.



appears. This becomes glazed, and in a few days more the usual covering of cicatrix is formed. The patch is usually circular, and presents slight ridges, and continues to increase in size circularly, until it reaches its maximum of growth, for it has a maximum of growth. I have never seen a patch larger than a florin, and I have seen large numbers of them. I should say that their average growth will not exceed the size of a sixpence."

Dr. B. A. Watson, in an article in *N. Y. Journal of Medicine*, for July, 1875, has an able article on skin-grafting. He insists on perfect cleanliness, and the removal of "every particle of dead tissue," by the application of emollient poultices, wet compresses, and the caustic (for which, perhaps, ten days may be required). He applies the grafts *in rows*, about half an inch apart, in order to dispense with the use of more plaster than is absolutely necessary. By placing the grafts in rows a single strip of plaster may cover half a dozen grafts, the line of direction depending upon the shape of the ulcer. The grafts are allowed to remain undisturbed for forty-eight hours, when the compress and bandage must be removed, and the grafts examined through the plaster, which, being of isinglass, can easily be done. The Doctor observes a fact which has often presented itself to my notice, that every trace of the graft may disappear, yet a healthy granulation may spring up in the same point, which the author believes the "germ theory" will fully explain.

He mentions, also, two other methods of healing ulcers by "germ-planting." One consists in "removing the epidermic scales from some portion of the body—more frequently the thigh, which had been previously shaved to remove fine hairs, after which the parts were scraped with a scalpel, and the scales collected on a piece of writing paper, and these carefully distributed on the surface of the ulcer." . . . .

The third method consists in applying a fly-blister to some portion of the body, collecting the serum, transferring it to the ulcer, and retaining it in contact. These methods may all be tried, but we see in this article the peculiarity which is observed in most of the surgical essays of the old school, viz., the great dearth of internal treatment.

As homœopaths, with *ars.*, *calcarea carb.*, *carbo veg.*, *carbo an.*, *asafœt.*, *phytolac.*, *mez.*, *sulph.*, *silicea*, and other medicines, we may cure these ulcers without the skin-grafting process, or if it be necessary to resort to these means, the internal exhibition of the appropriate medicine has a tendency not only to facilitate the "taking" of the graft, but also to promote healthy granulations, and induce a condition of the constitution, which is of the greatest possible importance in the healing of ulcers. A great deal of success has also been attained in my hands, by filling the ulcer daily with the first decimal trituration of *mercurius dulcis*, having previously sprayed the surface with calendula, and then evenly strap the part, as already directed.

When the ulcers are very old and have resisted all treatment for years, being sometimes benefited by medical and surgical appliance and then relapsing into their former indolent condition, a successful method has been introduced which consists in making deep incisions in either side of the sore in the sound skin, and keeping these open by means of pledgets of lint. By this procedure the integument yields to the cicatrizing process in the ulcer which had before been prevented from the hardness, inelasticity, and torpor of the parts, and the new wounds heal as kindly as recent sores.

Earth Treatment.—The treatment of varicose and indolent ulcers by the application of earth is often followed with very remarkable results. Good subsoil, dried and divested of grit, finely powdered and sifted may be applied directly to the part and held *in situ* by waxed paper, or gauze, the ends of which are fastened to the integument by collodion, as recommended by the late Paul Beck Goddard, of Philadelphia,* or the gauze may be first placed over the sore, and the earth applied over it to the thickness of half an inch or more. The earth not only is comfortable and cooling to the patient, but is a complete disinfectant. Many cases of the successful use of this easily-obtained topical application are recorded, the effect being immediately noticed. It is essential during the treatment that the patient should be kept in bed, and if there be any large and varicose veins they should be destroyed, either by subcutaneous incision between two pins passed beneath the veins with a figure of 8 suture of wire or silk above them; or the application of caustic lime and soda over the course of the enlarged vessels. *Vide Treatment of Varix.*

CHAPTER V.

GANGRENE AND MORTIFICATION—LINE OF DEMARCATION; OF SEPARATION—QUESTION OF AMPUTATION IN TRAUMATIC GANGRENE—DRY GANGRENE—TREATMENT—HOSPITAL GANGRENE—SLOUGHING PHAGEDÆNA.

GANGRENE is but a step in advance of ulceration, and may be divided into three stages. 1st. The death of the part. 2d. A period of arrest of the plastic deposit. 3d. A period of separation and granulation.

If the ulcerative process extends, then the dead particles of the ulcer are still given off molecule by molecule, but if we have a larger portion thrown off it is called a "slough." When gangrene is about to commence we have, first, redness of the part; after this it becomes of a bluish tinge, and above this a mottled appearance; blisters appear on the part; it becomes

* Earth as a Topical Application in Surgery, by Addinell Hewson, M.D., Philadelphia, 1872.

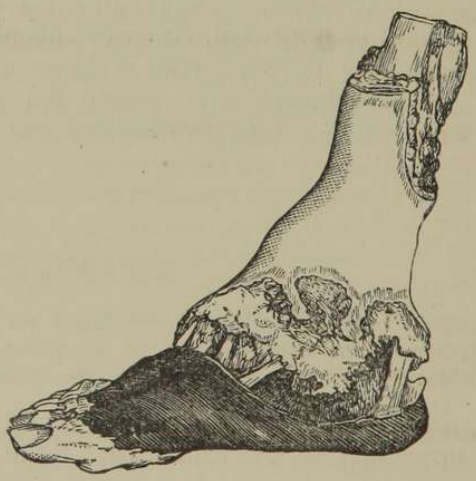
cold; it has a fetid odor. The constitution becomes weaker, the vitality of the parts is less and less, and we have gangrene, which is death of the parts *en masse*. The dead portion itself is called a "sphacelus" or "slough." If we take a portion of the gangrenous mass and press it between the fingers we find that it crepitates, because of the gas generated and contained in its substance. We always have this in the tissues where gangrene has formed, and it is an important fact to remember in connection with medical jurisprudence, that wherever there is decomposition of the body we have a lesser or greater accumulation of gas.

After a certain time, as this process of sloughing goes on, a "*line of demarcation*" forms, separating the healthy from the gangrenous part; this is caused either by an arrest of the process itself, or because the healthy parts are able to withstand the action of the process. There is severe pain and hectic fever accompanying gangrenous ulceration, and during the time that the line of demarcation between the dead and the living tissues is being formed. After the line of *demarcation*, that of *separation* is formed (Fig. 13); at this point the dead part is thrown off from the living. This line of separation is always *oblique*. The line of demarcation forms the surface-boundary of the "line of separation," which being oblique, leaves a stump, the reverse of that made by the surgeon in amputation. It either goes through the limb, or it "scoops out" the dead portion; and when the slough comes away there is beneath a healthy granulating surface.

Internal organs are not very liable to gangrene; the lung being more frequently attacked than any other. Among the causes of gangrene are injuries of all kinds, especially *crushed* wounds. Clean cuts are never liable to be followed by ulceration; but such injuries as are occasioned by railroad and steamboat disasters, congestions, and obstructions of circula-

FIG. 13.

FIG. 14.



tion, give rise to mortification. Sometimes gangrene is very rapid in its course, particularly the traumatic variety. A man's limb may be crushed to-day; to-morrow gangrene may set in; and on the third day he may die.

Obstruction of the circulation is a frequent cause of gangrene. This obstruction may originate from a variety of conditions; as embolism, tumors pressing on the arteries, clot in the arteries from fibrin, etc. Heat and

cold, especially if excessive, are prolific causes of mortification. Frequently we see this result from frostbite.

Tight bandaging in cases of wounds, fractures, and dislocations, has often produced mortification, and many limbs have been sacrificed to this careless practice. The cut (taken from Druitt), Fig. 14, represents sphacelus from starvation.

When gangrene does not involve the whole thickness of a limb, the line of demarcation is formed around the sphacelated portion, and the part sloughs away, leaving an ulcerated surface beneath, in which the process still continues until the unhealthy structure is cast off.

The constitutional symptoms in mortification generally assume a typhoid character. The pulse is quick and tremulous, the skin hot, tongue dry and of a brownish tinge, and the patient restless and uneasy. Delirium, subsultus tendinum, nausea, and hiccough are frequently present. In general the disease results from improper nourishment and inflammation (Fig. 13); gunshot wounds, fractures, dislocations, simple punctures, concentrated acids, poisons, stimulating applications, infiltration of acrid fluids into the cellular membrane, lightning, burns, long-continued pressure, intense cold, *must all operate, more or less, through the medium of inflammation, in producing their several effects.*

There are also some *specific* causes of gangrene, which will afterwards be noticed.

Mortification has been divided into *acute* and *chronic*, the former comprising the *humid, inflammatory* or *traumatic;* the latter, the *dry* and *idiopathic.* Generally speaking the acute is humid, and the chronic dry—the fluids being retained in the former, and gradually parted with in the latter; however, this is not invariably the case.

In the acute form of mortification there is always considerable swelling, which has been preceded by those symptoms which have already been mentioned as belonging to inflammation. Then the temperature of the parts diminishes, a slight blueness of surface attracts attention, and the skin may be covered with vesicles; there also may be a species of crepitus felt by pressing upon the parts. At this stage the general condition of the patient suffers, the countenance expresses the death of a portion of the body; hiccough, delirium, and death supervene. This is the ordinary acute gangrene, but there must be some distinction made between this and true traumatic gangrene, which results from severe railway and steamboat accidents. In these the parts are so crushed and the textures so pulpy that they die almost immediately, and not only does the implicated part suffer, but the gangrene spreads with alarming rapidity. To wait in such cases for the line of demarcation would certainly consign the patient to the grave. Every moment is precious, both to the surgeon and patient, and immediate amputation must be performed. Delay is death. Prompt action may be life. In this place, also, let me impress one truth upon my readers. In amputating in traumatic gangrene always leave a considerable space of healthy tissue between the gangrenous parts and the site of the amputation, because it is remarkable with what facility gangrene will attack the stump after the removal of the dead parts.

Dry Gangrene—or as it has been termed, senile gangrene—is generally seen in advanced years, and in many cases is the result of deficient circulation.

This variety of gangrene may commence with a burning sensation, which continues for a time, and ceases suddenly; or without any well-marked symptoms of inflammation, the toes and feet may become cold, discolored, and shrivelled, and finally converted into a hard dry mass, insensible, and

of a purple hue. Frequently there is no sloughing, and each part retains its original form, the skin remains entire, the nails adhere to the toes, and the part becomes hard and cold, and is perfectly free from fetor. Sometimes, however, the fetid odor and sloughing are considerable, and attended by severe constitutional symptoms, although these are of rather rare occurrence.

It is frequently very difficult to assign any cause for this variety of the disease. In some instances, however, it can be traced to diseased rye. During very moist seasons *secale cornutum, ergot, cockspur* (a medicine whose excellent qualities in many diseases is fully appreciated by the homœopathic practitioner), is generated in considerable quantities, constituting a disease in which the grains of rye become larger, firmer, and of a much darker color than natural; the diseased being mixed with the sound grain, is often eaten by families, and for a time without producing any detrimental effect, but finally the dry gangrene makes its appearance, and the population of entire districts becomes afflicted with the disease.

Such aggravated form of gangrene, arising from the continued use of secale cornutum, is of much more frequent occurrence in European countries, particularly France, than in North America.

"The patients who have suffered from it have experienced pain and heat with swelling, generally in the lower limbs, though occasionally in the upper. These symptoms abating, the parts became cold, insensible, and discolored, and were gradually separated from the body. The disease attacked patients of both sexes and every age; did not appear to be infectious, and was frequently fatal."*

Canstatt, however, gives a much fuller description of gangrene caused by the internal use of secale; for this we may refer the student to Hartmann's *Chronic Diseases*, vol. ii, pp. 152, 153.

Treatment.—The medicines best adapted to the treatment of gangrene are: Ars., chin., crot., lach., sec. cor., silic., acon., bell., carbo veg., euphorb., hell., hyos., sabina, squill., sulph.

Arsenicum has very many symptoms that belong to gangrene, and under its use in alternation with carbo veg., I have seen senile gangrene subdued. This medicine corresponds to very many of the constitutional symptoms, and has the following local manifestations: Numbness, stiffness, and insensibility of the feet, with swelling and pain. Coldness of the feet, with contracted pulse. Swelling of the feet, with hot, shining, and burning red spots, and bluish blisters. Hard, red, blue painful swelling; itching swelling, colorless swelling of the malleoli, with tearing pains, which are relieved by external warmth. The skin of the bottom of the feet is insensible, thick as leather, with rhagades. The toes are stiff and do not allow him to tread. Titillation and creeping itching of the great toe. Ulcerating and spreading blisters on the tips of the feet. Parchment-like dryness; coldness and blueness of the skin. Black blisters, with burning pain. Discoloration of the nails.

Crotalus.—Swelling of the feet, with coldness. Painful numbness of the toes, as after a cramp. Swelling of the bitten leg, burning like fire. Heat and intolerable gnawing of the feet. Livid spots, with frequent fainting fits and imperceptible pulse. The swollen part is cold and painful to pressure. Hot swellings, with cold skin and sickly appearance. Insensibility of the swollen part. Gangrene over the whole body. The spot where the bite was inflicted looks black, with red dark circle, blackish redness of the sub-adjacent muscles and cellular tissue, and inflammation extending from the place of the bite to the pectoral muscle, where gangrenous spots are exhibited. The skin where the bite has been inflicted becomes gangrenous, and is separated from the muscles by a fetid fluid.

Lachesis.—Gangrenous blisters. Black-blue blisters, vesicles of the size of a hazel-nut, with violent itching and burning, as if the flesh would be torn from the bones. Swelling and inflammation of the bitten limb, with violent pains, dry mouth, constant fever, dry skin, and constant thirst. The lightly brown areola be-

* Liston's Elements of Surgery, p. 40.

comes bluish-black. Gangrene of the bitten part, and gangrenous blisters. Tingling in the toes, with heat and numbness. Cracked skin between the toes, also deep rhagades. Blue-red large swelling of the leg and foot; prickings around the malleoli and calf, and aggravation of the swelling in the warmth. Coldness of the feet also, as from ice. Itching places on the tibia, with pain as if burnt, changing to painful spots after rubbing, with blue-red dark borders and dry scurfs. Tingling in the right tibia, from the knee to the dorsum of the foot and into the toes, with cold feet and icy-cold malleoli.

Secale cor.—The skin is dry and brittle,—withering dry. The skin all over the body looks lead-colored, the parts becoming shrivelled and insensible, and not emitting a drop of blood on being cut into. Burning in the skin as if a spark of fire had fallen on it. Bloody blisters on the extremities becoming gangrenous. Black suppurating blisters. Formication of the hands and feet. Numbness, insensibility, and coldness of the limbs. The limbs become cold, pale, and shrivelled, as if they had been lying in warm water for a long time. Gangrene of the limbs, the limbs becoming suddenly cold and lead-colored, and losing all their sensibility. Gangrene, deadness, and falling off of the limbs. Pain, accompanied with slight swelling without inflammation, followed by coldness, blue color, gangrene, and deadness of the limbs. Numbness of the fingers and tips of the fingers. Tingling sensation in the anterior portion of the thighs and calves, as if gone to sleep. Gangrene of the feet up to the knees. Gangrene of the lower limb, and spontaneous dropping off of the same.

In threatened traumatic gangrene, when there is violent synochal fever, of course *aconite* should be prescribed, and *calendula* in solution applied to the wounded part; or *arnica* diluted may be employed locally if there be but little solution of continuity. The former medicine has been highly recommended as a vulnerary, and it has been used with great success in Europe in all kinds of lacerated wounds; it has a powerful action over suppuration and its consequences; indeed, its beneficial influence in wounds of all descriptions is remarkable. This subject, however, will be again alluded to, when treating of wounds.

Belladonna is also a very important remedy, and must be exhibited when the constitutional symptoms demand its exhibition, particularly when the patient complains of burning heat and unquenchable thirst, and especially if there be the characteristic trembling of the extremities, clouds and spots before the eyes, with dilated pupils. This medicine is useful in dry and humid gangrene.

China must be used when there has been profuse hæmorrhage, which has greatly debilitated the patient. Coldness of the whole body, particularly of the extremities, with pale and clammy face; the parts around the wound blue, swollen, and soft. If there be gangrenous spots, with inability to swallow, hiccough, vomiting, hyos. may be administered. If typhoid symptoms, with excessive prostration, rhus tox. or phosph. should be exhibited.

Carbo veg. is indicated in some cases of humid gangrene, but from the general sphere of its action it is especially serviceable in *gangrena senilis*. It has in its pathogenesis several symptoms of the disease, and has been of much service in the treatment. Euphorbium is also useful in the gangrene of old persons.

Silic. and **Sulph.** are also important medicines in both forms of gangrene, and perhaps with arsen., crotalus, lachesis, secale cor., and also carbo veg. and solanum nigrum, are the most useful medicines for the treatment of gangrene as occurring in old persons.

It may be useful also, in this affection, to wrap the feet or other parts affected in *carded wool*. This practice is recommended by Sir B. Brodie in his *Lectures on Mortification*, and is mentioned by Mr. S. Cooper in his *First Lines*. There have been several cases treated successfully by this method,* and no doubt these means will assist in maintaining the warmth of the part, while by the proper administration of medicine the cause upon which the disease depends may be removed.

* United States Medical and Surgical Journal, vol. ii, p 318.

The following medicines have also been recommended: Chinin., merc., mur. ac., plumb., sabin, scill., sulph. ac., tart.

The American Columbo (Frasera carolinensis) is stated by Rafinesque to have cured widespread gangrene after bark had failed. *Vide Hale's New Remedies*, p. 379.

Dispascus sylvestris is used by Mr. Beullard, in certain cases of gangrene with great satisfaction. He says:

"*a.* The wound is of some days' standing, has a ragged, irregular, anfractuous, black appearance; exhales the well-known and repulsive odor of gangrene; this gangrene sometimes extends to quite a depth. With bistoury or curved scissors I remove as much of the mortified tissues as I can, taking care not to reach the quick, thus avoiding both pain and hæmorrhage; each one must judge for himself if bridles (of sound tissue) may be spared. I wash the wound with chlorinated water, in the proportion of one to ten, then I fill it with the leaves cut very fine, so that all parts shall be fully in contact therewith. I then cover with a compress, and all is kept in place by a few turns of a roller. Here (he writes in France) I dress but once in twenty-four hours; under the tropics I think it would be necessary to renew the dressing night and morning. Under the influence of this simple topical application, in twenty-four or forty-eight hours, sometimes more (one must not be discouraged—success is certain), the *gangrenous* becomes a simple wound; the black color has disappeared, a healthy suppuration is set up, and the wound begins to granulate.

"*b.* The part has been contused, the skin remaining entire; sooner or later gangrene sets in; it invades the skin or the subjacent parts to a considerable depth. In this case I dissect away the mortified parts, taking care, as above, to leave a slight layer over the quick to avoid pain and hæmorrhage. This cavity is washed with the chlorinated water, dressed with the *dispascus*, as above, and with the same result."

Dr. Blakely* reports five cases of traumatic gangrene treated very successfully by the internal administration of arsenic, lachesis, and iodine, with the local application of calendula solution. The efficiency of this method of treatment is remarkable. The following interesting case will show the method of homœopathic treatment in such cases:

Case.—The patient was a deck-hand upon a ferry-boat, and accidentally caught his foot between the wharf and boat as it was coming into the dock. The contusion and laceration were very severe. Dr. Bayliss, of Astoria, was called to see the case. Traumatic gangrene appearing on the second day, he sent him to the hospital. This was on Sunday, the first day of October. When I saw him that afternoon, his foot presented all the appearances belonging to acute traumatic gangrene, which extended from the toes to about the base of the first row of phalanges; the color was purple; the odor was that peculiar to moist gangrene; there oozed from the lacerated surfaces an offensive sanies; the sensation in the forepart of the foot was gone; and there was a reddish blush ascending over the instep, which indicated a rapid spread of the disease.

The next morning I amputated the leg at its lower third, making the circular operation, and forming a very large flap. It must be borne in mind, that the ankle and heel presented no appearance of gangrene. On the next day the patient was *too well.* I told him so. On the second day, when I saw him, the odor, the discoloration, the oozing, pointed to the rather discouraging fact that the disease had attacked the stump. I cut

* American Hom. Observer, vol. iii, p. 233.

open all the sutures, turned the flap backward, and ordered the part to be washed every three hours with water, and then carefully injected with carbolated glycerin. A compress wet with the solution was applied, and arsenicum[3] was given every half hour. The effect of the treatment was magical. The gangrene was entirely arrested, and I was enabled to cut away the dead portions of the flap with scissors. The man made a good recovery.

In the treatment of gangrene, so soon as the line of separation begins to form, the parts should be thoroughly wrapped in a disinfecting dressing. Billroth covers the parts with lint saturated with chlorine water. I have employed this method with success, but the ordinary charcoal poultice is better, although it is rather dirty.

The *acetate of alumina* used as follows is said to be most excellent:

℞.—Aluminis, ... ℥v.
Plumbi acetatis, ... ʒj.
Aquæ, ... f℥xiij. M.
Fiat lotio. Applied three times a day.*

Dr. Younghusband testifies, in the *American Homœopathic Observer*, for 1868, to the especial value of arsenic in gangrene. In his cases he used the *ulmus* as a poultice, made with yeast.

Dr. John C. Morgan highly extols the topical application of *white sugar* to the gangrenous parts; also, small quantities of glycerin.†

HOSPITAL GANGRENE—HOSPITAL SORE—SLOUGHING ULCER—SLOUGHING PHAGEDÆNA.

There is a variety of gangrene known by the above names, which is often so intractable, and spreads with such rapidity, that even a tendency toward its appearance should cause great solicitude. The disease no doubt was known from a remote date, Avicenna, Paulus, and others having written concerning it. However, it is said by Dr. Gross that Poicteau, of Lyons, in 1783, was the first who generalized the disease, and gave a lucid and distinct account of its symptoms and treatment. Since then, it has been noticed and commented upon by many surgical writers.

Its peculiarity is, that it generally appears in hospitals, or in apartments where many persons are crowded together; where there is not proper ventilation; where there is abundance of filth and a lack of pure fresh water; where the drainage is imperfect, and there is want of cleanliness in dressing wounds, ulcers, or abscesses. It is stated that few hospitals grow "old" without the appearance, in some form, and at certain periods of time, of this dreaded malady. It may follow scurvy, and may prevail on shipboard. It existed to an extreme degree on board the ship "Prince of Wales" on her homeward passage from Martinique.

Thanks to the better systems of drainage, sewerage, ventilation, and hygiene in their varied departments, which are now introduced into hospitals, this malady, at one time the scourge of charitable institutions for the sick, is less frequent in its appearance and in its intensity.

Hospital gangrene may be also produced by direct contact, and appears either on the surface without any previous abrasion—which, however, is rare—or it attacks a wound or ulcer.

In its one form, and when on the surface, a pustule is developed, or a vesicle makes its appearance, which bursts and discloses a dark and pur-

* Naphey's Surgical Therapeutics, p. 103.
† Transactions American Institute of Homœopathy, 1869, p. 115.

plish slough; this slough is accompanied with a thin, ichorous, and extremely offensive discharge, and separates rapidly, leaving, however, a jagged ill-conditioned sore, spreading speedily, with everted edges. The surrounding skin is purple or mottled in appearance. The ulceration extends with great rapidity, and has been denominated the *black phagedæna*. During this time, and even, in some cases, before the appearance of the sore, the constitutional symptoms are alarming; assuming the typhoid type, with great prostration and tendency to collapse. Sometimes, and in rare cases, hospital erysipelas may coexist with hospital gangrene, making a grave complication. When the tendency to this affection assumes an epidemic form, the matter secreted is intensely contagious and is liable to infect nurses and others attending the patients. The other inmates of the hospital are all liable to be attacked; the slightest abrasion of the surface, the scratch of a pin, or rubbing with the finger-nail sufficing to produce a rapid development of the affection.

When sloughing *phagedæna* attacks a wounded surface, the symptoms in general are not so pronounced at the onset. The patient may have been ailing, irritable, feverish, and thirsty, with anorexia. Upon examination of the wound, it will be observed to be unhealthy, and gradually becoming very painful. The discharge, which was once healthy, diminishes in quantity and deteriorates in quality. The surface of the wound is of a grayish or dirty white, with rather a spongy areola, which crepitates. Its base is lardaceous, and from its color has received the name of *gray pultaceous phagedæna*. Sloughs form and are cast away, the degeneration appearing principally at the edges of the ulcer. Sometimes the sloughing parts are infiltrated throughout with putrid extravasation. The pulse rarely shows less than one hundred and thirty beats to the minute; the patient becomes debilitated, and, in some instances, is troubled with profuse perspiration, or with colliquative diarrhœa.

It may be epidemic or endemic, and, occasionally, sporadic cases occur. The disease appears to have no preference for sex, age, or temperament, climate or season, although, no doubt, in excessively hot weather its course is more rapid and its effects upon the constitution much more severe. In its more violent forms, or where the *black phagedæna* attacks the wounded, which it does as well as appearing upon unbroken surfaces, it spares no tissue, and if unchecked, rapidly causes a fatal termination. In both varieties the lymphatic glands in the neighborhood of the sore are affected, and the joints may suffer from purulent formation.

Treatment.—There are some medicines which appear to exercise over this malady a powerful influence. The first of these is *arsenic*. The well-known pathogenetic effects of this drug need not be repeated here to indicate its applicability. It should be given, according to my belief, in the lowest potencies; and, indeed, sometimes Fowler's solution appears to be the preferable preparation. Other medicines are crotalus, lachesis, kreasote, carbo veg., secale, muriatic acid, nitric acid, rhus tox. Upon referring to the symptoms as detailed in the first portion of this chapter, the specific uses of these drugs can be found.

In this fearful disease local measures are called for frequently, and the best that can be applied is the chloride of zinc, which should be used in saturated solution and as an escharotic; it has, besides its caustic properties, the advantage of great antiseptic virtues, and, therefore, appears to be doubly applicable to the disease. After the application of caustic, the free use of carbolic acid paste is the best dressing; which should be changed frequently, and the sore washed thoroughly with tepid water and soap. All bandages and dressings used should be changed frequently, and the patient

allowed a certain amount of stimulus during each day. The inhalation of oxygen gas also, if practicable, should be employed, and the strictest attention paid to free ventilation and appropriate diet.

With reference to local applications, the *baptisea poultice* is excellent, as is also that made of charcoal.

Prevention by the Antiseptic Method.—Von Nussbaum* relates the preventive power of Lister's antiseptic plan of dressing in the Munich State Hospital, where hospital gangrene at once ceased, although, at the period of its use, eighty per cent. of the surgical patients had been affected. He holds that the secret of its great success lay in a pedantic exactness of its mode of application. Not even for a second should the wound be unprotected by the carbolic acid spray. Other methods of dressing had been employed without results. He states that during the prevalence of the disease, the appearance of gangrene the following morning could be foretold by the rise of the evening temperature to 104.8° or 105.8°. The actual cautery was found most efficacious in staying the course of the gangrene, and he noticed that a fall in temperature indicated a favorable change. He holds that hospital gangrene is strictly a local affection.†

For accurate details in regard to the antiseptic method, the reader is referred to Dr. Thompson's chapter on antiseptic dressings.

CHAPTER VI.

TUMORS.

Introductory Remarks — Classification — Innocent — Semi-Malignant— Malignant.

Since the time that Abernethy attempted a classification of the varied tumors which grow in and upon the body, there has been the widest difference of opinion among pathologists concerning the divisions and subdivisions of these neoplasms, which indeed appears more confused since the introduction of the microscope than settled by its wonderful powers. The fact is, as the microscope presents *actual appearances* on its field; as there are in the world comparatively few experts in miscroscopy; as the specimens examined are taken at varied stages of development,—that each specialist endeavors in his own way to satisfactorily account for the results he obtains, which may be very different at different times and under varying circumstances.

It has often struck me that notwithstanding a great deal of care in obtaining and preparing microscopic sections, that a slight alteration in such preparation (in many cases unavoidable), which would be inappreciable to our unaided senses, would render essentially different appearances in that world of new life revealed to us by powerful lenses; a film, a fibre, a little bit of difference in the age of the specimen, a minimum of dissimilarity unobservable to our ordinary vision, must necessarily be magnified to such proportions that attention is necessarily directed thereto, and so errors may

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* Monthly Abs. of Med. Science, March, 1876.

† Brit. and For. Med.-Chir. Rev., January, 1876.

creep into descriptions and be rapidly promulgated by those who follow in the lead of this or that pathologist. This may, in part at least, explain why opinions on these subjects are ever changing, and are ever likely to change. Schüppel's "giant cells," so loudly spoken of; Lostoffer's corpuscles, which for a time set the syphilographs by the ears; and the "typical cancer cell," that was said to belong to the cancer discharges, and which turned the heads of pathologists and surgeons, are monuments for our contemplation, on which the microscopist of the present day may read, "*Cave quid dicis, quando, et cui.*" As a means of *diagnosis* between innocent and malignant tumors (I mean, of course, primary diagnosis), the microscope is of little *practical use; after* their removal from the body their characters and peculiarities are better determined. How much better would be this condition *vice versa.*

I am therefore disposed to agree with Mr. Savage* in the introduction to the third edition of his work, when he says: "The question of malignancy is not to be determined histologically," and further, when he writes: "In regard to the question of malignancy, attended or not by *recurrens in loco eodem alioque*, the experienced surgeon decides without much reference to histology, and is generally right where the pure histologist is generally wrong. The greatest benignity and the greatest malignancy may be united in the sarcomata group. 'I can assure you, that two sarcomata *of the most similar histological qualities may differ entirely in course*' (Billroth)." Of all the classifications of tumors which have been attempted, I think that of Virchow, while it covers the greatest variety of species, and shows a vast amount of experience and research, is the most unsatisfactory to the student, on account of the uncertainty of its expressions and its necessarily numerous discrepancies. For instance, his understanding of the terms "homology" and "heterology." According to recent investigators of the English and French schools, these terms have a definite and distinctive meaning. The former applying to those tumors which in their structure bear a strong resemblance to the normal tissues of the human body; the latter, "heterologous," being applied to those growths which are unlike any of these tissues; of course it is understood healthy and fully formed structures. Thus Holmes† writes in his classification: "There is one class in which the substance of the tumor has an exact anatomical resemblance to some tissue of the body (*homologous tumors*). . . . . There is another class of tumors which do not present any resemblance to the normal tissues, and which are therefore described as *heterologous.*" Sir James Paget‡ coincides in this view; he says: "The intimate structure of malignant tumors is usually not like that of any of the fully developed natural parts of the body. . . . . Innocent tumors have not a structure widely different from that of a natural tissue." It is, however, unnecessary to multiply quotations. In Virchow's arrangement these terms possess merely a *relative* meaning, and refer to the character of the tissue from which the growth springs. It will be seen how confusing and uncertain this must be, when a tumor presenting the *same structural elements may be homologous in one part of the body and heterologous in another.* Besides this, even Virchow himself is in doubt whether in the majority of instances his cancerous growths are not heterologous.

Another obstacle encountered in describing certain tumors is the differ-

* The Surgery, Surgical Pathology, and Surgical Anatomy of the Female Pelvic Organs, London, 1876.

† Principles and Practice of Surgery, 1876, p. 348.

‡ Lectures on Surgical Pathology, English ed., pp. 382–387.

ent nomenclature adopted by different pathologists. Thus the "myeloid tumor" of Sir James Paget, is "the giant-celled sarcoma" of Virchow; "the recurrent fibroid" of Paget is the "spindle-celled sarcoma of the German pathologists," or the fibro-plastic of Lebert; "the sero-cystic sarcoma" of Brodie, include "the glandular proliferous cysts" of Paget, to which we have added a very great variety of sarcomata, as mucous sarcoma, net-celled sarcoma, granulation sarcoma, alveolar sarcoma, pigmentary sarcoma, round-celled sarcoma, and so on *ad infinitum*.

If we add to this, the difference in the acceptation of the term "sarcoma," another difficulty will be presented. The term may mean (and was for a time so understood) "fleshy;" then, again, it was used to express the myoma or muscular formations; afterward, a sarcoma was a species of growth composed of an extraordinary preponderance of cell elements, and deficiency of alveolar substance; and, finally, the Germans especially apply it "to the series of connective substances, which are distinguished from the tumors formed of the connective tissues, by the preponderating development of cell element."

By sarcoma should be understood a matrix or stroma, intermediate and surrounding cells of varied character, the precise character of the cell-element giving the peculiarity to the formation, hence the diversity of names. It is from the great variety of these elements that Paget objects to the term, for he says: "After a careful consideration of the matter, we are inclined to think that the group is too vague, and is made to embrace tumors which are too diverse, both in color, consistence, vascularity, structure, mode of growth, seat, course, and effects on the patient, to be included under one common term. We are not prepared, therefore, to employ the term sarcoma in the classification of tumors, for we believe that the morbid growths which have been ranked under that name, may be more satisfactorily and precisely arranged under one or other of the heads employed in these lectures."

Therefore, on account of the uncertainties at present realized, and those which, no doubt, are yet to come, and in view of the great variety of terms here and there introduced by the histologian, we shall attempt to classify tumors in accordance with their clinical characteristics, and to describe their structure also histologically, and may hope for a future when the many discrepancies which now overshadow the magnificent classification of Virchow and Billroth, will be removed, and a more simple arrangement of these growths, at least for the student and practical surgeon, be arrived at.

The fact is this, at least so far as I am able to get at it, the nearer a tumor approaches in its structure to the *perfectly developed* formations of the human body, in other words, the nearer its homology, the more likely it is to be innocent; the greater the departure from this standard, in other words, the nearer the resemblance to imperfectly formed, embryonic or abnormal structure, the more certain is the growth to be malignant.

We may therefore say that a tumor is a new growth, which is an addition to the normal tissues of the body—not merely an increase in structure, which would be a hypertrophy—"with," as Mr. Paget says, "appearance of inherent power irrespective of the growing or maintenance of the rest of the body, discordant with the normal type and with no seeming purpose."

The exudations of inflammatory processes may be mistaken for tumors; but these generally disappear as soon as inflammation subsides, or, if they remain, they constantly tend to assimilate themselves to healthy tissue. Tumors, on the contrary, continue to grow more or less steadily, with or without inflammatory action, and deviate more and more from the

normal type. In rare instances they may be confounded with aneurisms and abscesses; but the history of the case, a careful study of the symptoms, or, if these fail, a cautious use of the exploring needle or the aspirator, will render the diagnosis more certain.

Classifying tumors then clinically, we may say that there are two great typical divisions, viz., innocent and malignant, with a third or intermediate variety, which is known as the semi-malignant, which latter under peculiar circumstances partake partly of the nature of both. As a rule then, and with an understanding of the fact, that one division may overlap the other:

Innocent tumors may be distinguished by the following characteristics:

1. They are harmless in reference to surrounding structures.
2. With the exception of recurring fibroids, they are not liable to return after proper extirpation.
3. In texture, they resemble the normal tissues of the body.
4. As a rule, they are unattended by any marked constitutional disturbance.

The following diagnostic marks characterize malignant growths:

1. In microscopic structure, they completely differ from normal and fully developed tissues of the body. "Many cells resemble bland or epithelial cells, but can be distinguished from them by a practical eye. The cells are grouped or heaped one upon another, without any such definite arrangement as we find in other tissues." (Paget.)
2. They are disposed first to soften, then to ulcerate; and there is great tendency to infiltration and destruction of the surrounding matrix; this infiltration may be either slow or rapid.
3. They do not enlarge continuously, but become irregular and lobulated with offshoots; innocent tumors, on the contrary, are generally round and grow in one volume.
4. They are marked by persistent and often fatal hæmorrhage.
5. The fetor is always easily recognized, and is sometimes intolerable.
6. They have a tendency to invade all surrounding structures, to produce secondary deposits, and to sympathetically involve distant organs.
7. They are liable to return after extirpation.
8. They produce a marked constitutional cachexia.

To make the differences still more plain I have prepared the following differential diagnosis, premising, however, that there are certain forms of fibroid tumor which may and do appear after removal (the recurrent fibroid), and that a fungoid condition of a fibroid may exist, in which hæmorrhage is profuse and often occurs with but slight irritation, and that enchondromatous formations may also recur.

DIFFERENTIAL DIAGNOSIS BETWEEN INNOCENT AND MALIGNANT TUMORS.

INNOCENT.	MALIGNANT.
1. Harmless with reference to the surrounding structures.	1. The tumor is apt to destroy or involve surrounding structures.
2. Texture bears some resemblance to certain of the surrounding structures.	2. Texture differs from the normal structure of the human body.
3. Non-liability to return (excepting recurrent fibroid).	3. Great disposition to return.
4. Absence of hæmorrhage.	4. Liability to profuse bleeding.
5. Little disposition to soften.	5. Great tendency to soften.
6. Not much tendency to ulcerate.	6. Great tendency to ulceration.
7. Rarely accompanied by offensive discharges.	7. Very offensive, ichorous, or bloody discharge.
8. Non-infiltration of surrounding structures.	8. Infiltration of the part on which they grow, which is often entirely transformed.

Innocent and malignant growths may coexist in separate tissues in the same individual; and the innocent may become malignant, if a cancerous cachexia is present in any part of the body. Paget describes varieties of fibrous and cartilaginous tumors, which returned after extirpation, caused ulceration and sloughing, involved neighboring tissues and distant organs, and finally terminated in death. He also states that in children of cancerous parents, tumors apparently innocent in structure are functionally malignant.

Tumors may occur in any part of the body. As a rule, malignant growths attack most frequently the glandular organs, while benign tumors generally affect the skin, cellulo-adipose tissue, nose, uterus, and ovary.

In *form* they vary greatly; they may be smooth, lobular, round, conical, uneven, etc. Tumors involving lymphatics are generally nodular and irregular; encysted and fatty tumors, smooth and globular. Situation may modify the shape, especially if the tumor be bound down by fascia or muscular tissue.

In *volume* they range from the size of a millet-seed to a bulk greater than the patient's body.

The *color* varies with the number of bloodvessels contained in the growth, and also with the amount of inflammatory action in the tumor itself, or in the superimposed tissue. Nævus is generally purple; fatty tumors, yellow; fibrous, whitish; cartilaginous, white and glistening.

In regard to *consistence*, tumors may be hard, soft, or semi-solid; fibroid and scirrhous are hard; cystic, soft; and the fatty tumor has a "feel" between fibroid and cystic. Occasionally the position of a tumor and its confinement by fascia give it a sense of pulsation, which might lead to the supposition of aneurism.

The *mobility* of a tumor depends upon its situation and the character of the tumor itself. Some, like the fatty tumors, are freely movable; others, like the exostoses, are always firmly attached. *Consistence and mobility*, however, can give us but little idea of the true character of the tumor.

Cohnheim has lately endeavored to settle the question as to the **metastasis of tumors**, by actual experiment, which consisted "in detaching a small piece of periosteum from the tibia, and then introducing it into the jugular vein. At first they found considerable difficulty from the ordinary mechanical and surgical results of such an operation, but, by using Esmarch's method, combined with all antiseptic precautions, they succeeded, and the animals lived quite well. They were killed, after various periods, by bleeding. In those killed from the third to the fifth day, only embolized periosteum was found; in those from the tenth to the sixteenth day, a resistant hard place on the lung parenchyma existed; in those after the twentieth day, the results were quite negative. Microscopically examined, the masses found between the tenth and sixteenth days were truly growths of the periosteum, with commencing formation of bone; but in cases where more time had elapsed, the new growth was seen to be undergoing absorption, and after a month had entirely disappeared. They consider this disappearance to be due to that physiological capacity of the organism which shows itself in the removal of callus, and they suggest that the real factor in the generalizing of new formations is the abolition of this function. So long as the constitutional condition of the individual maintains this ability, tumors remain merely local affections, although fragments are being constantly detached and carried about by the circulation to distant parts of the body. According to this view, the inoculation of healthy animals with cancerous matter would remain without effect, as we know to be the

case. The explanation is hypothetical, but it is at least as comprehensible as the ' malignity ' of certain growths."*

INNOCENT TUMORS.

The innocent tumors are the *Fatty, Fibrous (Neuromatous), Fibro-cellular (myxoma, cylindroma, and glioma), Vascular, Cystic, Adenomatous, Enchondromatous, Osteoid, Horny.*

Fatty Tumors—Lipomata—Steatomata.—These tumors are either sessile, "continuous," or pedunculated, and are probably the fairest example of homologous tumors. They grow from either superficial or deepseated fat, and are found wherever adipose tissue is deposited in the body. They may occur at any period of life, and may remain for a considerable time without growing, until from sudden appreciable or some inappreciable cause they increase rapidly in size. They are not dangerous only so far as the pressure symptoms are concerned, and do not return after extirpation.

When the fatty tumor is sessile or pedunculated it is encapsuled, when it is continuous or appears as an outgrowth it is not, as a rule, encapsuled. I have only seen this latter variety on the nape of the neck; it appears like an agglomeration of fat-corpuscles, from the size of a small pea to that of a bean, held loosely together with a delicate connective tissue, and bound down by fascia. On the shoulders, arms, and legs, however, the masses of fat are quite large and lobulated, and held in position by a distinct though quite fragile capsule.

In the early stages of growth, this capsule is thin and delicate; at a later period, it becomes dense and hard. This fibrous degeneration of the capsule constitutes the variety described by Rokitansky, Gluge, and Vogel, as "steatoma,"† and "lardaceous tumor," and by Müller as "lipoma mixtum." Müller also distinguishes another variety "cholesteatoma," which is "apparently composed of crystalline fat inclosed in meshes of cellular tissue."‡

In the diagnosis of this form of tumor, the student must first bear in mind that there may be, indeed there often is, a deceptive appearance of fluctuation, and this is more especially the case when the growth is pedunculated; it must also be remembered that there is a peculiar tendency in this form of tumor to drop down or shift its position, which fact will assist in the diagnosis. Although as a rule it is not difficult to recognize this peculiar growth, yet sometimes other tumors have so nearly simulated it that care was necessary to arrive at a correct diagnosis. A fatty tumor which weighed, after its removal, twelve and a half pounds was mistaken for a spina bifida; the growth was situated midway in the lumbar region, and had been present since infancy.

A fatty tumor situated directly in the course of the great vessels may *receive pulsation* from the artery beneath; this has occurred to me in two cases, once in the neck over the subclavian, and once in the inner side of the right thigh over the femoral. Drawing the growth away from the parts beneath is generally sufficient to arrest the pulsation.

The following interesting case may show the action of internal medication. A young lady aged twenty-three years was sent to me by her medical attendant, to examine a large tumor occupying the posterior surface of the shoulder, and covering a space from the bend of the neck to the infraspinatus fossa of the scapula. The parents were averse to operation, and

* London Medical Record Oct. 15. 1877.

† The term "steatoma" is applied by some authors to encysted tumors. *Vide* "sebaceous cysts."

‡ Erichsen.

desired that medical treatment should first be thoroughly tried before the knife was resorted to. I knew of no medicine that was especially homœopathic to fatty tumors, but was aware that Sir Benjamin Brodie had spoken very highly of the liquor potassæ in such cases, especially in that of a footman, who had an immense tumor extending from ear to ear, which was cured by the medicine. I therefore prescribed that remedy, five drops in a teaspoonful of sweetened water three times a day, gradually increasing the dose until she took ten drops at a time. In seven weeks from the date of commencing the treatment, the tumor had entirely disappeared.

Dr. J. C. Morgan, of Philadelphia, reports a case of the kind, cured by crocus[200]. The indications were hæmorrhage (?) of dark clotted blood.

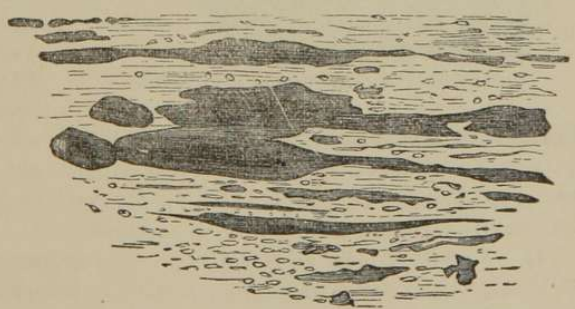
Removal.—To remove the flat continuous growths, a single incision across the tumor, extending a little beyond its base, is generally sufficient; but if the growth is large, it may be necessary to make the cut either **T** **X** or **H**-shaped, then the dissection must be carefully continued around and beneath, until the whole is removed. In the encapsuled variety the single incision (being sure that it is made *down to the capsule*) is sufficient. The handle of the scalpel and the fingers will generally be sufficient to dislodge the lobes, which often slip out in a most approved and cleanly fashion.

Fibrous tumors, or as they are called, *desmoid*, *chondroid*, *tendinous*, or *fleshy* tumors, possess all the characteristics of innocent growths, indeed, in many cases, the body appears to tolerate this variety of tumor better than any other, immense fibroids of the uterus being carried, with but little inconvenience excepting their weight, for many years. A fibroid, in shape, is spherical or ovoid, unless peculiarities of position or pressure alter this condition. To the touch, fibroma are hard, elastic, and firm, unless inflammation attacks them, then, of course, the tissues soften; at times a profuse hæmorrhage results, and from the opening a fungoid growth may appear. This must be remembered in making a diagnosis between it and cauliflower excrescence.

A fibrous tumor grows without pain, and can be handled with impunity; indeed, I have on several occasions removed tolerably large (six inches in circumference) fibroid polypi from the uterus, the patient making little complaint of pain, and not being under anæsthetic influence. These growths again may be sessile or pedunculated; the latter receiving the name of "*polypi.*" As a rule, also, we find the integument over them movable, unless inflammatory action be present.

Very often the fasciculi of a fibroma separate, and larger or smaller cysts develop within the structure; the tumor then receives the name "*fibro-cystic,*" and if calcareous matter has been deposited (Fig. 15), "*fibro-calcareous.*" They are invested with a capsule, which, however, is generally quite thin, and requires care in its dissection; but this is not always the case. In one or two instances I have found quite a distinct and firm capsule, and this I have noted more particularly in that variety of fibroma which was becoming cystic.

FIG. 15.



Calcareous Deposit in a Fibrous Uterine Tumor, from Dusseau.—Paget.

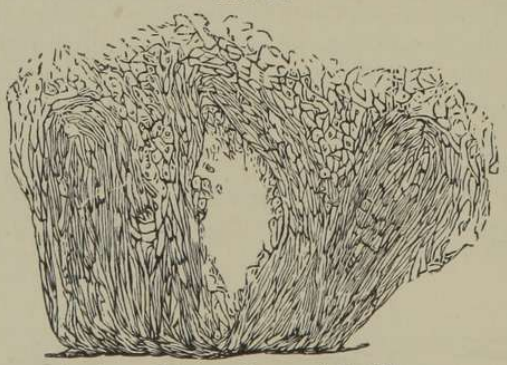
The uterus is most frequently affected with fibroma; the jaws come next in order, and after this,

perhaps, the nerves, making the *neuromatous tumor*. These growths also attack the subcutaneous tissue, the breast, the lobes of the ears, and the bones. The fibroid tumor, as it grows from the jaws, receives the name of *epulis*. This tumor is hard, but not to such a degree as the ordinary fibroid; it springs from the alveoli, and is connected distinctly to the periosteum; the tumor can be handled without pain, and often, nay, generally, is pedunculated. When it is raised with the forceps, it sometimes looks serrated along its edges, and is covered with mucous membrane. Absence of disease in the subadjacent glands, and also of the tendency to infiltration or to cachexia, diagnose it from malignant formations.

The **Neuromatous tumor**, "is also embraced under the head of fibroma; in such growth, according to Drs. Paget and More, it is impossible to distinguish the fibrous neuroma from that composed of nerve elements." It exists singly, or there may be hundreds in different parts of the body. In color, neuroma are grayish or yellowish-white, and are said to arise* from a deposit of lymph around a single nerve fasciculus, which becomes organized, while other deposits take place, until a fibrous growth results. These tumors are sometimes excessively painful when handled, but at others are not so; sometimes the pain shoots along the course of the nerves, and at others there is coldness of the part, and sometimes a great loss of sensibility.

These growths, however, must not be confounded with the "**Painful Subcutaneous tumor of Mr. Wood.**" This is a peculiar growth of fibrous structure situated underneath the skin, occurring more frequently in women than in men, varying in size from a pea to that of a chestnut. These tumors are round, and rise a little above the surrounding integument, and are *most intensely painful*, giving rise to hysterical symptoms of the most violent character; they are generally incased in a capsule of moderate firmness, but are not imbedded between the fasciculi of nerves, or beneath the neurilemma; hence they must not be confounded with the neuroma just mentioned. On section, the fibroid tumor presents fibres, matted together and interlaced in the form of loops (Fig. 16). Sometimes there is a concentric arrangement of fibres, especially if treated with nitric acid.

FIG. 16.



Section of Fibrous Tumor of the Uterus.

Treatment. — Of the medicines internally administered, those which have been productive of most good in my hands are undoubtedly conium and calcarea. However, of late years, I have generally resorted to operative measures. The internal administration of the muriate of ammonia has been productive of good, as will be mentioned in another place; also, the hypodermic use of secale cornutum; these two medicines being especially employed in *fibroma uteri*. Dr. Gilchrist has cured a case of fibroma with *conium*.†

The treatment by *electrolysis* is often successful. For a full description of this method, with cases, the reader is referred to Dr. Butler's chapter on that subject.

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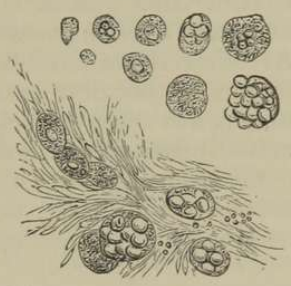
* Holmes's System of Surgery, vol i, p. 527.

† Tumors, their Etiology and Curability, by J. G. Gilchrist, M.D., p. 16.

FIBRO-CELLULAR TUMORS.

A fibro-cellular tumor is, in common medical nomenclature, considered as a "soft polypus," and that is its best name; nevertheless, it has received many others. According to Rokitansky, a fibro-cellular tumor is "a *gelatinous sarcoma;*" according to Voigt, it is "a *connective-tissue tumor;*" according to Müller, it is "a *cellular-fibrous growth,*" and according to Virchow, it is "a *myxoma,*" one of the endless varieties of sarcoma. These tumors are composed, as their name well indicates, of fasciculi of fibro-cellular structure, which are loose or otherwise, in accordance with the softness or succulency of the growth; in the meshes of this tissue is a fluid resembling somewhat the synovial, in which are found round or caudate cells or corpuscles (Fig. 17), which contain abundant nuclei; the more numerous these bodies, the denser the tumor; in some locations these growths are covered with a ciliated epithelium.

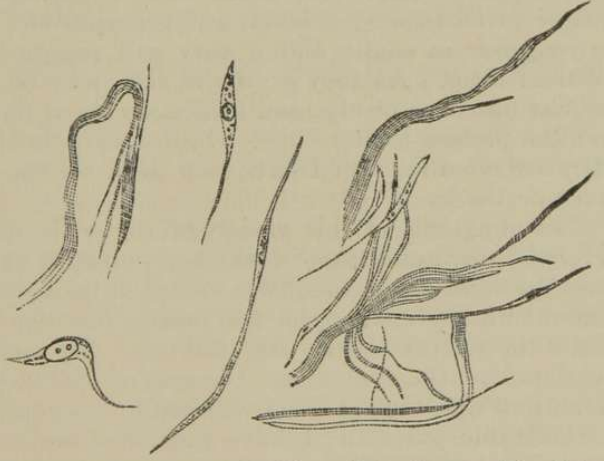
Fig. 17.



Cells of a Fibro-cellular Tumor.

To the touch, fibro-cellular tumors have a soft and pulpy feel, are painless and grow with rapidity, and may attain such considerable magnitude that parts may be displaced by them; they are generally continuous, are often lobulated, and are pedunculated, hence the term "polypi." They are chiefly found in the nose, ear, and uterus, although they may appear in other parts of the body. This variety of growth must not be confounded with that spoken of by Paget as the true fibro-cellular tumors, which are found in "the scrotum, the labium, or the tissues by the side of the vagina, and the deepseated intermuscular spaces in the thighs and arms." Polypi present "opaque white bands intersecting a shining, succulent basis substance of serous-yellow or greenish-yellow tint; the whole mass closely resembles 'anasarcous cellular tissue.' Examined under the microscope, they are found to be composed of parallel or interlacing filaments and fasciculi, interspersed with nuclei and cells like those of granulations." (Fig. 18.)

Fig. 18.



Microscopic appearance of a Fibro-cellular Tumor, with cells in various stages of elongation and attenuation.

These tumors vary greatly in the color, consistence, and nature of their contents; they are also subject to cartilaginous and ossific degeneration, and in some cases may ulcerate and slough.

These morbid growths, however, often yield to homœopathic remedies.

Professor Dunham reports cases cured with calc. carb., teucrium, and staph.

Dr. John Pattison has used successfully a snuff of powdered rad. sanguinaria canadensis.

Polypi may sometimes be cured by puncture and evacuation of the tumor.

I have very often succeeded in diminishing the size of polypi, and in one or two instances of curing them, with calc. carb. and teucrium, but have most frequently been obliged to resort to operative measures.

There are other soft and succulent tumors which have been described by pathologists, and which may be mentioned in this place.

The *myxoma* or *mucous tumor* of Virchow consists of "the embryonic tissue or Whartonian jelly of the cord."

The *cylindroma* of Billroth are those in which "are found cylindrical structures of a clear and transparent appearance, arranged like a series of anastomosing branches, which terminate often in bulbous ends, and contain numerous spindle or round cells, though they appear clear and structureless." At other times, little flask-like bodies are discovered, which are supposed to be some peculiar modification of the rudimental connective tissue. These tumors are sometimes classed as the semi-malignant, but there is not much actually known of them.

Glioma is the term applied to certain tumors appearing in the brain or nerve centres. They are said to be composed of connective tissue and connective-tissue corpuscles.

VASCULAR TUMORS.

Vascular tumors, as their name implies, are those composed of bloodvessels. They are divided into three varieties by Mr. Holmes:* *capillary, arterial, and venous.* In the first the tumor consists of an enlargement of both venous and arterial capillaries; in the second, the arterial twigs predominate; in the third, the venous.

Vascular tumors are found generally in the subcutaneous tissue, and then are called nævi. When they are large and composed chiefly of arteries, they receive the name *aneurism by anastomosis.* This variety of tumor varies in size; it is soft and compressible, often distinctly pulsating, is irregular in shape, and if very well supplied with bloodvessels gives a distinct *bruit.* As they grow the skin may be so overdistended that imperfect nutrition results, and ulceration opens the tumor, from which there is often profuse hæmorrhage. On the scalp, in the lip, and about the face, they are often found. I have seen them on the cheek, the forehead, and even on the back.

The diagnosis of this variety of tumor is usually easy, although Mr. Holmes mentions a case in which a pulsating cancer of the skull (I suppose a fungus hæmatodes) was mistaken for aneurism by anastomosis; the patient was operated upon and nearly lost his life on the table. Sometimes the tumors may be dissected out. The more complete treatment will be found in the chapter on Diseases of the Capillaries. I may mention here, however, that in the treatment of these tumors, even where there is considerable pulsation, I have succeeded well by injecting from forty to sixty drops of the fluid extract of ergot into the tumor, as recommended by Dr. Hammond. In two instances the injection was repeated after a lapse of eight days.

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* System of Surgery, vol. i, p. 542.

CYSTIC TUMORS.

Cysts are hollow growths with walls of widely different texture, and with their contents varying greatly. They may, in their many forms, occur in every portion of the body. I have myself seen them in almost every organ in the cavity of the abdomen. I have found many in the same patient, varying in size from that of a pea to a diameter of four and a half inches. There is, I think, no more remarkable case upon record than that reported in the *Western Hom. Observer*, vol. iii., pp. 154–162. In this case the liver, spleen, mesentery, and omentum, were studded with cystic tumors. Large cysts were found in the bladder and sigmoid flexure of the colon, and were distributed everywhere. They could, indeed, be counted by thousands.

As a general rule, there is no special difficulty in diagnosing cystic tumors; the chief symptoms which lead to their detection are fluctuation, and a smooth, oval character, with absence of pain, and with a healthy integument, which, however, may assume a bluish appearance from tension when the tumor is large. The diseases with which they are most likely to be confounded are cold—or, as they may be termed, subacute—abscesses; fluctuation is perfectly apparent in both cases, and there is no very high degree of inflammation manifested in either. The history of the case may be of great service, and the manner of growth of the tumor also assists; there is a greater degree of inflammation in the abscess, and its apparent pointing will be a guide to the surgeon; but where the tumors are covered by layers of tense muscles, it is almost an impossibility to recognize the cyst, and, at best, only the general conditions can be relied upon in the diagnosis.

Cysts may be primitive vesicles and form singly, attaining, in some instances, great magnitude, and in others varying from the size of a millet-seed to that of a walnut. Billroth, in his classification, places the cyst among those "tumors which seldom return after their extirpation, but sometimes occur distributed in great numbers over the whole surface of the body." He then subdivides them according to the contents of the sac, thus:

(*a.*) Cysts with *serous* fluid; found in the spermatic cord and in the neck.

(*b.*) Cysts with *mucous* contents (colloid), which contain a soft, gelatinous substance or mucous tissue; they are discovered on the neck, in the ovary, and in the thyroid gland; they may be very numerous.

(*c.*) Cysts with a *pultaceous* or fatty matter; these occur in great numbers, often in connection with sebaceous glands or hair-follicles. He says that their walls sometimes present a cutis-like construction on their internal surface; a rete malpighii, hairs, and sebaceous and sudoriferous glands (dermoid cysts). These cysts, when found in the ovary, sometimes contain pieces of bone, teeth, hair, and the like.

A somewhat remarkable case of this kind came under the observation of Dr. William A. Reed, of Philadelphia. The patient had died from an ovarian tumor. At the post-mortem examination, a bone was taken from the sac, resembling in many respects an os temporalis, which had inserted into its substance three molar teeth. The specimen, which I carefully examined, was exhibited to the American Iustitute of Homœopathy, at its session held in New York, in 1867. Dr. John C. Minor, of New York, lately found a tumor filled with hair on the left side of the forehead directly over the eyebrow.

In 1876, I removed an immense dermoid cyst from a woman aged twenty-seven years. There was, besides immense colloid accumulation, large masses of lime; many tufts of hair, from one to three inches in length; perfectly formed teeth; a bone resembling the superior maxillary, holding two molars and an incisor; a second bone of the shape and size of the first rib; and a third, looking like the scapula; besides other smaller ossific deposits. The solid parts of this tumor weighed twenty-three pounds, while the colloid and fluid substance must have amounted to thirty or forty more.

Paget's classification of cysts appears the most lucid. He divides them into: (1) Simple or barren; (2) Compound or proliferous; and (3) An intermediate variety, which may contain substances more highly organized than are found in the simple or barren, and less organized than those of the compound or proliferous.

Among the simple cysts are, (*a*), those containing serum, mucus, and other substances; (*b*), the transition cysts, containing synovia, milk, semen, or the like; while (*c*), the proliferous cysts contain still more highly organized structures. Holmes, in his *System of Surgery*, follows much the classification adopted by Paget, and arranges them thus:

A.—Simple or barren: serous and hygromatic; synovial; mucous; sanguineous; oily; colloid; seminal.

B.—Compound or proliferous: complex cystoid, with intracystic growths, cutaneous or dentigerous.

It will be seen that here, class A is subdivided according to the contents of the sacs; but in class B the position they occupy determines the subdivision into groups, which we need not enumerate. Billroth, in his *Surgical Pathology*, p. 619, disregards "the retention-cysts of large canals," leaving them, as he says, "to internal medicines and obstetrics," and confines himself surgically, "to those tumors that Virchow has grouped under the term 'follicular cysts.'" He gives the name "composite cyst, or cystoma," to a combination of such cysts, and designates those containing more solid substance as "cysto-fibroma, cysto-sarcoma, cysto-chondroma, cysto-carcinoma," etc.

With reference to the formation of the walls of cysts, the principles laid down by Thomas Bryant hold good. He says: "All tumors, with the exception of the hydatid, are made up of one or more of the natural elemental tissues of the body, and in no single example has any extraneous or new element been ever detected." So we find that cystic tumors, excepting the hydatid, are formed sometimes by the expansion of the walls of natural ducts, as in the case of sebaceous cysts, and those of the lactiferous tubuli; others are formed from an expansion of the areolar spaces, in which fluid collects; and others still by the enlargement of bursæ, or in ovarian tumors of the cystoid variety. In very many cases—and in almost all cysts of any magnitude which have come under my own observation—the true capsule, or wall of the tumor, has been covered with a network of bloodvessels, most of them capillary in size, but involving here and there one of larger magnitude. Cysts may also contain gas, such are denominated "gaseous cysts." Again, in some instances, cysts in the neck appear to be a transformation of erectile or vascular tumors. Paget's classification is, as has been said before, decidedly the most simple and most readily understood.

Several varieties of cystic tumors have come under my observation, and from the lessons which the cases have taught me, I would lay down the general rule, that *the simplest and safest method of dealing with them is to extirpate the sac by dissection.* The treatment by puncture and injection is unsatisfactory, and should only be tried when excision cannot be performed.

The neck appears to be the seat of many simple serous tumors—hygroma—as well as of the other varieties.

Case: Hygroma of the Neck.—This case was one of rather a critical nature, and deserves even more minute mention than can be given to it here.

The patient, a lady about forty years of age, after being caught in a snowstorm in March, 1868, felt an uneasy sensation in the right side of her neck, and on putting up her hand discovered a tumor. From this time it continued gradually to increase. Within a few months a second growth appeared just above the first, and finally a third. She applied to Dr. Dunham. Under his medical treatment the two smaller growths disappeared, and the larger one remained stationary until March, 1871, when it began to rapidly increase, and in a short time attained twice its former size. It occupied, when I saw it, the whole of the posterior triangle of the right side of the neck, and extended behind the clavicle, and in front of it, so that the bone appeared to be *saddled* with the tumor.

After two hours careful dissection the entire cyst was removed. Dr. Jernigen, now of Boston, and Dr. Bayliss, of Astoria, assisted me during the prolonged operation. After the integument, platysma, and deep fascia had been divided, the mass beneath looked so dark and purple as to lead me to conclude that the cyst was of the sanguineous variety. But the color proved to be due to a coating of dilated vessels, chiefly veins. This was divided upon a director, and the true cyst then came into view. With such a dissection as is made in hernia, I succeeded in exposing the whole superficies of the sac without rupture. It was as thin and delicate as the peritoneum. In getting behind it, however, at the anterior margin of the trapezius, the sac gave way, and a dark, brownish, thin fluid was discharged. By drawing up the sac, enough of its contents were retained to form a guide to its entire removal. In its very centre was found a second cyst of the size of a pigeon's egg. A third, which was discovered behind and below the clavicle, was also removed. When the operation was completed, the anterior border of the trapezius, the sterno-mastoid, the omo-hyoid, and the scaleni muscles were perfectly exposed. The third portion of the subclavian, the transversalis colli, and the transversalis humeri arteries, were distinctly seen, and the pneumogastric nerve and the brachial plexus were also plainly visible. Eight vessels were ligated, and considerable blood was lost. The external jugular was divided also, and bled pretty freely.

The patient was very much exhausted after the operation, suffering more, however, from the effects of chloroform, than from any other cause. The wound was perfectly adapted, and in two weeks had almost entirely healed. The ligatures came away between the tenth day and the twelfth. A small portion of the surface, that over the deep section toward the back, necessarily had to granulate. The tumor measured six inches and three-quarters in its long diameter, and four and a quarter inches in its transverse.

Serous ovarian cysts, and cysts of the broad ligament, are treated, and their differential diagnosis pointed out, in the chapter on Ovariotomy.

Serous Cysts.—A gentleman having four or five fluctuating tumors on the right side of the neck, in the direction of the sterno-mastoid muscles, applied to me for relief. The tumors were punctured, and a clear serum issued from them. After a time the cysts refilled, and again the fluid was evacuated and the sacs scarified. The site of the tumors became inflamed, and they again filled, not with serum, but with a glairy substance, which constantly oozed from them. Suppuration finally ensued, and after a long period the openings closed. This happened in my practice some years ago,

and since that period I have always extirpated the walls of such cysts, by dissection if possible, if not, by including the whole mass in a ligature.

Cysts in Bone.—A young lady desired relief from a tumor in which fluctuation was apparent, and which was situated on the left side of the os frontis. I at first diagnosed a simple sebaceous cyst, but found afterward that I was in error, and that it was a cyst seated within the bone. It made its appearance first in the diploe, and gradually pressed the external table forward, until finally the bone substance was absorbed, and the periosteum assisted to form its anterior wall. The appearance presented after the removal of the tumor was very similar to that which obtains in the os frontis when the external table has been cut cleanly away by a trephine. Every portion of the sac was removed, and the bone thoroughly scraped. The cure was complete.

Sanguineous Cysts, the "hæmatoma" of Bennett and other writers, are nearly related to serous cysts. According to Paget, they may be formed in three different ways, either by hæmorrhage into a previously existing serous cyst, by partial obliteration and transformation of a nævus, or by the occlusion and dilatation of a vein. These tumors occur most frequently in the neck, and contain a bloody fluid. The cyst-wall varies in thickness, according to locality. In subcutaneous cysts it is membranous, and presents a columnar or fasciculated appearance, due to the unequal rupture of the membrane.

Sometimes a bloodvessel opens into a sero-cystic tumor, and forms a sero-sanguineous cyst, which is described by some writers as a separate variety of cystic growth. Mr. Paget, however, makes no such distinction; on the contrary, he expressly states that a sanguineous cyst may be formed by "accidental hæmorrhage into the cavity of a serous cyst."* I therefore prefer to regard it as a mere subdivision of the preceding variety.

Thyroid Cysts.—An infant was recently brought to me with an obscurely fluctuating tumor directly over the thyroid cartilage. The growth was not exactly of an erectile nature, or a nævus, but I was rather of the opinion that it was connected with deepseated veins or vessels. By grasping the tumor and pulling it forward, and passing beneath it three needles crossed at angles, and then strangling the mass with waxed silk passed behind the pins, the whole tumor sloughed off. It was, as I had supposed, in close connection with bloodvessels, and at its base presented somewhat of a honeycomb appearance. Tapping and injection of iodine generally cures.

Congenital Cutaneous Cysts are sometimes found on the foreheads of infants soon after birth. They are round, flat, or oval; the cyst-wall consists of "membranous connective tissue, lined with tessellated epithelium," and contains an oily fluid. These tumors may also occur in other parts of the body. They are evidently synonymous with the variety described by Mr. Paget as oily cysts.

Congenital Serous Cysts of the Orbit.†—Congenital serous cysts of the orbit are said by Dr. J. Talko, from his observation of six cases, to be situated between the eyeball and the under, or under and lateral wall of the orbit, to be commonly covered with conjunctiva, to increase in the direction of the lower lid, causing ectropion, to vary in size, and prevent the development of the eye, producing micro-ophthalmus. They contain a yellow serous fluid, rich in albumen, and are not formed after birth. They

* Paget's Surgical Pathology.

† London Med. Record, July 15th, 1877; Monthly Abstract of Med. Science, Sept., 1877.

are not usually intimately united with either the conjunctival fold or eye-ball, and should be extirpated.

Of **synovial cysts** we may distinguish two varieties, those formed by the enlargement and transformation of bursæ, and those which occur in the sheaths of tendons, and which "appear to be the cystic transformation of the cells, inclosed in the fringelike processes of the synovial membrane of the sheaths." (Paget.) The cyst-wall may consist of a thin membranous expansion, or it may be thick, fibrous, and lined with a pasty-looking laminated growth of imperfectly organized fibrin. The contained fluid is serous, and of a yellowish or brown color. Attached to the walls, and floating in this fluid, are sometimes found small grayish or yellow granular bodies, irregular in shape, and closely resembling granulation-cells. These often exist in such numbers as to completely fill the cyst, and convert it into a solid mass.* These tumors often show a tendency to inflame and suppurate. Paget classes synovial cysts as a variety of simple cysts; but it will be seen from the preceding description, that in some instances they might, with equal propriety, be ranked among the proliferous. In fact, it is impossible to accurately define their position.

Case.—A woman twenty-seven years of age, had suffered much from an enlarged synovial bursa of the knee-joint, immediately above the tubercle of the tibia. Iodine and pressure were applied without any benefit; she suffered patiently and long. A careful dissection removed the mass, which, when opened, contained a fluid exactly resembling the vitreous humor of the eye. The tissues surrounding the bursa, from the lasting inflammatory action, had become thickened and agglutinated together into a mass. Synovial bursæ of the wrist are so frequent, and have come under observation so often, that it is unnecessary to mention them here.

Concerning gaseous cysts, comparatively little is known. According to Hunter (vol. iv, p. 98), they consist of air-bladders, and are "frequently found upon the intestines of hogs that are killed during the summer-time." Whether they ever occur in the human structure is not known; upon this point neither Hunter nor Paget give any information.

Mucous Cysts.—Under this head may be included all cysts found in mucous tissue. They occur in various parts of the body, but attack most frequently the female sexual organs. They grow either singly or in clusters, and are generally oval. The cyst-wall is sometimes thin and membranous, in other cases thick and tough; the contents vary greatly; generally they consist of a transparent or opaline viscid fluid; at other times this fluid is dark, turbid, greenish or nearly black; and Mr. Cæsar Hawkins relates a case in which it closely resembled fluid fæces. By microscopical analysis it is found to contain corpuscles, granular molecular matter, and cells. (See also "Ranula.")

Colloid Cysts.—The term "colloid" is applied to those cysts which contain gelatinous substances; the contents "may range between pellucidity and the thickest turbidness, and may be of all hues of yellow, olive-green, orange, brown, pink and nearly black."† These cysts occur in the thyroid gland and the kidneys, and according to Professor Tobold are occasionally found in the larynx.

Colloid Tumor beneath the Eye.—A girl of about fifteen years of age suffered from a fluctuating and rapidly-growing tumor on the right side of the face, over the malar bone. It was easily removed by a single straight incision. The contents of the sac were peculiar, being oily and of a semi-

* Vide Erichsen's Surgery, p. 392. † Paget's Surgical Pathology, p. 349.

fluid consistence. Erysipelas followed this operation, but the recovery was complete.

I have mentioned elsewhere the cases of proliferous cysts that have come under my observation. Very many other cystic tumors of the classes which I have now given have been successfully removed, but they presented nothing worthy of record.

The last variety of simple cysts are those formed by the inclosure and dilatation of a duct and the transformation of its contents. Under this head may be included "milk tumor," "seminal cysts" or "encysted hydrocele of the cord," and some forms of ranula. The walls are generally composed of "fibrous tissue, lined with tessellated epithelium."

The contents are either a serous fluid or the natural secretion of the part —*par exemple*, seminal cysts may contain either semen or spermatozoa. In the latter case, the cyst seems to acquire a secreting power of its own, for it is entirely unconnected with the proper secretory apparatus.

Compound or Proliferous Cysts have been already defined as those "which contain highly organized substances, and possess the power of producing more highly organized and even vascular structures."

Cysto-Sarcoma is a peculiar disease, and has given rise to considerable discussion among pathologists. It consists, however, in cyst-formation developed in different or heterologous parenchyma, and is said to occur much more frequently in females than males. The mammary gland is peculiarly liable to be attacked with it, although it may occur in bone, within the medullary canal, or in the compact structure.

According to Johannes Müller, we find the three varieties, which he describes thus:

"1. *Cysto-sarcoma simplex*, in which the cradle mass does not intrude at all into the cavity of the cyst, is of the rarest occurrence.

"2. *Cysto-sarcoma proliferum* is engendered by the development, within the terminal excrescence bulbs of the acinus-like cavities, into filial cysts, and the intergrowing of the cradle mass is here repeated.

"3. *The cysto-sarcoma phyllodes* of Johannes Müller, with its amply developed warty cauliflower and foliated or cock's-comb-like ingrowths, has nothing to mark it beyond the size and development of the excrescences. The cyst-membrane is here no longer demonstrable, having coalesced with the cradled mass of the cyst.

"It has been stated that the dendritic intrusions into the cyst may occur at one point only of the cyst, at several points, or, lastly, at all points simultaneously. In the last case they converge, coalesce, and eventually fill the entire cyst, determining thus its aggregate lobulated structure."

It will readily be seen how well the last description answers to the case about to be mentioned. It is asserted that the "chronic mammary tumor," so often spoken of by Sir Astley Cooper—the "imperfect hypertrophy of the mammary gland," of Mr. John Birkett—are somewhat analogous tumors to the cysto-sarcoma of Müller.*

Mr. Paget,† in his lecture on compound or proliferous cysts, embraces under this head the sero-cystic sarcomata, mentioned by Sir Benjamin Brodie in his lectures on pathology and surgery, the tuberous cystic tumors of Mr. Cæsar Hawkins, and cysto-sarcoma phyllodes and proliferum of Müller, and describes the cysts as having abundant power of producing more highly organized and even vascular structures.

It appears to me, however, that the proliferous cystic structures are made

* Rokitansky, Pathological Anatomy, vol. ii, p. 194.

† Surgical Pathology, p. 352.

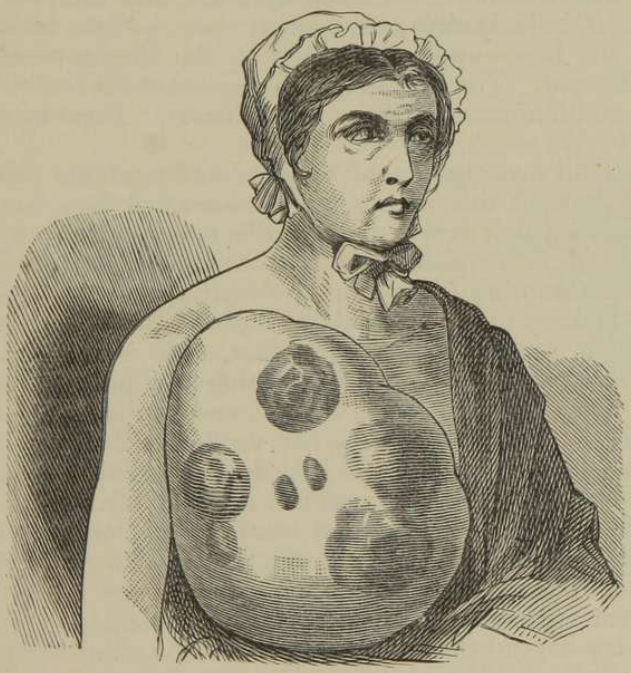
by Mr. Paget to include too great a variety of growths, and that the subdivisions adopted by Müller and Rokitansky are much more readily understood by the student, and by their classification he is enabled to detect the true pathology of the cases when he meets them in practice.

These tumors grow to great extent, sometimes rapidly, sometimes slowly, often with long intervals of arrest. They generally appear upon the breasts of unmarried and childless women, but cases occur sometimes in the child-bearing woman; a few cases have been known to occur on the breast of the male. They are nearly all spherical in form, the large ones irregular, knobbed, lobulated and tolerably resistant, elastic, and feeling like a cyst filled with fluid; the small ones are smooth, even and regular in shape. The skin sometimes adheres to the tumor, and has a dark livid appearance, and is filled with enlarged veins. The mammary gland wastes and dies.

These tumors are painless, but multiply rapidly, and often reappear several times after removal. In many respects they are similar to the fibrous tumor of the uterus and enchondroma.

The case of cysto-sarcoma illustrated in Fig. 19, is one which, in many respects, is very interesting. The patient, a lady sixty-eight years of age,

FIG. 19.



The author's case of Cysto-sarcoma.

about twenty years ago, noticed a tumor in the right breast, the size of a hickory nut. This was shown to many surgeons, many physicians, and many quacks, with just as many different opinions; some declaring it was scirrhus, others that it was fibrous, others that it was serous, and some proposing an immediate operation.

To this latter proceeding she was utterly averse, and never, throughout the twenty years' duration of the tumor, could she be prevailed upon to have a scalpel brought near to the diseased mass.

During a number of years other growths made their appearance, and she, during this period, made a visit to Europe for the purpose of placing herself under the care of the most distinguished physicians and surgeons. She saw many eminent medical men of both schools, and finally placed herself under the somewhat notorious Lutze, who promised a cure. After three or four years of travel—the tumor continuing to enlarge—she returned to America and applied a variety of salves and washes and ointments, and was visited by spiritualists, soothsayers, astrologists, and charmers, many of whom promised to remove the now enormous mass, and some in an incredibly short space of time.

I was called to see her about six or eight months before her death, and found the following characteristic symptoms and appearances: The tumor extended from the clavicle to below the waist, and from beyond the centre of the anterior wall of the thorax, under the axilla and around by the back, and was growing steadily. It presented an uneven surface, and portions of the integument rising over the nodulations were bluish in color. These eminences were circumscribed; fluctuation was very evident in them, and they were not only scattered over the surface of the gland itself, but were appearing above the clavicle and under the integument along the lower margin of the mammary gland.

She then was suffering from some dyspnœa, and complained of occasional rigors. On the surface of the larger cysts, a slight bluish blush had formed, and the base—apparently fixed to the thorax—was very hard, firm, and nodulated. The general health was somewhat impaired, although at times she would appear almost as well as usual. There was profuse perspiration and some cough.

After a careful investigation of the case and a minute examination of the tumor, at the same time taking into consideration the age of the patient, I gave the opinion that very little could be expected from any treatment whether medical or surgical, and that the only indications for relief consisted in endeavoring to prevent the further extension of the morbid growth, and to keep up the general strength of the patient. I gave her many medicines, among others *calc.*, *silex*, *kali iod.*, *nux*, *sulph.*, etc., without much benefit, and then, remembering the peculiar action of *kali bromatum* in many forms of cystic disease, and having no especial indications to guide in the selection of other medicines, and no surgical interference being allowed, even if it had been deemed necessary, I concluded, at a venture, to place her under the action of the bromide of potash. I began with two grs. three times daily, and continued it for two weeks, when a most remarkable action took place in the tumor. Two of the larger cysts opened, and the amount of discharge that passed away was so large and so long continued as to utterly surprise all who beheld it. Three smaller cysts, which lay beyond the internal margin of the gland *disappeared;* one on the apex of the shoulder also disappeared, and the balance of the tumor shrunk perceptibly. The medicine was still continued, lessening the dose, however, when two other large cysts at the inferior surface of the tumor gave way and freely discharged. After the evacuation of the liquid, in the bottom of the cavities were huge masses of decomposed substance resembling the cores of decayed apples or of bulbous vegetation. This I scraped away in large quantities, the tumor, meanwhile, growing smaller, but the patient evidently very much weaker. The decayed masses which were removed were very fetid, and it was only by the use of constant injections of carbolic acid, and the application of disinfectants, with careful attention to proper ventilation and cleanliness, that she could be kept at all comfortable.

She had from time to time many symptoms which would indicate the occurrence of paralysis of the affected side, but these would gradually subside.

After several months of this treatment, she finally succumbed to the disease. Although an urgent request was made no autopsy was allowed.

This case is recorded not only from the rarity of its nature but to mark the action of the bromide of potash.

Whether the rupturing of some of the cysts and the disappearance of others were merely coincidences occurring after the bromide had been given, or whether it was the true action of this important medicinal agent, I am at a loss to determine, although I am disposed to place the changes which took place in the morbid mass to the action of the medicine, and I think I may do this with some confidence, when it is remembered what peculiar action this medicine has been known to possess in other forms of cystic disease.

In *Proliferous Ovarian Cysts* we find two principal varieties of endogenous cystic growths; those that are spheroidal have broad bases, and are similar in structure to the parent cyst; and those that are slender have thin walls, are attached by pedicles, and occur in clusters. Intermediary and mixed forms also occur in which the characteristics of each class are present to a certain degree.

Cysts of the Chorion—"the hydatid mole" of some writers—are developed, according to Paget, in the following manner: certain cells of the villi, degenerate, enlarge, and form cysts, upon whose surface new villi spring up, which, in their turn, undergo a cystic transformation; and this process may be repeated indefinitely. As the result of these changes, the chorion becomes covered with oval, pellucid vesicles, which contain a limpid fluid, and are attached by "long, slender, and often branching pedicles," as represented in the accompanying cut (Fig. 20).

Fig. 20.

A

Hydatid Tumors are composed of cysts containing entozoa or hydatids. The cyst-wall is strong; composed of fibrous tissue; possesses considerable vascularity, and contains a dirty-looking pulpy substance, in which the parasite is found. The hydatid itself contains a limpid saline fluid, odorless and incoagulable. These entozoa "perish in a few years from suppuration, gangrene, or gradual drying up of their contents. Under such circumstances, the inclosing cyst is often remarkably thickened and even transformed into fibrous tissue."* These tumors vary in size "from a mustard seed to a small orange;" are globular in shape, and of a whitish color. They generally occur in the liver, uterus, and ovaries, and are occasionally found in the testicles, mammæ, and serous cavities. By the irritation of their presence they sometimes produce fatal inflammation.

Hydatid tumors may also occur in the cancellated tissue of bones. When existing near articular extremities, they may cause destruction of the joints, giving rise to intense pain, and often inducing hectic fever.

Sebaceous Cysts have been variously described by different authors, as encysted, atheromatous, melicerous, and steatomatous tumors; when situated on the scalp they are generally known as wens. Most surgical writers hold, with Sir Astley Cooper, that these cysts are composed of enlarged and obstructed sebaceous follicles; but Paget claims that in many cases

* Gross's Surgery, vol. i, p. 232.

they are essentially new formations. They occur most frequently on the scalp, face, and neck, are generally subcutaneous, and may be either single or multiple. In many instances they seem to be hereditary. The cyst-wall may be thin and delicate, or thick, tough, fibrous, and even calcified; the contents usually consist of a semi-liquid, yellowish-white substance, which, in old cysts, is hard, dry, laminated, and of a brown, green, or blackish color. Examined under the microscope, they are found to contain epithelial scales, granular matter, crystals of cholesterin, and rudimentary hairs.

When small, they are round, smooth, non-adherent, semi-fluctuating, or elastic, grow slowly, and are painless. As they increase in size, they adhere to surrounding tissues, and show a tendency to become pedunculated. Encysted tumors of the scalp, when fully developed, may induce inflammatory action in the pericranium, causing adhesive and cartilaginous degeneration of that portion of the pericranium lying next the sac. In rare cases the tumor may cause absorption of the outer table of the skull, forming "a cup-shaped cavity, with rough, slightly elevated edges." In some instances the cysts inflame and suppurate; the skin adheres, ulcerates, and the tumor is either thrown off in the discharges, or "the sebaceous matter, exposed by the ulceration of the integument, undergoes a process of putrefaction. In other cases, again, large granulations are thrown out in it; the atheromatous mass appears to vascularize, becoming irregular and nodulated, rising up in tuberous growths, with everted edges, exuding a fetid foul discharge, becoming adherent to subjacent parts, and assuming a semi-malignant appearance."—(Erichsen.)

Paget describes two other varieties of compound cysts: the "cutaneous proliferous," and the "dentigerous." They contain skin, hair, teeth, and other *outré* substances; are found most frequently in the ovaries, but may also occur in various other parts of the body, and exist either in connection with other tumors, or as independent growths.

Treatment.—Homœopathic remedies sometimes prove successful in removing the different varieties of cysts.

I have seen great advantage from the internal administration of kali brom., given in two-grain doses three times a day.

Calc. carb. is recommended by Prof. Dunham for encysted tumors of the head and neck, with fluid or semifluid contents.

Apis, arsen., graph., hepar, iod., kali bichr., lyc., merc., phos., sil., and sulph. may be tried.

Electrolysis is also recommended by various authors, and may prove useful in some cases. *Vide* chapter on that subject.

A seton may occasionally be efficacious, and in a few instances a radical cure has been effected by subcutaneous puncture and evacuation.

The cysts may also be punctured and injected with a strong solution of iodine, sulphate of zinc, or some other irritating substance, to produce adhesive inflammation.

Dr. John Pattison, of London, reports several brilliant cures by enucleation; he cuts down upon the cyst, evacuates its contents, and fills the cavity with cotton-wool, smeared with an enucleating paste, composed of equal parts of powdered hydrastis root, chloride of zinc, flour, and water.

If these various methods fail, the only resource is complete extirpation both of the tumor and the wall of the cyst. Great care must be taken to remove the cyst-wall *entire*, for if the slightest trace of it be suffered to remain, the cyst will probably be reproduced.

Sebaceous Cyst of the Prepuce.—A unique case of this kind came recently under my care. The patient was one of Dr. Bartlett's, of New York.

He was a healthy boy of about eighteen months. He had an enormously enlarged prepuce, on the right side of which, at birth, was noticed a small round tumor, about the size of a pea. This remained stationary for some time, but after a period of months it began to grow rapidly. Circumcision was all that was necessary. The tumor had a firm envelope, and contained a substance resembling cottage cheese in texture, and smelling exactly like the secretion from the glands of Tyson.

Sebaceous Cysts.—A gentleman desired the removal of five tumors from his scalp. They were removed each by a single straight incision; but it was worthy of remark that one of the walls of the cysts was tough as leather, while two or three were actually as thin as intestine; three were sebaceous, and two of the mucous variety. If the cyst is large, the whole top of it may be cut off, the contents evacuated, and the sac dissected out.

Cysts with Mixed Contents.—An elderly lady had upon the top of her head a large tumor, which had been there for very many years; latterly it had begun to grow, and presented such evident signs of suppuration that I cut into it. There was a considerable discharge of pus; afterwards a large amount of cheesy-looking substance was removed with a sac, which at its base was of a cartilaginous hardness.

For serous and hydatid cysts in bones, the following methods of treatment have been proposed:

1. Cutting down upon the tumor, evacuating its contents, and painting the cyst-wall with iodine.

2. Trephining and evacuation, opening and counter-opening with pressure. In bad cases, resection or amputation is the only resort.

ADENOMA, OR GLANDULAR TUMORS.

These tumors are most commonly found in the breast, in the prostate, in the thyroid gland, and sometimes in the lip, the name of the part in which they grow, generally being added, to determine their locality, thus, labial glandular tumor, mammary glandular tumor, etc. In the majority of cases, the growths occur *within* the glands, but sometimes they are found external to them.

These tumors are more frequent in adult life, they grow slowly, and may attain considerable size without much inconvenience to the patient; they are smooth, round, and sometimes lobulated. When they are cut into, their structure appears to be separated by interstices, in which a small quantity of fluid is found; they are especially in the breast encased in a distinct capsule, and generally may be dissected out with ease. They are painless, unless from pressure or, as in the mammary gland, from dragging the parts downward. Occasionally cysts are developed in the substance of these tumors, which appear to contain a serous fluid, resembling that spoken of above, as found in the interstices of the tumor.

The microscopic elements of adenoma resemble true glandular structure arranged in a lobular form, each lobe containing more or less glandular epithelium. The septa are formed of fibrous tissue which is often concentric in form, sometimes, however, radiating from the centre to the circumference.

These tumors are amenable to treatment, and I have seen them disappear under calc. carb., conium, and especially phosphorus. In the breast they are likely to enlarge during the menstrual period. In removal they may be taken out by removing the capsule and enucleating the morbid mass.

Sometimes, however, the gland must also be removed, especially when a good deal of its substance is involved.

ENCHONDROMA.

Enchondroma is but another name for cartilaginous tumors, and is also synonymous with osteo-chondroma, chondroma, and benign osteo-sarcoma of some authors. I believe the simple expression "cartilaginous tumor" is preferable to any of these ambiguous terms.

It must be remembered that these tumors, though classed as innocent, occasionally recur after their removal, although I believe in most cases their reappearance is owing to admixture of imperfectly developed cells.

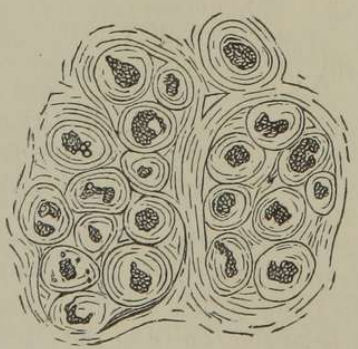
These tumors present many peculiarities, among which may be noticed the difference in structure which is presented in a single enlargement. In the case related below, the superficies of the swelling was very soft, nay, almost fluctuating; while its base was extremely cartilaginous. We find, also, in this (which is a general characteristic of the affection) the parts firmly adhesive to the adjacent bones.

Paget, in his *Surgical Pathology*, gives an accurate description of enchondroma. He says—page 422:

"To the touch, cartilaginous tumors may be very firm or hard, especially when they are not nodular and their bases are ossified. In other cases they are firm, though compressible, and extremely elastic, feeling like thick-walled, tensely-filled sacks. Many a solid cartilaginous tumor has been punctured in the expectation that it would prove to be a cyst."

In the specimens which I have observed, the different properties, as to touch and the eye, are appreciable. The base of the excrescence is particularly cartilaginous, while the superficial parts are much more elastic, and this difference is to a greater degree apparent immediately after an operation than after the immersion of the tumor in spirits. In enchondroma all the intermediate gradations, from the hardest cartilage to the softest consistency of ordinary fatty tumors, are present, and, necessarily, the microscopic characters of each of these different portions present a different cell formation. The cartilage corpuscles, however, in the more dense structure are said to bear no resemblance to those that exist in the normal cartilages of man or any of the vertebratæ. (*Vide* Fig. 21.) According

FIG. 21.



Microscopic Characters of Enchondroma. Druitt.

FIG. 22.

Enchondroma of the Hand.

to Mr. Queckett, however, whose authority in cytology is acknowledged to be very high, the natural cartilage of the cuttle-fish possesses corpuscles

of a similar character to that of enchondroma, which fact in itself is certainly a point of interest, showing that the abnormal character in the higher order of animal species may constitute a normal characteristic of the lower creatures.

Rokitansky (vol. i, page 143), speaking of cartilaginous growths, has, as usual, a full and at the same time a very concise description of them.

"Wounds of cartilage are not reunited by means of cartilaginous substance, nor is this substance regenerated when destroyed. Nevertheless, new growths of cartilaginous texture are both frequent and voluminous, The structure of the growths or tumors was first ascertained with the aid of the microscope by Johannes Müller, who applied to them the term 'Enchondroma.' These excepted, not a single new growth, whether designated as cartilage-like or as cartilaginescence, chondroid, or fibro-chondroid, has more than a seeming analogy with true cartilage texture. . . . . .

"The capsular case of the enchondroma is unessential, and is common to many other heterologous growths. . . . . Many of the so-called cases of spina ventosa of older observers were probably of the nature of enchondroma."

These growths have also been known to have their seat upon the lower jaw, but the general site is upon the fingers (Fig. 22), or thighs (Fig. 23). The surgeons whose names are chiefly associated with the removal of enchondromatous tumors are Dieffenbach, Müller, John Bell, Sir Astley Cooper, Hodson, Lawrence, Paget, and Hunter.

Prof. Miller, in his *Principles of Surgery*, says the following of these growths:

"Cartilaginous formations (*enchondroma* of Müller) occur more frequently in bone than in the soft textures; their nature and tendency are simple, yet degeneration is possible, while discussion is impossible, and therefore early extirpation is expedient."

The following interesting case came under my observation in the Good Samaritan Hospital, St. Louis, and was removed by Dr. Fellerer, myself, Dr. Comstock, and others assisting.

FIG. 23.

Bony Skeleton of Enchondroma.

This tumor occupied a space from shoulder to shoulder of the unfortunate possessor, and from the nape of the neck to below the angles of the scapulæ. Portions of it were purplish, and other parts presenting the natural color. Throughout the whole *cutis* a number of enlarged and tortuous veins were distinctly seen. To the touch this tumor presented all those sensations which belong to fatty enlargements, excepting at its base, where the structure appeared more dense. This hardness extended also to the right *clavicle*, and to some distance below it. On the vertebral column, immediately under the posterior margin of the enlargement, were several well-marked cicatrices.

The history of the case was given by the patient as follows: Some years since, at a wine shop in Berlin, the man became engaged in an altercation, which resulted in a quarrel, and he was stabbed several times in the back by his assailant. For many weeks his life was despaired of by the attend-

ing physicians, but a tolerable recovery resulted, and the duties of life were resumed. After a time, however, a small swelling appeared on the region of the spinal column, at the site of one of the late wounds. This tumor was not accompanied with any very severe suffering, and was allowed to remain and grow undisturbed, until its rapidly increasing size induced the patient to apply to a physician, who declined taking any steps towards its removal. The man then came to this country, and during the voyage the tumor increased in volume very considerably. He travelled through different portions of the United States, and finally came to St. Louis. For nearly a year he had been obliged to sleep upon his belly, with his head bent over the edge of his bed or supported on his hand. He had suffered great pain, and in a state of desperation demanded a removal of the tumor. He was plainly told at the hospital that the chances of such an operation would be decidedly against him; but rather than drag on such a miserable existence, and finally succumb to the disease, he begged that no delay should be used, but at once his suffering should be terminated.

Accordingly he was placed prone upon his abdomen, his head projecting beyond the edge of the table, and chloroform administered. A crucial incision was then made, and Dr. Fellerer dissected up the two left-hand flaps, while I turned over those on the right side, by such a procedure saving considerable time. The tumor was then raised up, and with the greatest difficulty dissected from the bones and spinous processes of the vertebræ, to which it was most firmly attached. Portions of this attachment were almost ossific.

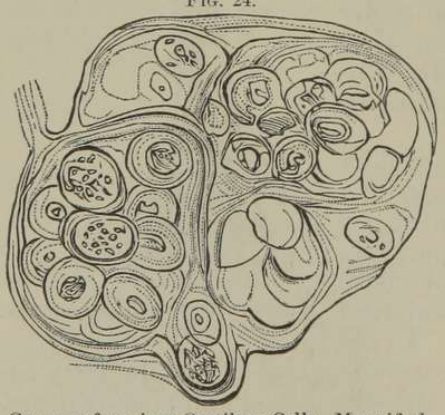
The hæmorrhage was very profuse, but all venous, and occurred chiefly during the dissection of the flaps, that resulting from raising the tumor from its bed not being excessive.

The operation lasted two hours, and the man to all appearances appeared to rally from the chloroform very well. About three hours after the performance he took some wine and appeared quite rational, then turned upon his side and died in a few moments.

Fig. 23 represents from Druitt the bony skeleton of enchondroma.

Cartilaginous tumors are subject to degenerative liquefaction, which may occur either on the periphery or in the interior. The central softening often proceeds to the formation of cysts; the skin covering the tumor inflames, ulcerates and sloughs; fistulous openings form, and a viscid ichorous fluid is discharged. It is a somewhat singular fact that these two processes—ossification and disintegration—may coexist in different parts of the same tumor. Calcareous and fatty degenerations may also occur. (Fig. 24.)

Fig. 24.



Groups of various Cartilage Cells—Magnified 400 times.

Dr. John Pattison reports that he has successfully enucleated an enchondroma of the index finger with a saturated solution of sulphate of zinc.

The usual and best surgical treatment is excision of the tumor, or amputation of the affected part.

OSTEOID OR BONY TUMORS.

As has been already noticed, ossific deposit may be found in cartilaginous and other tumors, but growths undergoing such change do not receive the

name *osteoma*, it being applied to fully developed bony formations. Osseous tumors are homologous, or, in other words, innocent; their resemblance to healthy bone formation of the body being perfect, both anatomically and chemically.

These tumors are generally outgrowths, and partake either of the nature of the *compact* or *cancellated* structure. In the *compact* or *ivory* or *eburnated exostoses* (which chiefly are found connected with the cranial bones) the structure is firm and of different shapes. These tumors are attached either within or without the cranium, and when in the latter position are very difficult to diagnose. "This exostosis," says Rindfleisch, "is so remarkable a phenomenon, just because quite divergent from the usual schema, namely, without regard to the vessels and their course, the osseous tissue is deposited layer by layer about one of the smallest tubers as a nucleus. This gradually becomes a warty, polypus-like, white formation, which may attain the size of a man's fist, and nevertheless consist throughout of compact bony structure. This entire kind of growth undoubtedly reminds us of dentine."*

It is worthy of remark also, that there often exists between the compact layers of bone, a cancellated structure, and that in very many cases the tumors have a small base, are round, smooth, and hard, and sometimes rise to a considerable height above the surrounding bones. The pain they occasion is generally that of pressure.

The second variety or *cancellated exostoses*, as the name indicates, are formed of structure exactly resembling the cancellated structure of healthy bone. They usually arise from cartilaginous tumors, are round, lobulated, sometimes presenting spiculæ or angles. These tumors grow sometimes in most peculiar locations, and Mr. Paget calls especial attention to those found at the lower end of the femur, above the insertion of the adductor magnus.†

These tumors grow often by stems or peduncles, which, when broken, do not appear to be reproduced. A peculiarly hard species of this variety of growth is that seen as growing from the last phalanx of the great toe, giving great pain, pushing up the nail, and rendering the parts around sensitive. During the past winter, at the college, I removed two of these *subungual exostoses*, and found them hard, unyielding, perfectly cancellated, and being direct outgrowths from the last phalanx of the toe. Mr. Paget has seen such tumors growing from the little toe, and also "from the dorsal surface of the last phalanx."

The upper jaw is often affected with exostosis, and in some cases there appears to be an hereditary tendency to the production of these tumors.

The medical management of osteoma will be found in the chapters upon diseases of the bones, and in other parts of the volume treating on the surgery of those regions where they most frequently appear. Suffice it here to say, that some very remarkable cures have been made. In many instances, however, removal of the parts is necessary.

Horny Tumors.—These curious morbid growths generally occur in connection with sebaceous follicles, and their origin can frequently be traced to injuries or chronic inflammation.

They are usually found about the head and face, but may also exist in other parts of the body. They first appear as soft, semi-transparent masses inclosed in complete cysts; as they increase in size, they become dense and hard, and assume all the characteristics of horny structure.

They grow slowly, and frequently attain considerable magnitude; one

* Text-book Pathological Histology, p. 602.

† Surgical Pathology, p. 532.

case has been reported in which the tumor measured eleven inches in length by two and one-half inches in circumference; and in another instance the horn was fourteen inches around the base.

They are more or less flexible, and of an almost cartilaginous hardness. The surface is marked by rough rings, indicating the different stages of growth; sometimes it is "knotted or covered with small pearl-like scales."

In shape they are usually conical, and twisted upon themselves like the horns of a sheep; their color varies from a dingy yellow to brown or black.

Under the microscope they exhibit flattened epithelial cells and nuclei.

The only treatment for these tumors that I know of is excision.

RECURRENT TUMORS.

Recurrent Fibroid Tumors—Spindle-celled Sarcoma.—The chief characteristics of the spindle-celled sarcoma appear to be as follows: First, their almost invariable tendency to recurrence after removal, such reappearance not being attributable to any portions of the tumor which may have been accidentally allowed to remain in the parts. Second, they generally appear at the site of the former wound, as well as in other portions of the body. Third, their growth is slow at first, but afterwards they enlarge with greater rapidity. Fourth, they give but little pain, and life is not threatened by them for a long time, unless (which most frequently happens) local pressure causes danger and death. Fifth, the superjacent skin is not involved, nor does it proceed to ulceration, unless such solution of continuity is produced by tension and consequent deficiency of circulation. Sixth, they are hard, lobulated, and often immovable, appearing to be firmly attached to the aponeuroses and fibrous sheaths. Seventh, they do not infiltrate the tissues surrounding them, nor do they produce the cachexia found in cancers. Eighth, their structure appears to resemble somewhat the natural tissues of the body, but the cell-element is rudimentary, incomplete, and preponderating. Ninth, the oftener they recur the more succulent and soft do they become, and the more rapid is their growth. Tenth, the cells composing them are spindle-shaped and caudate, often with attenuated processes, with large nuclei (*vide* Fig. 25). There may be, also, free nuclei scattered

FIG. 25.

Microscopic elements of a recurring Fibroid Tumor, magnified 400 times.

throughout the intermediate cellular substance. Eleventh, the hardness or softness of spindle-celled sarcoma consists in the deposit of fatty particles in the one variety, and their absence in the other.

The case which I here record, is one of considerable interest, because of the simultaneous appearance of *three* tumors, after the complete extirpation of the first, and of the train of pressure symptoms which were gradually developed. The patient, Ella S., was about twenty years of age, and

healthy in appearance. Her father partook of the rheumatic diathesis; her mother died of phthisis (that disease being hereditary in that branch of the family). She had enjoyed average health from childhood, excepting a severe attack of scarlatina, occurring during her fourth year, from which she is said to have made a complete recovery. From a careful inquiry, I could not find that she ever received an injury of the neck, or that there was an appearance of any abnormal growth until about two years prior to the date of operation. About that period a tumor appeared near the centre of the right side of the neck; it gave but little inconvenience and no pain, and scarcely attracted notice. After a time, however, as it slowly enlarged, occasional difficulty of deglutition called more critical attention to the growth, which had considerably increased in an upward direction. In addition to the above unpleasant symptom, there were paroxysms of great dyspnœa; both of these symptoms being produced by pressure on the œsophageal branches of the vagus and the inferior laryngeal or recurrent branch. The suffocative paroxysms increased until life was in peril, the growth of the tumor also proceeding with marvellous rapidity.

In consultation with Dr. Banks, of Englewood, whose patient she was, it was decided that nothing but operative measures could prolong her life, and though the season of the year was rather unpropitious (it being midsummer), the day was appointed for the operation.

The tumor at this time extended from the mastoid process of the temporal bone, bordering closely the ramus of the inferior maxillary, to the margin of the clavicle, and from near the mesian line of the neck to a point about half an inch beneath the anterior border of the trapezius. The sterno-mastoid muscle crossed it diagonally, and from the pressure consequent upon the protrusion of the growth had become much attenuated. The external jugular vein, from the same cause, was reduced to a thread. The tumor was distinctly lobulated, hard, and most firmly fixed, a condition which renders every surgeon more careful in his methods of procedure; in fact, it is recommended by some distinguished authorities that this immobility should decide the question of surgical interference, especially in parotid tumors.

The patient was placed on the table about noon, and ether administered. There were suffocative paroxysms during the first period of anæsthesia, which, however, gradually passed away.

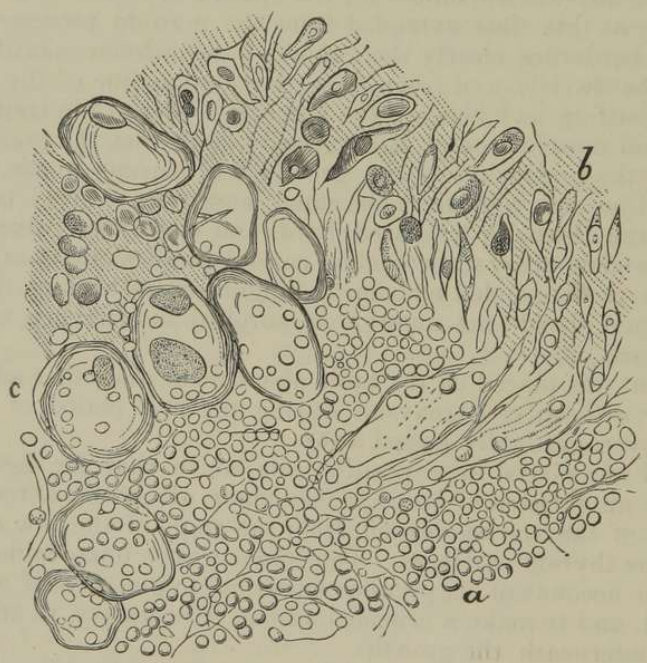
The head was placed in a position similar to that for ligation of the carotid, and an incision of three inches made along the anterior attenuated border of the sterno-mastoid, from the angle of the jaw to the lower border of the thyroid cartilage. The tumor was so immovable that I determined, on account of its peculiar situation, to give myself all the room that I could, and to make a crucial incision, if necessary, to afford facility in getting underneath the growth.

The fascia was cut through and the sterno-mastoid held aside; finding, however, that the tumor lay beneath the deep cervical fascia, and that the sterno-mastoid was attached, I divided it with a transverse incision. The next step was the transverse division of the anterior fibres of the trapezius, which was accomplished upon a director. This allowed a free and full exposure of the upper surface of the tumor, which was laid bare after a tedious dissection. The next step was to dislodge it from its base; beginning with the posterior border, the handle of the scalpel was introduced beneath it. The adhesions were extremely dense, and repeated touches of the knife, the use of the director, the fingers, and the handles of instruments, gradually raised the tumor until we discovered its connection with the sheath of

the great vessels. Having, thus far, loosened the tumor from the posterior side, the adhesions on the anterior borders were attacked in the same manner; they gradually gave way until it was free, excepting its line of connection with the sheath of the carotid and internal jugular. Having then a finger placed on the carotid, as it passed under the tumor ready for compression if necessary, the dissection was carefully continued from below upward until the growth was removed, taking with it the external portion of the sheath of the great vessels of the neck.

It is unnecessary to say that this was both a trying and tedious dissection. It occupied nearly two hours, and the heat was overpowering. There were six ligatures applied, but there was no serious hæmorrhage, excepting for a short time from a prick of the internal jugular; continued compression stopped this. The wound was brought together with silver sutures and the patient progressed without untoward symptoms, excepting a slight convulsive cough, for three weeks, when a swelling showed itself in the site of the wound. In a few days *a second growth* was developed on the *left* side of the neck in a *position precisely similar to that occupied by the first tumor*, viz., beneath the sterno-mastoid. Then were presented a train of peculiar and most unfavorable symptoms. Ptosis of the right lid; insensibility of the pupils and diplopia; then numbness of the right side of the

FIG. 26.



Section from a spindle-celled sarcoma of the femur, taken from the exterior of the tumor. *a* shows the "indifferent granulation material" or "adenoid tissue" stretching out from the tumor structure (*b*) into the adipose tissue (*c*) separating its cells. The tumor was of a malignant character, and contained in other parts of its substance cartilaginous and osteoid material. Path. Soc. Trans., vol. xxi, p. 341, and pl. viii, Fig. 1.—(HOLMES.)

face, which was followed by deafness of the right ear; these symptoms increased, until finally the eyeball began to protrude from the orbit. Distressing paroxysms of cough then were present, and to add to the suffering of the poor girl, difficulty of deglutition again ensued. At this time, bulimia of an actually fierce character superseded with rapid and great emaciation. The tumor on the right side grew to a considerable size, but was much softer than the former growth (a characteristic of this variety of

tumor). The eyeball was pushed out from a tumor of the orbit until it lay upon the cheek. Severe neuralgic pains and sleeplessness were present, and she died in great agony, which opiates were powerless to relieve.

Fig. 26 represents the appearance of the different cells in a section of a recurrent fibroid.

Myeloid Tumors (Paget). **Fibro-plastic** (Lebert). **Giant-celled Sarcoma** (Virchow).—These tumors are of rather rare occurrence, and there is no better method of describing them, or indeed any varieties of abnormal growth, than by the history of a typical case. The following is one in which I removed the superior maxillary and turbinated bones for the disease in question.

Joseph Vogl, age forty-nine, entered the Good Samaritan Hospital, at my suggestion, on account of a peculiar tumor involving the upper jaw of the right side, extending downward and forward into the mouth, forcing forward the alveoli and the teeth contained therein, and growing, according to the statement of both the patient and his wife, with amazing rapidity. The tumor was turned toward the left side, and the lower eyelid drawn somewhat downward. The mass that could be seen by drawing the cheek aside, resembled in many respects the gum from which it appeared to grow; never bled excepting after severe handling, and then but slightly; had a peculiar odor, but not that which belongs to encephaloid disease, and appeared to involve the whole bone, excepting the orbital plate, extending upward to the articulation of the nasal bones. The patient's health was rapidly failing, and I advised an operation as soon as the system could sustain the shock.

The diagnosis was difficult to make out. There was an absence of symptoms which generally belong to malignant tumors, and that part of the growth which was capable of being examined presented many appearances of epulis. My first impression was that it was the latter-named disease, but in reading over *The Surgical Observations* of John Mason Warren, I recollected a passage which I think led to the correct diagnosis of this case. The lines were as follows, page 64: "Myeloid tumors in the jaw are rare, and at a late stage of their existence are *often distinguished with difficulty* from that external affection called epulis." Further research justified the opinion, and the examination of the diseased mass since its removal has put the question beyond doubt.

The question as to the malignancy of the tumor was first to be considered, and many of the features which I have found to belong to the so called heterologous growths were absent; thus there was entire absence of hæmorrhage; lack of proneness to ulceration (which is very characteristic of malignant formations), together with the appearance presented by those parts which could be examined (which in homologous growths, is, as a rule, similar to some of the textures of the body on which the formation is found), which was normal in both color and consistency. On the other hand there was an amazing rapidity of growth, some fetor, general depression of vitality, and other symptoms which were of serious import. Now, a myeloid tumor is one which, in appearance, resembles, after slight maceration, common suet. The growths generally occur in bones and in cancellated structure; on section they present reddish or even purple spots in their texture, and present a similar external appearance to epulis. According to Mr. Paget, "they grow slowly and without pain; generally commence without any known cause, such as injury or hereditary predisposition; bear considerable injury without becoming exuberant; they are not apt to recur after complete removal, nor have they, in general, any features of malignant disease."

Dr. Gross differs somewhat in his opinion regarding these growths, and his words are so expressive that I shall quote them. He states "that the myeloid tumor is rather rapid in its growth, occurs in both sexes at different periods of life, but more commonly in the young and middle-aged than in the old, and is capable of attaining considerable bulk. From its tendency to destroy the structure in which it is developed, and from the fact that it occasionally displays a malignant tendency, recurring after extirpation, and ultimately causing death, there is a strong reason to conclude that it is merely a modified form of encephaloid or fibro-plastic growth. Nevertheless, in the existing state of science, we are not warranted in expressing a very positive opinion regarding the true nature of the disease." These remarks are very applicable to the case in question, and the appearance of several fibrous polypi attached to the nasal bones would appear to demonstrate the fibro-plastic nature of the disease, with a tendency to degeneration. After a careful consideration of the facts, and some research as to the advisability of the operation, I felt myself justified in removing the bone.

On the 13th of March, the patient was laid upon a bed, with his shoulders and head elevated, with the affected side towards a good light. This is the position advised by Dr. Gross, and really insisted on; but I am persuaded that the upright position in a stout chair is a better posture, preventing the flow of blood into the fauces. After this the patient was thoroughly brought under anæsthetic influence, and an incision was commenced at the angle of the mouth, and carried around the cheek to the zygomatic arch; a second cut was then made parallel to the border of the lower lid, to the lateral margin of the nasal bone on the right side, and the flap dissected up. The zygomatic arch was then divided, partly with the saw, and partly with the bone pliers. The mass was then separated from the orbit, and the division effected through the palate with the pliers. By seizing the tumor with Fergusson's forceps, and depressing it, the growth was taken away. Parts of it, however, were found adhering to the under surface of the nasal bones, and indeed had invaded the left alveolar processes. These were cut away with the pliers, and several polypi, one of them quite large, were removed from the upper part of the fauces. The appearance presented by the wound was rather revolting, and a considerable quantity of blood was lost during the operation, though there were but three vessels (the largest being the internal maxillary) which required ligature. I was in considerable doubt whether the patient would survive the operation. The wound was brought together by several points of suture and the patient put to bed.

The patient succumbed to the disease about six months after the operation was performed. The growth reappeared and grew with frightful rapidity. The sufferings of the poor man were terrible, and he died in great agony.

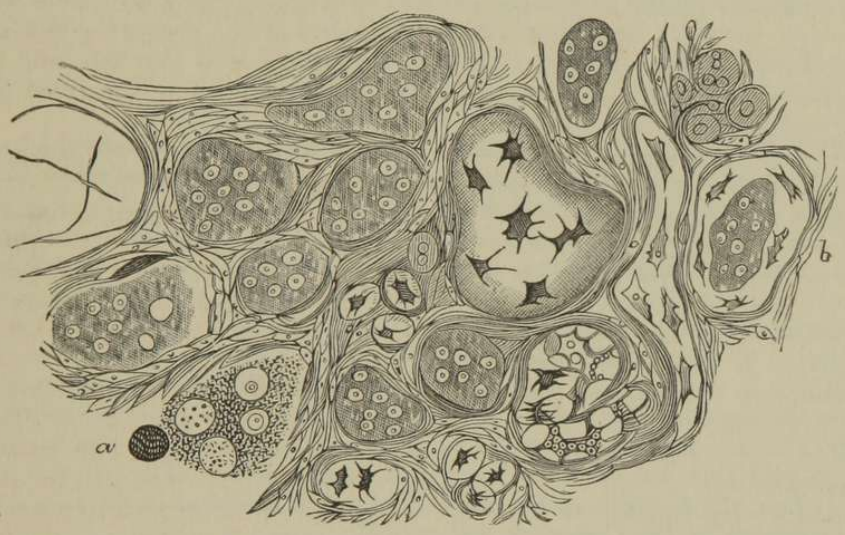
When a section of a myeloid tumor is placed under the microscope, the characteristic poly-nucleated cells are plainly visible; they are large and contain often very many nuclei floating in a clear and granular fluid. (Fig. 27.) Sometimes the spindle-shaped cells, so well known as belonging to Paget's "recurrent fibroids," are seen.

It is quite probable from the embryonic and heterologous nature of the cellular elements in glioma, cylindroma, and myxoma, that these tumors would recur after removal, and, therefore, might well be placed among the semi-malignant growths.

CANCER.

Under this head will be classed those tumors which are essentially malignant in their nature and possess those characteristics which have been already mentioned, the chief peculiarity of the disease being unusual, nay, often tremendous cell production. These cells are often found crammed into the tissues without order or regularity; they float in a liquid known as "the cancer juice," and not only have the tendency, but the power under certain circumstances, being heterologous and ungovernable, to rush upon any tissue, infect, and destroy it.

FIG. 27.



"Giant-celled Sarcoma," or Myeloid Tumor.—After Billroth. *a* points to a part where cysts were being formed by the softening of the tissue of the tumor; *b* to a focus of ossification.

The great distinction between true cancer and the innocent tumor with reference to auto-infection is this: in the latter the parts are pushed asunder, a separation of tissue taking place; in the former the surrounding tissues are *infiltrated* with the cancerous material.

Again, another of the peculiar marks of cancer consists in the glandular enlargements which follow its growth. If we find a tumor which is apparently innocent in its characteristics, accompanied during its life with lymphatic or neighboring adenoid swelling, it must at least be regarded as suspicious in its character.

With reference to the actual pathology of this affection, the following most appropriate language is used by Mr. Bryant.*

"Pathologically, a cancerous tumor is *not* composed of any definite or characteristic elements, such as at once stamp it as being a cancer; it does not contain any distinct cancer-cells which mark its nature, for the cells, nuclei, and fibres, which enter into the formation of a cancer, may all be traced in other and in innocent morbid growths. 'But neither in tumors of innocent character, nor in natural tissue, do these elements combine in such variety as is common in a single cancer' (Moore). It does not appear, however, to be incorrect to assert that the more the cell elements predominate in a growth, and the more they approach an epithelial type, the greater is the probability of its being malignant, and therefore cancerous; for the

* The Practice of Surgery (Am. ed.), p. 666.

soft cancers, which are undoubtedly the most virulent, are made up almost entirely of cells and nuclei—only enough fibre tissue existing to bind and hold these cells together."

It has been supposed by some, that the primary origin of cancer is to be looked for in a deviation from the healthy standard of nutrition, and that there exists in some an hereditary predisposition to this abnormal action; that though this tendency may exist for years latent in the system, yet it ultimately develops itself either from known or unknown causes in the form of one or other of those tumors known as cancerous. Certain I am that in the majority of cases of cancer that have come under my own personal supervision during the last ten or fifteen years, I have been able to trace back a cancerous disease somewhere in the family. At first this predisposition may be denied on the part of the patient, from ignorance of the actual facts; but upon carefully inquiring it has been found that "cancer" somewhere existed more or less remotely. I think I may say that this heredity may sometimes skip a generation, and appear again with redoubled violence in the same family.

With the peculiarity just noticed there is another which should be observed, which consists in the fact that those causes which produce ordinary diseases do not appear to have much influence in the production of cancer; and that all classes are more or less liable to its invasion; nor, indeed, does impaired health appear to be a factor in its production. I have known in several instances, a true scirrhous tumor to exist for years, in the persons of wretchedly poor, ill-fed, dyspeptic, and hysterical women, and with the exception of occasional pain, be of no inconvenience.

Cancer is a disease of adult life and old age. It occurs generally between the ages of thirty-eight and sixty, and is more frequent in women than in men. I have only seen one case of cancerous disease in the male breast, and this was of a most aggravated character. The patient was a clergyman, the founder of the Good Samaritan Hospital in St. Louis, and was attended by Dr. Comstock and myself.

As we have already mentioned on two occasions, there is believed at present *to be no typical cancer-cell;* it is the whole history of the case, the multiplicity, the proliferation, the heterology of the cells, which have to be considered in making up the diagnosis. On general principles it may be said that the cancer-cell is oval, with a large, double, or concentric nucleus. Water clouds the cell; acetic acid acts in a somewhat similar manner as is noticed when applied to the pus-corpuscle—it clears them up. Another form of cell discovered in cancerous formations is the "mother" or the "brood" cell, which receives its name from the fact that it contains in its interior several apparently perfectly formed cells.

The "cancer juice" is a milky-white, sometimes glairy fluid, which lies between the stroma; it is often quite limpid, though from being loaded with disorganized products it may sometimes be more or less dark or bloody. This cancer juice must not be mistaken for the oil-globules which run away frequently during an operation for cancer (a fact that should warn the operator that he is cutting *into* and not around the growth). Cancer-cells are exceedingly liable to undergo a fatty degeneration, and, indeed, what is called the "*saponification*" of cancer is the fatty degeneration of the stroma and cells. Sometimes the fat deposition stretches along the connective tissue, giving rise to a peculiar appearance known as "reticular cancer."

I give here the different types of cancer, with the microscopic structure of different varieties, which I have taken from Dr. Moxon's celebrated chapter on the microscopic anatomy of tumors in Bryant's *Surgery*. His classification is as follows:

"Five leading types of carcinoma may at present be conveniently distinguished.

"1st. Those in which the fibrous meshwork is in preponderance, and the epithelioid contents of the alveoli are scanty, and perhaps, also prone to perish early, so that they are found more or less degenerate within the fibrous meshes—hard carcinoma, or scirrhus.

"2d. Those in which the fibrous meshwork is in smaller proportion, and the epithelioid contents are plentiful, making large collections of cells, but with no evident approach in the form of these collections to the shapes of gland-acini, and no evident resemblance of the component cells, either to the columnar epithelium of mucous glands or the squamous epithelium of cuticle—soft carcinoma. This kind occurs especially in glands, and the transformation of the glandular tubes or follicles to cancer alveoli can be seen in all stages in the growing margin of the tumor.

"3d. A structure essentially such as that last described, but with this difference, that the epithelioid cells have a quantity of mucus between them, which is regarded as arising from a transformation of them. This change to mucus may be carried to such an extreme that scarcely any cellular elements are left, while the alveolar meshes in which the mucus is contained becomes very strikingly visible from its nakedness and the pellucidity of the mucus—colloid, or alveolar cancer. A common seat of this is the wall of the alimentary canal, where it may be traced arising from Lieberkühn's follicles.

"4th. A structure in which the epithelial cells resemble squamous epithelium, and form masses which are very like the follicles of cutaneous glands, or occasionally like rudimentary hairs; the tubular and bulbous forms may, however, be seen ramifying like the lymphatic vessels of the skin, as if their form were moulded to the lymphatic plexus. In these cancers peculiar bodies are found, composed of flattened cells disposed concentrically so as to form a scaly-walled globe, whose appearance is like the section of an onion, or like a bird's nest; these are so large as often to be visible to the naked eye; when they are numerous and well characterized, they are diagnostic; some authors (Billroth) distinguish a variety of this cancer in which the stroma preponderates over the epithelial part, calling it scirrhus of the skin—squamous epithelial carcinoma.

"5th. A structure in which the epithelial cells resemble ordinary columnar epithelium, and the structure itself is quite like normal mucous membrane, in which it always primarily arises (alimentary canal, especially colon, uterus); the secondary formations which occasionally occur in these cases, in the liver especially, have the same structure, and thus a tissue like the glandular mucous membrane of the colon may be found in the liver—cylindrical epithelial carcinoma.

"The fourth and fifth varieties are distinguished from the first three as epithelial cancers or epitheliomata. Some authors have used the term cancroid for the fourth variety, as though it were not completely cancerous. These are less likely to infect the viscera than the first two varieties, which are the most infectious of all tumors, though they are very far from being the only kinds of infectious tumors."

Mode of Death.—Cancer patients die in many cases because their systems are actually poisoned, the blood becomes scanty, the organs break down, the secretions alter. The entire lymphatic system appears to be filled with the poison, which often manifests itself in many parts of the body at the same time. Those individuals who possess a strong constitution of course give greatest resistance, although this may not always be the case, for I have known patients who have been suffering from other

diseases offer more resistance to the inroads of cancer than those who to all appearances were much more robust.

Cancer patients also die indirectly from the poison; some are carried off by effusions, and some with pyæmia. Again, cancers entirely obstruct the bowels, cancers eat out the œsophagus, cancers destroy the air-passages, cancers tear open arteries, cancers perforate the organs, in fact deaths from cancers are effected in all parts of the body and in many ways, and, sad to say, medicines are not of much avail against their inroads.

The different varieties of cancer are as follows: *Scirrhus, Encephaloid, Epithelioma, Melanosis, Colloid, Osteoid, Villous.*

Scirrhus—Hard Cancer.—It is said that scirrhus is the most frequent form of cancer; in my own experience I have not found it so. I think that in America, at least in those sections in which I have had an opportunity of observing the disease, epithelioma is the more frequent. The occurrence of fibroma and adenoma in the female breast may have given rise, in part, to the statement regarding the frequency of scirrhus, the one being mistaken for the other. A scirrhus tumor is hard, nodulated, and circumscribed; its chief peculiarity and its *diagnostic* mark, is its tendency to *contraction*, or the drawing around it of all the tissues. (Fig. 28.) Who has not seen in a female affected with this disease, a healthy well-developed breast on the one side, and a shrivelled, drawn, potato-like excrescence on the other? This mark, its contraction, together with its tendency to adhesions to the underlying and superincumbent structures, may be said to be pathognomonic of the disease. No other tumor possesses these peculiarities to such a degree.

There is often noticed in the growth of a scirrhous tumor a peculiar increase, either in the middle, the one side or the other; by careful observation it will generally be seen that the most marked increase in structure is found at that point where there is most nutrition; in other words, near the nutrient artery. There is another point to which attention should be directed, and that is, the undoubted fact that *scirrhus withers of itself;* especially is this true of breast cancers. This withering of scirrhus has been found by most careful observers not to consist in its transformation into other tissues, nor in its conversion into healthy structure. It is merely a breaking up of the cells and nuclei, and the escape of oil-globules and *debris.*

A somewhat peculiar feature of scirrhus is the "*cupping*" of its surfaces. When cut into, after its removal from the body, the sections become concave, the surface shining, the substance elastic and glistening. This pitting is explained by the tendency, which has been before noticed, to contraction inherent to the growth.

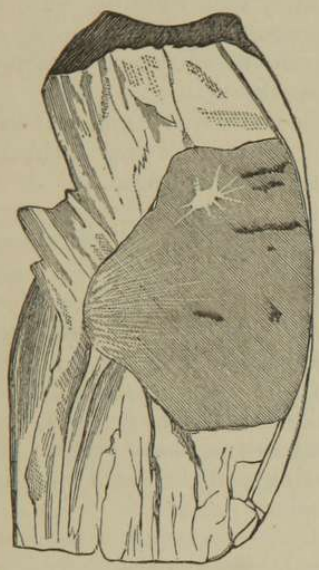
The pain of scirrhus is not severe in the early stages, indeed a tumor may exist for a time, and be by accident discovered. There is, however, always soreness of the lump when handled, and sharp, lancinating pains, which are peculiar. As the disease advances these darting pains become more frequent and severe; these, though peculiar to most forms of carcinoma, are much more severe in scirrhus, being probably due to the pressure exerted by so firm a growth on the nerve-fibres. Glandular enlargement also is another most prominent symptom, which is more peculiar to scirrhus than perhaps the other forms of cancer.

After a time ulceration sets in, as has been noticed, and the action is then rapid, the discharges are thin and offensive, the ulcer is jagged and ill-defined. (Fig. 29.) With this we find the cachexia well marked, and the usual symptoms of decline are present.

The yellow lines through scirrhus have already been noted; besides these, there are often whitish bands which extend into the substance of the growth, which resemble the tissue of the lacteal ducts. The cells are round and

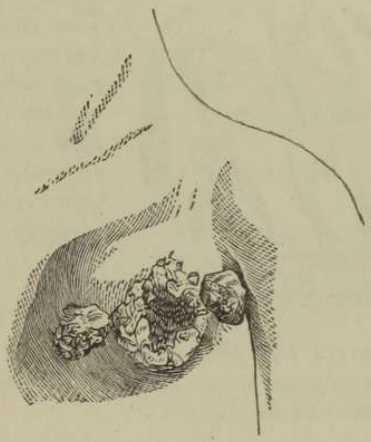
oval, and are about $\frac{1}{1000}$th of an inch in diameter. There are often two nuclei in each cell, and each has one or more large nucleoli. There are also often present withered cells, undergoing either fatty or calcareous degeneration.

Fig. 28.



Hard cancer, extending from a border lobe of mammary gland to the skin, affecting intervening tissues.—*Paget.*

Fig. 29.



Ulcerating Scirrhus of the breast.

Encephaloid Cancer.—This form of carcinoma has received several appellations, chiefly from the appearances it presents. The fungus hæmatodes and fungus melanodes of the old writers and the soft or medullary cancer of the more recent authors are synonymous. There are two distinct forms of encephaloid disease; the one appearing as a round and defined growth, the other being nothing more than intense and perfect infiltration; the latter is often found in serous membranes, and also in the bones. The former are "boggy" in their feel, and generally inclosed within a delicate capsule, which sends trabeculæ into the substance of the tissue, dividing it into compartments, each of which may also have a covering of connective tissue. In the other variety the tumor is not so distinctly marked, though the elevation rises above the surrounding structure, and presents such elasticity that fluctuation is apparently present. On more than one occasion these fluctuating tumors have been punctured with the expectation of finding either serum or pus.

Encephaloid cancers are always profusely supplied with bloodvessels, which have exceedingly delicate walls, and which are in size much out of proportion to the structure through which they ramify. Besides this internal vascularity, the veins on the surface of the tumor are enlarged and tortuous. It is from this profuse supply of vessels, especially if the cancerous growth is bound down by dense tissue, that there may be distinct pulsation in the tumor.

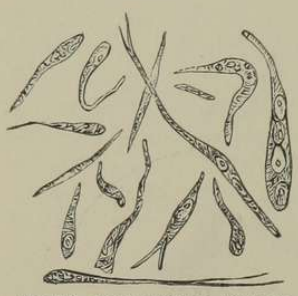
A peculiarity of this variety of cancer is found in the fact that it may exist with scirrhus in the same patient, and that all ages are liable to its invasion. It has been found in the fœtus at birth. The sufferings of those affected with encephaloid are, as a rule, not so great as is found in scirrhus,

particularly if the disease appears in soft and yielding structures; there is often extreme suffering, however, when bone or periosteum is affected.

The most frequent seats of the disease are bones, testicle, uterus, eye, and female breast; the bladder and the face are also often affected.

As the disease progresses, a bluish spot near the surface becomes visible. The integument becomes thinner and thinner, until it ulcerates, generally with profuse hæmorrhage. Almost immediately from this opening there sprouts a red, soft, fungoid, readily-bleeding mass, which grows with great rapidity and undermines the health of the patient with marvellous speed. The cancerous cachexia is more marked in this variety of cancer than in almost any other, and is noticeable even in the earlier stages.

FIG. 30.



Nuclei of Medullary Cancer magnified 500 times.

The "cancer juice" pressed from an encephaloid is of yellowish or milky hue; the stroma is reticulated and spread out like a net, within the meshes of which are found the cancer-cells already mentioned, floating in a liquid intercellular substance. The cells vary in form, being caudate or pyriform, and have many nuclei. (Fig. 30.) The progress of soft cancer is rapid, the duration of life under its ravages not often exceeding two years. Death often occurs from actual exhaustion. The following, from Gross, is the differential diagnosis.

ENCEPHALOID.	SCIRRHUS.
1. The tumor is soft and elastic, not uniformly, but more at some points than others.	1. Uniformly hard and inelastic, feeling like a marble beneath the skin.
2. It grows rapidly, and soon acquires a large size—perhaps ultimately attaining the bulk of an adult head.	2. Growth is slow, and bulk comparatively small; the tumor rarely, even in the worst cases, exceeding the volume of a double fist.
3. The pain is slight and erratic, until ulceration sets in, when it becomes more severe and fixed.	3. The pain begins early; is distinctly localized, and is of a sharp, darting, burning, or lancinating character.
4. There is always marked enlargement of the subcutaneous veins.	4. In scirrhus these vessels retain their natural size, or are only slightly enlarged.
5. The ulcer is foul and fungous, with thin, undermined and livid edges, and is subject to frequent and copious hæmorrhages.	5. The ulcer is incrusted with spoiled lymph, and has steep abrupt edges, looking as if it had been scooped out of the part; bleeding little and seldom.
6. There is generally early lymphatic involvement.	6. Usually not until late, or just before ulceration is about to occur.
7. Occurs at all periods of life.	7. Seldom before the age of forty-five.
8. Is most frequent in the eye, testicle, mamma, lymphatic ganglions, bones, skin, and cellular tissue.	8. Never occurs in the eye and testicle, and rarely in the bones, skin, and lymphatic ganglions.
9. The disease usually terminates fatally in from nine to twelve months.	9. Seldom sooner than eighteen months or two years.

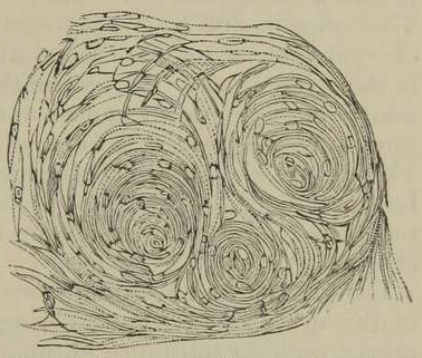
Epithelioma.—Epithelioma, as its name implies, is that form of cancer which bears some resemblance to the epithelial structure of the human body. It possesses all the characteristics of the ordinary malignant formations, and is found especially in the lip, the tongue, the penis, the os uteri, and rectum.

It generally begins as a wart, or a fissure, or a tubercle, and spreads by

infiltration. It in many cases becomes fungoid, and then the peculiar papillary structure can be discerned by the naked eye. There are two peculiarities which I have carefully noted in this disease, and those are: 1st. The length of time that the disease may rest locally in the system without harm being done; and 2d. Speaking purely from my own experience, it is less likely to return than any other form of carcinomatous disease; at all events the patients have a longer immunity from it when the growth is early and thoroughly removed.

There is one peculiar method in which it may make its appearance which deserves attention. It is when there appears to be formed over an abrasion of the skin, or a round red spot, a hypertrophied epithelial structure (Fig. 31), a dry scale, which, upon being removed, again develops; when this scurf is removed a small quantity of moisture shows beneath, but nothing more. Gradually, however, the papillæ are enlarged, and, indeed, often become enormous; then there appears to be considerable ichor exuded, and the parts around show symptoms of infiltration, which soon ravages the parts around. This may be called the second stage of epithelioma. In some cases it has been noticed, that as the ulcerative process goes on, there is a deposition of new growth at the sides and borders of the chasms. Men are more liable to epithelioma than women. I have seen but two cases in the female.

FIG. 31.

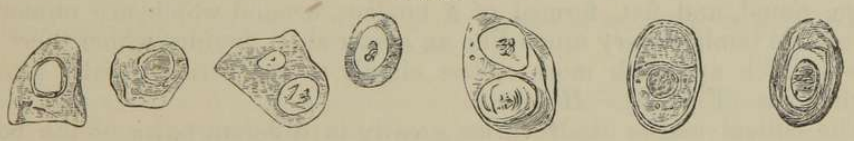


Microscopic appearance of three papillæ of Epithelial Cancer.

In this variety of cancer there seems to be also a local irritation existing in most cases. Thus: the heat of the clay pipe on the lip of smokers, the soot in the scrotum of the chimney-sweep, or the irritation of old warts or moles, often, indeed in the majority of instances, lead to the development of epithelioma.

The cells, which have already been described, are irregular in shape, and vary from $\frac{1}{200}$th to $\frac{1}{2000}$th of an inch in diameter (Fig. 32). The nucleus

FIG. 32.



Epithelial Cancer-cells magnified 350 times.

contained is small and round. There are also "brood-cells," and laminated corpuscles.

A peculiar fact is also noted by microscopists, that the nuclei of these cells become excessively enlarged, and appear as clear spaces.

Melanosis—Melanotic Cancer.—The synonyms of this variety of cancer are "*black cancer*" and "*carcinoma melanodes.*"

Melanosis is undoubtedly encephaloid or medullary cancer, with a deposit of pigment throughout its substance. The history and symptoms are therefore very similar to those already noticed as belonging to that disease. The colors of this kind of cancer constitute its peculiarities; they are brown, bronze, and even black. In those cases of melanosis which have come

under my observation the color was rather a dark plum-color, and was interspersed throughout the growth without regularity, and in masses varying in size from a pea to that of a kidney bean. It is understood that the pigment bears no especial relation to the malignancy of the disease, and that parts of an encephaloid may be entirely free from coloring matter, while others may be very melanotic.

In the primary melanotic cancers the structure is softer than other malignant growths of the same age. They make their appearance as infiltrations, but also may be circumscribed. The peculiarities of melanosis are, besides that of color, just noted, according to Sir James Paget, their proneness to appear near cutaneous moles, and their profuse multiplication. The color is due to the pigment cells, which are similar to those of the choroid coat, or to those found above the basement membrane of the skin in the colored races. From the similarity which exists between the coloring matter of this form of cancer and that found in the lungs of aged people, some have supposed that melanosis is "a *pigmental degeneration of cancer.*" The second and third peculiarities are not well understood, although the last may be more apparent than real, the pigmentary deposit having a tendency to draw out and color many cells which otherwise would be unobservable.

Ganghofner and Pribram* have given especial attention to the character of the urine in patients suffering from melanotic cancer, and find it contains a peculiar substance, chromogen, which varies with the specific gravity, viz., the solid constituents of the urine.

Colloid or Gelatiniform Cancer—Alveolar Cancer—Gum Cancer.—According to Lebert this form of cancer is found oftener in men than in women, and appears most frequently in middle life; it is, however, rarer than either scirrhus, encephaloid, or epithelioma. It attacks chiefly the mamma, stomach, and intestines, and may be present in the system with other forms of the disease.

This form of cancer is essentially infiltrating, and sometimes attains considerable size, and from being in dense structure presents the sensation of fluctuation. Its name "*alveolar cancer*" is derived from the arrangement of the fibres of its stroma in large open meshes of transparent fibres, in which are seen rounded or oval nuclei. Lying in the interstices of these fibres is a transparent jellylike substance, in which will be seen, under the microscope, cells of various sizes and shapes, the most characteristic being large, round, and flat, formed of a nucleus, around which are numerous concentric laminæ, very much like an oyster-shell, besides which there are others which approach more or less closely to the forms usually seen in epithelioma (Fig. 33).—*Holmes.*

The colloid matter itself varies greatly in different parts of the body. It generally resembles boiled starch, which has been strained, but not allowed to become cool. It is slightly bluish in color, although its variations are very great. Sometimes it is greenish, sometimes pink; at others it may be opaque and brown, and resembles decomposing tuberculous matter.

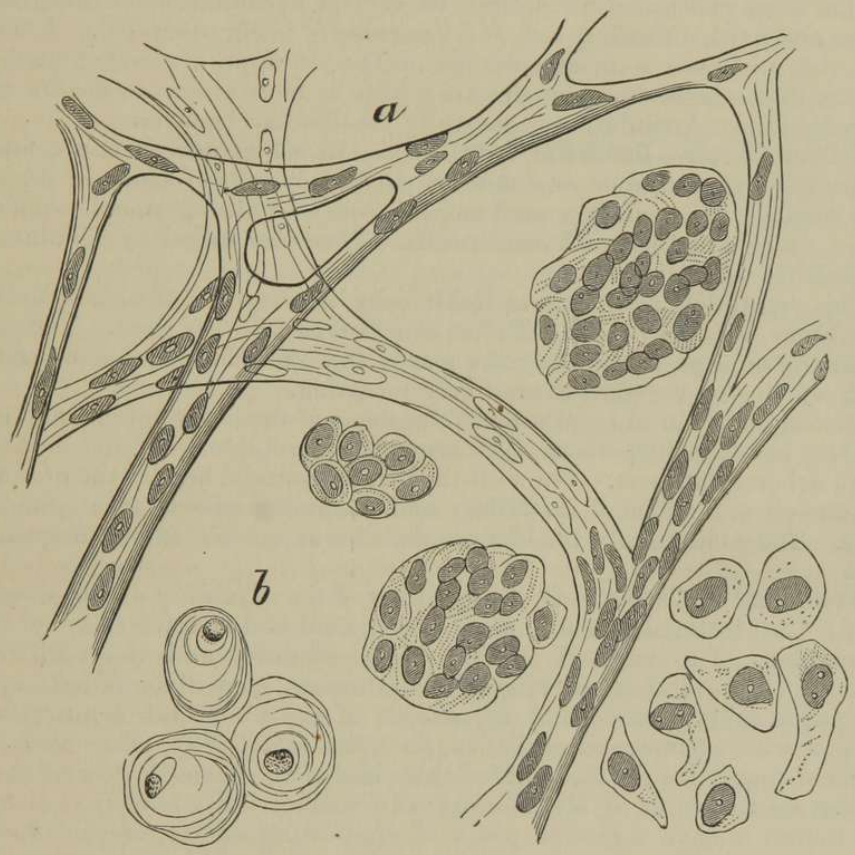
The growth and multiplication of colloid is most remarkable. I have removed two pailfuls of the substance from one patient, and in a second case, in which there were also many tuberculous deposits, about sixteen quarts. In several other cysts of the ovary, I have taken away quite enormous quantities of this material.

The main points of this peculiar formation are, that it presents structure which is most unlike the usual protein compounds, and is so dissimilar in

* London Medical Record, January 15th, 1877.

structure from ordinary cancerous growths that some have denied it a place in the classification of that disease. Of this latter point Mr. Paget says that its locations are the same as medullary cancer; that it infiltrates, it supersedes, and replaces the natural textures; it repeats itself in the lymphatic glands and lungs; it is often associated with other forms of cancer; it recurs after removal, and is often hereditary.

Fig. 33.



Colloid Cancer: *a*, epithelioid type; *b*, "round or oval" oyster-shell cells. Very characteristic.—Holmes.

Osteoid Cancer.—The appearance of true cancer, and in different varieties, in the osseous system, appears to contradict the opinion advanced by some pathologists that true cancerous growths are produced from external or glandular epithelia. There can be no doubt of the fact that cancer does attack the osseous system, and often develops first within the bones. It appears also that certain bone cancers are liable to occur in the same localities, and to present the same histological species. The extremities of the humerus and femur are often affected with cancer; sometimes the cancellated structure appears to be the seat of the disease, while at others the periosteum is first involved. As soon as these parts are thoroughly infiltrated the cancer grows with great rapidity, and a delicate framework of ossific matter is formed, which is filled with soft rapidly-growing cancer-nodules. Sometimes the tumor begins in the diploic structure, and may extend both within and without, perforating the bone both ways.

The form of these tumors is generally oval, and can be traced with the

finger down to the bone from which it grows. The tissues around are in most instances in a healthy condition, although scattered throughout them small masses of well-developed cancerous formation may be found.

According to Sir James Paget "the unossified part of an osteoid cancer appears fasciculated or banded, and it is always very difficult to dissect. In some specimens, and in some parts, it has only a fibrous appearance, due to marking and wrinkling of a nearly homogeneous substance, in which abundant nuclei appear when acetic acid is added." After an osteoid cancer has been macerated for a time, its central portion is found to be very dense and hard, difficult to cut, and incapable of being triturated. Around this the substance is more succulent. The duration of bony cancers is shorter than any other, and males are said to be more subject to the disorder than females. Amputation is generally all that can be done.

Villous Cancer—Dendritic Vegetation.—In some cases there are found projecting from a fibrous or a mucous surface, sprouts of tissue in clusters and rows, or the stem may send out branches containing round protuberances, which are filled with cancer-cells. These are called by Rokitansky "dendritic vegetations."

This vegetation, according to Rokitansky, is composed of a structureless membrane, which is hollow and often attached to a fibrous stem. This may gradually enlarge until it becomes a sac; this sac contains a serous fluid, from which new vegetations are likely to spring.

Bloodvessels run in loops around the stems of these vegetations, and also in some instances loop themselves around the protuberances and branches in an arborescent form. The villi themselves contain, besides the ordinary cancer-cell and nuclei of medullary and melanotic cancer, true epithelial cells. The gums and the bladder are the sites at which it is most frequently met.

Treatment of Cancer.—Gross, speaking of the curability of this disease, says: "All internal remedies of whatever kind and character have proved unavailing. The vaunted specific of the empiric, and the enchanted draught of the honest but misguided enthusiast, have alike failed in performing a solitary cure; and the science of the nineteenth century must confess with shame and confusion, its utter inability to offer even any rational suggestion for the relief of this class of affections."* Scarcely less strong are the words of Mr. Moore,† who writes: "No remedy is at present known to have a specific power of eradicating cancer, of neutralizing its taint, or altering the nature of its growth. Scarcely less, in our present ignorance of the causes from which it springs, are we in a position to rely with confidence on any means for obviating its outbreak."

Mr. Thomas Bryant says, in his late work: ‡ "The general treatment of cancer resolves itself into the improvement of the general health, and the nutrition of the body by hygienic means, good nutritious diet, and tonic medicines. No medicine has any special influence on the disease."

It is not necessary to multiply quotations on this subject from the allopathic authorities of to-day; and I may remark, that the three that have been given were not selected on account of any peculiar force of expression, but were those that first came to hand in consulting works for the facts in the case.

We may turn then with some feeling of satisfaction to our own literature, although at the outset we must regret that while throughout our

* System of Surgery, vol. i, p. 257.
† Holmes's System of Surgery, vol. i, p. 593, London, 1871.
‡ Practice of Surgery, p. 738, London, 1872.

periodicals there are many cases of "cancer" reported cured, in very many of these the specific variety of the disease is not diagnosed. Cancer is, by the majority of surgeons, considered as a generic term, and has several important species. To group the scirrhus, medullary or encephaloid, melanotic, epithelial, and osteoid, as "cancer," and in the report of a case to omit to diagnose the variety, is not sufficiently precise; leads us astray in our ideas; has a tendency to throw distrust upon our records, and gives us but little information for the treatment of subsequent cases. For instance, in a "Report of the Homœopathic Institute of Leopoldstadt,"* there is a case of "cancer of the womb." The variety of the disease is not mentioned, whether epithelial, scirrhous, vegetating epithelioma, or other. Bryonia removed the severe pains and belladonna was given for the uterine tenesmus; "the discharge diminished, and became less fetid, sleep and moderate appetite were established, and the patient felt so much stronger that she was enabled to undertake a journey." Such a record really counts for nothing in the establishment of the superiority of homœopathic treatment. Many such ulcerations are temporarily arrested by hygienic influences and the tonic system of treatment, as it is called, of the old school. This case is merely selected as one from many, that are found in our literature, and can only be accepted as indicating that relief for a cancerous ulcer was obtained. So again, Dr. Bayes† speaks of a case of "cancer of the lip" (probably ulcerating epithelioma), which was arrested; cancer of the left breast, in which the tumor had almost entirely disappeared; and an "open cancer of the left breast," which from the size of a half crown diminished to that of a pea.

These and many cases that might be cited prove conclusively that there are certain medicines employed homœopathically that can arrest "cancerous" formations, but it is, as before stated, much to be lamented that more precise diagnoses have not been given in each case. The chief among the medicines referred to in Dr. Bayes's paper is hydrastis can. I have used it frequently with excellent success, and from cases of my own, may affirm, that its efficacy in cancer is chiefly in the epithelial variety; also that its action in other forms of the disease is correctly indicated by Dr. Bayes, who says: "My experience has thus led me to infer, that the remedial sphere of hydrastis is confined to the arrest and removal of scirrhus in its early stage and chiefly when its situation is in a gland or in the immediate vicinity of a gland."

We have other reports, however, which are more conclusive. The remarkable case of Field Marshal Radetsky‡ is one that it is fair to set down as a cure of encephaloid of the eye. So also we find that Dr. Hughes§ has a most excellent case, quoted from Petroz, in which a woman under the care of Dr. L. Herminier had a suspicious ulcer of the tongue, involving the parts deeply. The doctor distrusting his own diagnosis, sent her to Professor Mardolin, who returned the following: "Cancerous ulcer; no chance of cure but from operation, and this is impossible, for the base of the tongue is involved." This case, which was probably one of epithelioma, was cured by the hydrocyanate of potassa, $\frac{1}{100}$th of a grain, at a dose repeated every fourth day. Eighteen years afterward there had been no relapse.

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* British Journal of Homœopathy, vol. xix, p. 144.

† British Journal of Homœopathy, vol. xix, p. 150.

‡ British Journal of Homœopathy, vol. i, p. 147. Being a series of letters which appeared in the Hom. Zeitung, July, 1841, by Dr. Hartung.

§ Therapeutics, p. 219.

Stapf* reports a most interesting case of fungus hæmatodes oculi, which was completely cured. Belladonna[30] removed the excessive photophobia and inflammation in six days; calcarea carb., cleared the cloudiness of the cornea; lycopodium[12], sepia[36] and silicea[12], removed the fungous growth. The cure was complete.

Muhlenbein† gives also a case of the same disease so diagnosed by several allopathic physicians and an experienced surgeon, in which belladonna[26], one drop at intervals of a week for four weeks, together with nux vomica, euphrasia, and aconite, completed the cure.

Dr. von Vietiunghoff‡ among his cases, has recorded a case of encephaloid of the breast which is interesting. The pain was relieved by belladonna[3] and bryonia[3] in alternation. Phosphorus[30] and hepar[30] also in alternation, materially improved the character of the discharge; arsenic[30] caused separation and discharge of tumor. After persevering with the latter for several months the cure was perfected.

Other cases of this variety (encephaloid) of cancer are found throughout our literature.§

Dr. G. M. Pease,|| in a short and practical paper on "Cancer," mentions three cases, in two of which operations had been performed, and these are merely noted here, inasmuch as being under the carbolic acid treatment, one was alive five years, the other four years after operations had been performed. The third, however, a case of *hæmatoid cancer*, located on the right cheek, and extending to the ala of the nose, was cured by carbolic acid internally and externally with no return in three years.

Dr. A. G. Beebe¶ gives a case of melanotic cancer, cured chiefly by carbolic acid and sanguinaria, the former for the specific disease, the latter for gastric disorders. During the first three weeks of treatment, the tumor was reduced to the size of a pin's head, and all suffering relieved. Ultimately, there was complete recovery.

Dr. Leon** relates a case of *carcinoma uteri* which had not recurred after three years. The medicines were: arsenic, a dose night and morning for one week; conium[3] night and morning for one week. These medicines were continued four months in alternation, with an occasional dose of china as an intercurrent for hæmorrhage.

We must now turn to the consideration of Dr. Bayes's essays,†† written especially with reference to the use of hydrastis can. in the treatment of cancer; and for brevity's sake will merely introduce his table appearing at the end of his second paper. He also includes in these statistics Dr. Bradshaw's‡‡ cases, offering additional testimony to the beneficial effect of the "Golden Seal."

These papers certainly show (although the percentage of cures is small) that this medicine does possess more or less influence over the disease; but when the question arises as to the comparative efficacy of homœopathic

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* Archiv fur die Homœopathische Hilkunst, vol. vii.

† Loc cit (both these cases are recorded in Dr. Jeanes's Homœopathic Practice).

‡ British Journal of Homœopathy, vol. xvii, p. 53.

§ British Journal of Homœopathy, vol. xxvi, p. 658. Dr. Quin's case in the Annals, vol. i, p. 177, quoted by Hughes. Fungus hæmatodes, Dr. Hughes, British Journal of Homœopathy, vol. xxviii, p. 795.

|| Transactions of the American Institute of Homœopathy, 1872, p. 390.

¶ Medical Investigator, vol. xi, p. 549.

** United States Journal of Homœopathy, vol. i, p. 41.

†† Hydrastis can. in Cancer, B. J. H., vol. xix; also, *loc. cit.* vol. xx, p. 1.

‡‡ A Few Remarks on Hydrastis, B. J. H., 1861, vol. xviii, p. 598.

treatment combined with surgical operations, I think it may be shown that a better result is obtained with the knife than without it.

Of the following twenty-three cases, six are diagnosed as scirrhus, thirteen as cancer (ulcerated or otherwise), one as fungus hæmatodes, and three as cancerous tumors. The results of the treatment are as follows: three were cured; in six others there was "improvement;" in three "arrest of development;" and in six, relief from pain was noticed; while again in five others "no effect" was produced. It would be interesting to the operating surgeon to ascertain how long the three cases remained cured; and if in any there was a recurrence of the disease, at what time the symptoms were developed. Until this point be clearly settled, the vexed question as to the expediency of operative interference with the knife, cannot be satisfactorily determined. Few operations for cancer, especially of the lip and mamma, are not followed by a more or less complete exemption from the disease, from one, two, or even three years; but even then the conscientious surgeon would scarcely be justified in announcing a complete cure of the affection.

Case.	Age.	Sex.	Disease.	Location.	Result.
1	41	Female.	Scirrhus.	Breast.	Cured.
2	42	"	Tumor.	Ovary, right.	Relieved.
3	46	"	Cancer.	Right breast.	Much improved.
4	77	"	"	" "	Arrested.
5	25	"	Scirrhus.	Cervical glands.	Much improved.
6	55	"	Hard nodulated tumor.	Dorsum of foot.	Almost cured.
7	45	"	Scirrhus.	Breast.	Pain relieved.
8	50	"	Ulcerated cancer.	Left breast.	Greatly improved.
9	37	"	Cancer.	" "	Cured.
10	48	"	"	Right breast.	Pain relieved.
11	38	"	Tumors (cancerous).	Both breasts.	Much improved.
12	48	"	Scirrhus.	Os uteri.	No effect.
13	56	"	Cancer—ulcerated.	Os uteri, vagina and rectum.	" "
14	42	"	Scirrhus.	Uterus.	
15	60	"	Fungus hæmatodes.	Right thigh.	"
16	22	"	Cancer.	Left breast.	Cured.
17	50	"	Ulcerated cancer.	" "	Relieved.
18	50	Male.	" "	Lip	Arrested and improved.
19	40	Female.	Carcinoma.	Left breast.	Relieved.
20	58	"	Scirrhus.	" "	Arrested.
21	40	"	Ulcerated cancer.	Os and cervix uteri.	Slight and temporary relief.
22	60	"	" "	" " "	No relief.
23	37	"	" "	" " "	Arrested.

This phase of our subject brings us directly to the consideration of the cases of Marsden and MacLimont,* in which the "enucleation treatment" was adopted. In the ten cases they record, the subsequent histories of the patients have not been given, obviously from the many difficulties surrounding dispensary and hospital practice. In stating these cases here they must be considered in a measure operative; as nitric acid, chloride of zinc, hydrastis in powder and tincture, and stramonium ointment, would scarcely be called by the pure homœopathicians, homœopathic medicines, especially when in combination and applied locally. Yet the success of these applications may in a measure be attributed to constitutional treatment with medicines exhibited according to the law of similia; and such being the case, does not the operator, whether with knife or caustic, who, throughout the entire duration of the case (before, during, and after operative measures), prescribes homœopathically for the presenting symptoms, possess a most decided superiority over those who rely chiefly on hygienic and general constitutional treatment? In other words does not homœopathy even here exercise a beneficent influence upon operative surgery? The answer may be given in the affirmative.

* B. J. H., vol. xxi, p. 616.

In June, 1873,* I reported to the New York Homœopathic Medical Society fifty cases of cancer, and since that period have operated with knife and the enucleating paste on twenty-three others. I now give further results. It is needless to say that the patients have always, while under my supervision, been taking those homœopathic medicines which appeared indicated. In order to be more accurate, I shall omit mentioning any of the more recent cases, because a sufficient time has not elapsed to convince me of their cure. I will merely state that eleven of the twenty-three have died between the date of my last report and the present. Two of the cases were scirrhus of the breast; one advanced epithelioma of the penis; one scirrhus of the parotid, in which I may say that I think electrolysis did decided harm; four, encephaloid of the mamma, and three from general dissemination of the disease. Of the fifty cases I then placed upon record five of the epithelioma cases are now alive; in one instance, thirteen years, having elapsed since the treatment; in another, ten years; and both of these were locally treated by Marsden and MacLimont's paste. Another has lived six years, and is at present enjoying good health. Five years have elapsed since another was operated upon, the patient being well, and the fifth also has survived five and a half years. A sixth case might also be reported as cured, as the patient died of gallstones two years after the operation. Of the encephaloid of the mamma subjected to the knife, four survived; the longest time elapsing being four years. Three have died. Of the scirrhus, of which twelve were operated upon with the knife, one is alive nine years after; two have died. The others I have been unable to hear from in time to report in this chapter; although I have made many attempts, by letter and otherwise, to ascertain their condition.

Many quotations of cures have been omitted; but it is to be hoped that sufficient facts have been given to prove, that in a disease, considered beyond the reach of medicine by the old school, well-directed homœopathic medicine can and has effected cures; and that when operative interference becomes necessary, the beneficial influence of homœopahtic medication cannot be denied. It may modify the cachexia, or postpone the recurrence of the disease. It would be ridiculous, however, even with this knowledge, to make the broad assertion that all cases of cancer may be cured, or that return after extirpation is not to be expected. The facts remain, that cases are and have been cured, and such facts encourage every surgeon, in his endeavor to select the proper homœopathic medicine, and avoid, if possible, the performance of operations; and still further, if the knife is deemed necessary, or the caustic treatment seems advisable, he has certainly in the homœopathic Materia Medica, agents which will assist him to prevent recurrence and alleviate suffering.

Looking at the matter with these proofs before us, endeavoring to view the testimony as impartially as we are able, and referring to the written opinion of the best allopathic authorities of to-day, it may safely be claimed that homœopathy has exerted a most beneficial influence over this department of surgery, whether the knife be employed or internal medicines exhibited.

The special indications for some of the principal remedies are as follows:

Apis mel.—Sharp, burning, stinging pains in scirrhus or open cancer, with tendency to œdema of face and lower extremities; scanty urine, and absence of thirst.

Asafœtida.—Syphilitic origin; edges of ulcer hard, bluish and very sensitive to contact.

Aurum met. and **mur.**, **clem**, **merc.**, and **nitric acid** are especially suitable for syphilitic and syphilitico-mercurial cases.

* New York Journal of Homœopathy, vol. i, p. 146.

Arsen., especially **arsen. iod.**—Burning, lancinating pains; great emaciation; extreme restlessness and anguish; thirst for small draughts of water at frequent intervals.

Belladonna.—Erysipelatous redness about the cancer; stitching pains, which suddenly appear and disappear; in persons of plethoric habit, who have been subject to congestions to the head with flushed face, throbbing of carotids, etc.

Bryonia.—Tensive burning pains, aggravated by motion and contact.

Calc. carb.—Especially when the menstrual function has been deranged; menses too early and too profuse; gastric troubles; cough worse morning and evening; very sensitive to cold air.

Carbo an. and **veg.**—Great tendency of cancer to deteriorate; extreme prostration of vital power.

Chamomilla.—Drawing rheumatic pains, worse at night; erysipelatous redness, with drawing and tearing pains, worse by contact.

Chimaphila umb.—E. S. Coburn, M.D., reports a case of ulcerated scirrhus cured by the use of this remedy.*

Conium.—Scirrhus of the breast caused by a *blow;* piercing pains, worse at night; great tenderness of the whole mammary region; enlarged and indurated glands; great weakness after stool.

Galium aperinum has been known for some time to exercise a powerful influence upon certain cutaneous diseases, and also to possess some curative virtue in cancer and nodulated tumors of the mouth and tongue. Cases are upon record where it has certainly proven of great efficacy. Mr. F. A. Balley, F R S.C., records a case† in which a cure was apparently effected. The preparation used was—

Extract. Galii aperini solidi, ... ℥ij.
Aquæ, ... Oss.
M. ft. extract. fluid.

Of this a drachm and a half was given twice a day in a wineglassful of water, and as a warm lotion applied to the parts several times during the day.

Phytolacca appears to have some influence on cancer, especially scirrhus of the breast. Not long since there was a good deal written concerning the action of acetic acid upon cancer-cells, and Mr. Bence‡ reported a very interesting case of cancer of the breast, treated by Sir Henry Thompson at the University College Hospital, with the examination of the morbid specimen. The method of treatment was first suggested and employed by Mr. Broadbent.

Dr. Hastings§ also has employed the treatment successfully in cancer of the liver, stomach, and mammæ. The acid was given in the latter case in three-drop doses three times a day, after which an interval of two days was allowed to elapse, and the medicine resumed. A compress saturated with an acetic acid solution was worn over the breast. This case was apparently cured.

I have tried this method, and also injected the tumor with the acid, but am sorry to say that I have derived no positive benefit from its use.

Hydrastis has proved curative in scirrhus of the breast and of the uterus. "When there is great prostration, the cancerous diathesis being well marked, the part feels hard and heavy, and the skin dark, mottled and much puckered," this remedy is of great service.

Phytolacca.—Dr. Hale reports a case of scirrhus cured with this remedy. Prof. Allen uses it successfully in the treatment of epithelioma.

Phosphorus.—Scirrhous indurations; tall, slender persons with flat chests and tendency to tuberculosis.

Cundurango.—In regard to the efficacy of this remedy introduced by Dr. Bliss, there is a great difference of opinion; some surgeons are enthusiastic in its praise, while others condemn it *in toto.* Its true value and proper sphere of action can only be determined by a proper proving and varied clinical experience.

Cedron.—This medicine was introduced to my notice by Dr. E. M. Kellogg, of New York, who had used it successfully as a palliative to the severe sufferings,

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* Vide Trans. N. Y. State Hom. Med. Society, 1870.
† Medical Times and Gazette, July 30th, 1864
‡ Medical Times and Gazette, February 16, 1867.
§ Cancer, with Cases Cured. London: Henry Turner, 1869.

especially the lancinating pains in the advanced stages of cancer. Drop doses of the tincture, frequently repeated, are necessary to produce relief.

Lapis Albus.—This medicine, introduced by Dr. Grauvogl, was kept secret for a while by him, in order to prove to Liebig that the power of medicines might be ascertained, and the position of the science secured, without in all cases the aid of chemistry. This substance is the white primitive calcium gneiss, found in the lower Ache valley, abounding in the mineral springs of Gastein. Grauvogl says:

"I made five triturations, and then dilutions on the decimal scale; of the sixth dilution I gave to men and women.

"I observed as a most frequent symptom: burning, later, after continued use of four or five drops every two hours, stinging pains in the cardia and pylorus, in the female breast and uterus, sometimes the pains were of considerable intensity. This sufficed for the present, and as I have no time to be my own apothecary I gave to the pharmaceutist in Nuremberg, where I then resided, the first trituration in order to have on hand the necessary dilutions for my practice.

"I very soon observed the most astonishing results in my practice; and the cure of carcinoma of the cheek in a woman fifty years of age, which already had produced an opening in the cheek as large as a silver dollar, interfering to an alarming extent with masticating and swallowing of food, created such a sensation in Nuremberg that I soon ascertained that other homœopaths had commenced to experiment with this same *Lapis albus*. In this woman I was particularly struck with the healthy color of the countenance which intervened soon after commencing to take the remedy; her complexion indeed assumed a freshness and ruddiness such as are seldom seen in a woman of her age, showing that the condition of the blood had become quite normal. In consequence of this I also gave this remedy in chlorosis, but without any success whatever, thus showing that our indications of remedies must totally differ from those of the physiological school.

"But the success in all scrofulous affections, abscesses, and sores was the more astonishing; also in all affections of the glands and the lymphatics; also in glandular tumors, where physiologically no glands are usually found, in unbroken carcinoma, in fluor albus, even in tuberculosis, which points to the fact that much of what is called tuberculosis is derived from so-called scrofulosis.

"But an indispensable condition of success in these forms of diseases, consists in that they develop in constitutions that have not suffered previously from intermittents or other malarious affections; as otherwise *Lapis albus* not only aggravates everything but even engenders relapses of intermittents and other malarious affections. I have not as yet observed any favorable action of the remedy in paralysis, but it has produced erections.

"These were all the experiences I had when I was called to St. Petersburg last year, and there five cases of uterine carcinoma were reported to me, cases that were pronounced by allopaths as true and incurable carcinoma, but with *Lapis albus* they were thoroughly and permanently cured. I have not yet seen a cancer apertus cured by this remedy."

Enucleation.—The system of enucleation was first introduced by Justamond, an English surgeon of the last century, who employed an arsenical paste. The pastes generally used consist mainly of arsenic and chloride of zinc.

Marsden and MacLimont's treatment, as reported in the *British Journal of Homœopathy*, is essentially as follows:

"The method of removal varies as the disease is in a state of ulceration or otherwise. When the skin is entire, the site, size, and bearing of the tumor are ascertained and marked out on the skin with nitrate of silver or vermilion paint; then a mixture of ice and salt is applied to deaden sensibility; the affected parts are then dried and the skin destroyed by application of pure nitric acid, and this action of the acid is kept up until the skin assumes a tawny or yellow aspect. The skin is then douched with cold water, and a piece of lint applied soaked with the following paste: a decoction of hydrastis root, powdered hydrastis, chloride of zinc and flour, equal

parts, one of this mixture to one part stramonium ointment.* On removing the dressing at the end of twenty-four hours, a yellow, hard, dry eschar is produced, surrounded by a slight amount of erythema. The pain caused by this application varies with the amount of surface destroyed, and is generally lessened by congelation of the part. Through the eschar make vertical parallel incisions one-twentieth of an inch in depth, and one half of an inch apart; into each incision insert a slip of calico smeared with the paste; cover with adhesive plaster, and apply over all a light dressing. Repeat the process every day, until the tumor is percolated. Do not use the knife too freely, but cut deep enough to get through the eschar, being careful not to draw blood. We can tell when we reach the base of the scirrhus by the feeling—the cancer is hard and cuts with difficulty, and when the knife pierces sound tissues, it feels as though it had entered a cavity or an abscess. It is important that the slip of calico should be carried to the bottom of the incision, and extend its whole length, or even one-quarter or one-half an inch below on each side, but care should be taken not to let the paste run down on the sound skin. In the process of enucleation it often happens that a cavity containing disintegrating cancerous matter is opened; expose the cavity freely, evacuate the contents, and proceed through the *floor* of the cavity, the same as before. At the end of a fortnight, a line of demarcation forms around the tumor, beginning at its most dependent portion; the living healthy tissues beneath granulate and push the tumor out, and the entire mass sloughs away in from four to seven weeks. Remove all unhealthy granulations, diseased glands, etc., and allow no cicatrization so long as cancer-cells can be distinguished in the discharges. After the slough has come away, dress the sore with lint spread with stramonium ointment."

Marsden and MacLimont claim for this mode of treatment the following advantages: that it obviates all danger of pyæmia, "the chloride of zinc acting as an antiseptic;" that it produces no constitutional disturbance; that it is equally applicable to all forms of malignant growths, and may be employed when the use of the knife is inadmissible; and that "it gives rise to such drawing or contraction as to bring within reach of the paste portions somewhat deeply imbedded in the surrounding tissues."

Dr. John Pattison,† of London, employs an enucleating paste composed of equal parts of powdered hydrastis root, chloride of zinc, flour, and water. The method of application is the same as that already described. This treatment gives rise to slight constitutional symptoms, which are met by the appropriate homœopathic remedies.

The following is Michel's process for removing external tumors, for a knowledge of which Dr. Bell paid 25,000 francs, and which, in a spirit of true liberality, he has made public. *The Practitioner*, June, 1871, p. 377, gives the following:

"The preparation used in all cases where the tumor can with safety be reached externally is made in the following way. Asbestos, as soft and free from grit as possible, is reduced by rubbing between the hands to the finest possible fleecy powder; it is then mixed thoroughly with three times its own weight of strong sulphuric acid (SO_3HO). A mass is thus formed

* I have used the following preparation:

Zinc, chlor.,	℥j.
Hydrast. submur.,	℥ss.
Flour,	℥ij.

Mix into a powder and keep in a glass-stoppered bottle in a dark room. When wanted for use, make into a paste with tincture or strong decoction of hydrastis.

† Vide Pattison on Tumors.

which may be easily worked with a silver or gold spatula into any size or shape, corresponding with the tumor to be destroyed. Any malignant growth of the breast which is detached and solitary, with the subaxillary glands unaffected, is suitable for treatment, whether open or not makes no difference. In the application of the caustic the adjoining healthy parts of the skin are carefully protected by applying a zone of collodion and pads of linen, and the patient is so placed that the surface of the tumor is perfectly level. The saturated acid asbestos is then laid on the surface to the thickness of half an inch for a tumor the size of a hen's egg. Rapid destruction of the tissues follows, with, after the first half-hour or so, but little pain. An oozing of clear watery fluid appears, which must be carefully sopped up. After twelve or fourteen hours' action, the first application is to be removed, and a new portion of smaller size adapted to the sore. After this has been applied for twelve hours, the operation is complete, and the healing of the deep excavation alone requires to be attended to; for the details of which we must refer our readers to the pamphlet. Dr. Bell does not pretend to say that this mode of operation will effect a permanent cure of cancerous cases, but he thinks that the plan presents various and considerable advantages over extirpation by the knife, as in producing much less shock to the system, in removing the tumor alone with but little of the surrounding breast, and in postponing, in malignant cases, for a longer period the recurrence of the disease."

Dr. Broadbent recommends injections of the first dilution of acetic acid. The pain is slight, and hæmorrhage is checked by the use of styptics.

Dr. Routh, of the "Samaritan Hospital," London, reports two cases of scirrhus cured by the topical application of bromine.

Professor J. C. Morgan, of Philadelphia, has cured a case of epithelioma of the lower lip by local application of carbolic acid.

Dr. James Arnott has advised continued application of cold, by means of some freezing mixture applied to the surface of the tumor. This may check the growth for a time, but can never effect a radical cure. The same may be said of Mr. Young's treatment by compression.

W. Neftel, M.D., reports* that he has used electrolysis successfully in cases of scirrhus. From his experiments, he is inclined to believe that this treatment exerts a positive beneficial influence upon the cancerous diathesis.

The *iodide of arsenic* has been *partially* proved, and from the symptoms it has produced, and from certain cases in which it has been productive of great benefit, is highly recommended, as has been also the phosphate of iron; the latter is said to have produced "the most happy results;" by its administration the pain is lessened, and the ulcer takes on a more healthy appearance.

Arsenicum cured cancerous ulceration on the lip the size of a bean, with fatty base, and hard roll-like margins, surrounded by a dark-red areola; at the same time a red spot on the cheek.

In a case where cancerous ulceration had invaded the left half of the upper lip, and the soft parts upwards to the bone, and outwards to the angle of the mouth, *arsenicum* 3d, repeated every eight days, effected a cure.

Bellad.—A man, æt. forty, had suffered for three months with a considerable swelling of the upper lip, which was very inconvenient whilst eating or speaking, and considerably disfigured his countenance. In the swelling a hard body could be

* Richmond and Louisville Medical Journal, July, 1870.

felt, which was painful on being pressed. In cold, raw weather there were flying stitches through it. Cause of the disease unknown. *Bell.* gtt. 1.12 was given, and in eight days the swelling was considerably diminished. At the end of fourteen days the remedy was repeated in a smaller dose, and in a very short time the swelling entirely disappeared.* The above is reported as a case of scirrhus, but there are not sufficient indications enumerated to prove conclusively that the disease was true carcinoma. However, *bellad* is often a very serviceable medicine, and produces great alleviation of the pain, particularly in cancer of the uterus, when there is severe bearing down, and great weight and pressure, or violent pain in the sacrum.

In a case of scirrhus and prolapsus of the uterus, in which, in the earlier stages of the disease, there was metrorrhagia, in varying quantity and quality; still later the discharge of a fetid, whey-like matter, pain in the back, flying stitches in the pubic region, costiveness, the uterus in a state of scirrhous induration, *bell.* gtt. 1.20 every forty-eight hours, for two weeks, and a dose of *arsen.* every four days, for some time afterwards, together with the local application of a weak infusion of *bell.*, by means of a sponge, effected a cure.

Conium.—In the case of a woman æt. twenty-two. Five years before, she had been struck on the left breast, and afterwards a scirrhus had formed in the spot; it had grown until at length it had attained the size of a walnut. It was seldom painful, but immovable. At times there was an itching in the skin over it, which was not discolored. The disease appeared not to affect the general system in the least. With reference to the originating cause of the disease, *con. mac.* was prescribed. Soon after taking the medicine, the patient felt some additional stitches through the scirrhus. A considerable diminution of the tumor could be perceived the next day, but the improvement soon ceased. *Cham.* gtt. 1.3, was then given, and was followed by peculiar exacerbations and remissions. In the evening the scirrhus would be larger, and somewhat painful, and in the morning smaller and movable. These changes continued to occur for ten days, and during this time the tumor diminished in size. At the end of fourteen days the improvement ceased. A number of other remedies were for some time tried, which exhibited no action on the induration. The physician therefore considered it most advisable to employ local applications, and he directed some drops of the tincture of *conium*, prepared from the fresh expressed juice of the plant, to be rubbed every evening over the induration. Under this treatment, the scirrhus entirely disappeared. This remedy has also been found useful in cancer of the lip.

Magnesia murias removed scirrhous induration of the uterus.
Nux vom. proved useful in cancerous ulceration of the lips.

A man had a scirrhus of the size of a pea on the middle of the lower lip, which was removed by a surgeon by means of repeated applications of caustic, but afterwards there appeared at each extremity of the lower lip, adjoining the angles of the mouth, eroding ulcerations, with elevated uneven margins of a white color, pale-red ground, and discharging a thin fluid without any perceptible bad odor. The patient had a constant flow of saliva, which every one who trod in it with a bare foot pronounced "very sharp and biting;" his disposition was passionate, but at the present time depressed, and he asserted that his disease and his unfavorable circumstances had taken away from him all desire of life. *Nux vom.*, gtt. 1.13, was given, and was followed by great improvement. On the sixth day *con. mac.*, gtt. 1.21, was given, and by the tenth day the disease was completely removed.

Phosph. proved very useful in excessively painful and hard indurations in both mammæ, unaccompanied by inflammation.

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* See also Dr. Buchanan Ker's case of cancer of the pylorus, treated with arsenicum. British Journal of Homœopathy, vol. vii.

Sepia has proved beneficial in scirrhous indurations of the cervix uteri. "This remedy removed a cartilaginous and frequently-bleeding tumor of the lower lip."

Silic.—An induration, commencing at the left angle of the mouth, and involving nearly the whole of the left cheek, was removed by *silic.* "This remedy also is said to have cured a cartilaginous induration with a deep fissure, which was seated in the upper lip."*

The following medicines have been recommended for encephaloid and other malignant growths:† Ars., carb. an., carb. veg., phosph., sep., silic., thuja, calc., crot., lyc., merc., nit. ac., sulph.

Phosph.—Fungus hæmatodes in the thigh, somewhat painful, accompanied with continued discharges of venous blood.

Fungus hæmatodes of the eye, with chronic ophthalmia, complicated with ulcers on the cornea, great photophobia, burning, lancinating, and boring pain in the eye, the sight fast diminishing, calc. c. as the chief remedy, with lyc.[12], sep.[30], silic.[12], was cured.‡

An elderly negro man in Surinam had a bleeding tumor on his knee, which was removed by excision. Some time afterward a tumor formed in each hip near the trochanter major; that on the right was much larger than the one on the left hip. Two years and a half after the operation it had a diameter of four inches, was of a conoidal shape, slightly movable, hard, elastic, of the natural temperature, and without pain or pulsation. After being ruptured by a blow, it bled slowly, but almost incessantly, and became slightly painful and somewhat warm. On wiping the blood, which was apparently venous, from the opening, "*the structure of fungus hæmatodes could be clearly discerned.* Cinchona 1.12, and shortly afterward phosph. 1.30, were given. About the same time the patient filled the wound with tinder. The tumor continued to increase in size, as also did a fungous growth from the opening, which had made its appearance previously to the administration of the medicine, and the hæmorrhage was considerable till the fourteenth day, when there was a slight fever, which disappeared without medicine. After this period the tumor began gradually to diminish in size, and the hemorrhage ceased until the thirtieth day, when it occurred suddenly, but soon ceased of itself. After the second or third week the patient, being very much debilitated, was allowed to take a glass of wine occasionally. The tinder remained adherent in the opening till after the fiftieth day. On the sixtieth the wound was unclean, of a bad odor, and again bled a little; but the tumor had greatly diminished, as had also that on the left hip. By the eightieth day the improvement had advanced much farther, which advancement was attributed by the patient to a common adhesive plaster which had been applied to gratify him with the idea of active local treatment. By the ninetieth day there only remained an indurated cicatrix. The induration gradually diminished, and at the end of four months had entirely disappeared."§

Dr. Marsden in a late work recommends the following, which I have used with some success in the treatment of epithelioma. His formula is two drachms of arsenious acid to one drachm of mucilage of gum acacia, well mixed into a thick paste. The success of this method is highly spoken of, but I must refer the student for details to his work.‖

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* The above clinical record is taken from Dr. Jeanes's Practice of Medicine.

† Jahr's and Possart's Manual, p. 620.

‡ See Guide to Practice of Homœopathy, p. 155. London, 1844.

§ See Jeanes's Homœopathic Practice of Medicine, p. 236.

‖ A New and Successful Mode of Treating Certain Forms of Cancer, by Alex. Marsden, M.D., F.R.C.S.E. London, 1874.

Removal by the Knife.—A great diversity of opinion obtains regarding the extirpation of the diseased mass. Dr. Gibson writes: "Even extirpation of the tumor, and that, too, in its very incipiency, answers so little purpose that there is hardly a case on record where this operation has succeeded."* The futility of operation in this affection is well illustrated by a case detailed by Mr. Allan.† The patient suffered during thirteen years from a very large tumor which occupied the left hip. When it attained the size of a child's head it was dissected out by Mr. Newbigging, of Edinburgh, apparently with success, for the wound healed and the patient felt perfectly well. At the end of nine months, however, it grew again, and in seventeen months from the first operation, a second was performed by Mr. Russel, upon a tumor as large as the two fists. The wound soon closed, but in nine months following, the tumor recurred, and soon equalled in size a very large mamma. A third operation was now undertaken by Mr. Allan, and so extensive was the dissection that the wound was as large as the crown of a hat. In a few weeks it healed perfectly, but the tumor appeared again in seven months. The late Mr. John Bell was then consulted, and performed a fourth operation upon it, the tumor at the time being as large as the head of a child eight years old. Several months after the diseased mass was reproduced, and from the surface a fungus sprouted, in shape and size resembling a large cauliflower. This Mr. Allan removed by ligature, and the patient for the time was relieved. His constitution, however, was completely ruined, and although he lived for several months afterward, he died at last from the long-continued discharge from the fungus, nearly eight years having elapsed from the time of the first operation. "This case," continues Dr. Gibson, from whose work it is taken, "plainly shows how little we are to expect from extirpation."

Notwithstanding, however, the liability of these malignant growths to return again and again after removal, yet there may be cases in which the surgeon may deem it both prudent and proper to resort to the knife. Life may be prolonged for months, or even for years, as in the case above, by an early eradication of the mass. A vast amount of suffering may be saved; business may be settled which, if left undone, would cause great discomfort or even poverty to a family; and, therefore, it becomes important to ascertain when operative measures should be resorted to.

When the tumor is not amenable to remedies, and the patient is unwilling to await the somewhat tedious process of enucleation; or when the morbid growth occurs in the osseous structures, then exsection of the diseased mass, or amputation of the affected part, is the last resort. Excision may be practiced under the following circumstances: the patient must not be over fifty years of age; the general health not much impaired; appetite and other functions remaining normal; there should be no extension of the disease to neighboring lymphatics; and the patient possess sufficient vitality to react from the operation. But as has been before noticed, even under the most favorable conditions, excision is rarely, if ever, successful in effecting a radical cure; sooner or later the disease returns and progresses rapidly to a fatal issue.

The power of arsenic as a prophylactic after these operations, is very highly spoken of by the celebrated ovariotomist, W. L. Atlee, of Philadelphia. At a meeting of the American Medical Association, held in Philadelphia in May, 1872, the subject of cancer being under discussion, the Doctor made the following remarks:‡

* Institutes and Practice of Surgery, vol. i, p. 314.
† Allan's Surgery, vol. i, p. 364.
‡ Medical Record, New York, June 15th, 1872, p. 261.

"My experience with arsenic is unusually large, and each year has increased my confidence in it. I have now patients in the city—and if it had occurred to me, I could have brought you four or five—whose breasts have been amputated from five to twenty-five years, and who are examples of the protective power of arsenic, and of its extinguishment of the cancer-cell.

"Twenty-five years ago a lady presented herself to me with a large breast of soft cancer, which we denominated fungus hæmatodes, because the great mushroom mass, almost black, looked ready to burst and let the patient bleed to death. I had no idea that she could be saved; but I put her immediately upon small doses of Fowler's solution—the maximum being three drops three times a day—and when her system was thoroughly saturated with it I extirpated the breast. It healed up readily; and, according to my observation, the wound from extirpation of cancer commonly heals more quickly than a like wound under other circumstances. I kept her under the influence of arsenic for one year after the cicatrization, and to this day she is a living example of perfect freedom from cancer."

He details other cases with a similar result, and observes that his maximum dose of Fowler's solution was three drops. He records cases of removal and non-return which were considered incurable by celebrated surgeons of Philadelphia.

CHAPTER VII.

SCROFULA—STRUMA—TUBERCULOSIS.

The term *scrofula* is supposed to have derived its origin from the circumstance that swine were said to be subject to the disease, though the correctness of this etymology has been rendered very questionable by the remarks of Dr. Henning,* and the statement that these animals are really liable to be attacked, appears to be erroneous. The disease received, likewise, the appellation of *struma*, or *king's evil*, from the custom of submitting patients affected, to the royal touch. It is an affection, one of the chief or most palpable symptoms of which, is a chronic swelling of the absorbent glands in various parts of the body, with a gradual tendency to imperfect suppuration. Our ideas of scrofula, however, would be very indefinite, were we to define the disorder as a morbid condition of the lymphatic glandular system; for, as a judicious author observes,† "the system of absorbent glands, it is true, seldom or ever fails to become affected in the progress of the disease; but there is reason to believe that scrofula appears for the first time in parts that do not partake of a glandular nature." There are, perhaps, but few of the textures or organs of the human body that are not liable to attacks of scrofula, even as an original idiopathic affection.

Scrofula is a constitutional affection, which is generally developed early in life, and exhibits its presence by many and varied signs. The glands, the bones, the joints, the skin, and mucous membranes may suffer by turns or simultaneously, at the same time many constitutional symptoms

* Critical Inquiry into the Pathology of Scrofula.
† Thompson's Lectures on Inflammation, p. 134.

presenting, both difficult to manage and liable to recur. Indeed, in scrofulous persons we know not when to foresee a new outbreak of disease.

Throughout the body tubercles may develop themselves, and all the structures be invaded and infiltrated by them.

The disease may be hereditary or it may be acquired; it may descend from generation to generation, or may develop in an apparently healthy child, born of unhealthy parents. Exposure, want, privation, poor ventilation, abuse of mercury, and other causes develop the disease. Struma, however, must be considered a vague term, and it must not be allowed to cover too wide a field. It was formerly the custom to attribute all diseases of the bones and the glands to this affection, but at the present day the term is more restricted.

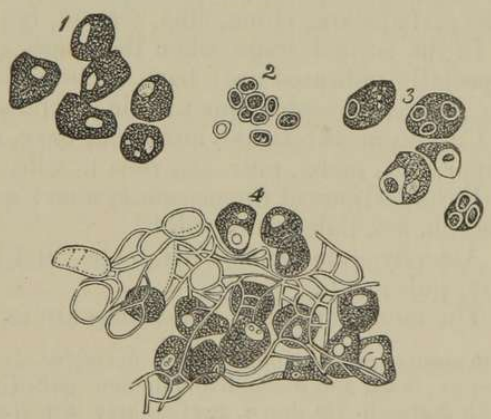
On this subject, Mr. Paget writes: "Scrofula or struma is generally understood as a state of the constitution distinguished in some manner by peculiarities of appearance even during health, but much more by peculiar liability to certain diseases, including pulmonary phthisis. . . . . Little more can be said of them than that, as contrasted with other diseases of the same appearance and parts, the scrofulous diseases are usually distinguished by mildness and tenacity of symptoms. They arise from apparently trivial local causes, and produce, in proportion to their duration, slight effects; they are frequent, but not active."

The glands show the most marked disposition to the disease, and it is not infrequent to find children in which the cervical, axillary, and mesenteric glands are enlarged, infiltrated, and tuberculous. Fig. 34, from Mr. Druitt's work, represents the enlargement of the mesenteric glands of a scrofulous patient. Males are more liable to external scrofula than females;* while in the latter, the phthisical diathesis is more frequent.†

There are said to be two varieties of tubercle: the miliary, or, as they are termed, the "*gray granulations*" of Bayle, and the "*yellow*" or "*cheesy.*" The

Fig. 34.

Fig. 35.



Elements shown by teasing out a miliary tubercle, after Rindfleisch. 1. The large tubercle-cells. 2 The small tubercle-cells. 3. Endogenous cell development. 4. Delicate reticulum from the interior of a miliary tubercle, the cells partly removed by pencilling.

first are small (Fig. 35), and as their name implies, bear a close resemblance to millet seed; they have irregular borders, and possess no moisture; whereas

* Scrofula and its Nature, by Sir B. Phillips.

† Dr. Walsh's Report on Phthisis. British and Foreign Med.-Chir. Rev., Jan. 1849.

the latter are soft like cheese or putty. Many, and indeed most pathologists regard these two varieties as but different stages of the same deposit; the hard being the early stage of life, the soft the more advanced. This, by analogy, would certainly appear to be a reasonable deduction. The question, however, is by no means satisfactorily determined.

Tubercles possess a very low grade of vitality, and are composed of an aggregation of granules and corpuscular bodies of various forms and shapes, about $\frac{1}{2000}$th of an inch in their long diameter, and are composed, chemically, chiefly of nitrogenous substances, albumen, cholesterin, and many of the ordinary salts; they are very prone to degenerate, and show a great tendency to infiltration, making the ordinary "*tubercular infiltration.*" The formation of these peculiar bodies is now supposed to arise from the degeneration of inflammatory exudation, and Virchow thinks they originate from degenerate cell proliferation.

Villemin demonstrated that tubercles may be transmitted from man to the inferior animals by inoculation, and from this a transmitted specificity was argued, but it has been also proven that tuberculous deposit may take place from the mere introduction of non-specific matters into the body. Billroth states that a very small amount of irritation applied to rabbits and guinea pigs can establish tuberculosis.

The treatment of the various diseases which either directly arise from scrofulous cachexy, or are dependent thereon, would comprise more space than can be allowed here; the following medicines, however, may serve as an outline to guide the student in the selection of others, which may prove appropriate to each presenting case. Many of the diseases dependent upon struma will also be mentioned in different portions of this work.

The medicines are in general: ars., asaf., baryta c., bell., calc., cina, con., hepar, iod., lyc., merc., rhus tox., silic., sulph.; also aur., bromine, carb. an., carb. veg., cist., dulc., graph., kreos., merc. iod., staphis.

At the commencement of the disease, when children exhibit a tardiness in learning to walk, the principal medicines are: bell., calc., silic., sulph., and perhaps ars., china, cina, ferrum, lyc., magnesia mur., pinus, puls., sep.

In the second stage, when there are glandular affections, the medicines especially indicated are: bary. c., bell., bro., calc., cist., con., dulc., hepar, lyc., merc., phosph., rhus t., silic., staphis., sulph.

Cutaneous affections: aur. met., bary. c., calc., cist., clem., con., dulc., hepar, lyc., merc., mur. ac., rhus t., silic., and sulph.

For affections of the osseous system: aur. met., calc., lyc., merc., phosph., phosph. ac., puls., silic., sulph.

Atrophy—marasmus: ars., calc., and sulph., or perhaps baryta c., lyc., nux, puls., rhus.

The more particular indications are as follows:

Arsenicum.—Atrophy, with excessive swellings of the cervical and axillary glands; hard and distended abdomen, puffed face, loose evacuations, great debility, with desire to lie down, particularly in leucophlegmatic constitutions; scrofulous cutaneous affections, particularly ulcers, ophthalmia, etc.

Asafœtida.—Exostosis, caries, distortion, or curvature of the bones; engorged glands; otorrhœa; ophthalmia and ozæna.

Baryta carb.—Atrophy; enlargement and induration of the glands of the neck, and nape of the neck; bloatedness of body and face, with distension of the abdomen; physical and intellectual weakness; scald-head; ophthalmia; herpes on the face; frequent angina, great liability to take cold.

Belladonna.—Hard, swollen, or ulcerated glands, muscular weakness of infants; ophthalmia, photophobia, and blepharitis; cough with rattling of mucus; otorrhœa; inflammatory swelling of the nose; swelling of the lips; frequent epistaxis; oft-recurring phlegmonous angina; asthmatic sufferings; enlargement and hardness of the abdomen; incontinence of urine; precocity of intellect.

Calcarea carb.—Enlargement of the head with open fontanelles; distortion of the spine; incurvation of the bones, and other diseases of the osseous system; various cutaneous affections; engorged, indurated, and suppurating glands; ulcers; enlargement and hardness of the abdomen, with swelling and hyperæmia of the mesenteric glands; excessive emaciation with bulimia; wan, wrinkled face, with dull appearance of the eyes; dry flabby skin; difficulty in learning to walk; difficult dentition; ophthalmia, photophobia, and blepharitis; otorrhœa; red swelling of the nose; leucophlegmasia; constipation or frequent diarrhœa.

Cina.—When there are, besides other symptoms, verminous affections, paleness of the face, emaciation, great voracity, and incontinence of urine.

Conium.—Engorgement and induration of the glands; ophthalmia; photophobia; frequent bronchial catarrh, asthmatic sufferings, cancerous affections.

Sycamore bark has been employed for struma and scrofulous diseases for some time, and often with extraordinary results.

Dr. A. R. Clement, of Hannibal, Missouri, communicated to me on the 1st of April, 1869, the following case: "Henry V——, æt. nineteen, of a strumous habit, had been for several years unable to leave the house from the effects of an ulcer situated on the anterior inferior part of the tibia. This ulcer would slough and heal alternately, and discharge a fetid and ichorous matter. His appearance was cadaverous; when walking, his spine assumed the form of a bow, making one think that a posterior curvature existed; assistance was necessary to sustain him in a semi-upright position; when reclining, this curvature did not retain its form, or only partially; abdomen sunken; fever, with a pulse at 94. The cuticle presented a pale ashy aspect, and, with what has been enumerated, there were other symptoms of wasting disease. This was the state of affairs when the sycamore bark infusion was administered. It was given as a *dernier ressort* by the patient's friends, not that they had confidence in it as a curative agent, but merely to palliate the morbific advance. The change was radical from the start, and after a thorough course of bathing with, and drinking this infusion, persisted in for one month, the patient was able to leave the house."

In this case and in others where the sycamore bark has been used, it has been made into a tea, and taken often and in large quantities, the parts also being bathed therein.

Hepar.—Leucophlegmasia; induration and suppuration of the glands; scald-head; ophthalmia; otorrhœa; swelling of the nose and upper lip; cancerous ulcers; tendency to phlegmonous angina; unhealthy skin.

Iodium is useful when there is excessive emaciation; engorgement and induration of the glands, with affections of the whole lymphatic system; diseases of the bones; ophthalmia; blepharophthalmia; otitis and otorrhœa.

Lycopodium.—Inflammation, suppuration, and ulceration of the glands; affections of the mucous membranes; inflammation, distortion, and other affections of the bones; atrophy; herpetic eruptions; ophthalmia, otitis, and otorrhœa; frequent angina.

Mercurius.—Physical and intellectual weakness; inflammation of the mucous membranes; great liability to take cold; diseases of the glandular system; exostosis, distortion, curvature, caries, and other affections of the bones; cutaneous affections.

Rhus tox.—Engorgement of the glands; scald-head and other cutaneous affections; emaciation; hardness and distension of the abdomen.

Silicea.—Diseases of the bones and skin; cancerous affections; tendency to ulceration; swelling of the face.

Sulph.—This medicine in many cases is useful when commencing the treatment of scrofulous affections; it has very many symptoms, which it is unnecessary to mention here.

A scrofulous ulcer is distinguished from other sores by its inert, pale, and torpid appearance, and the peculiar character of the pus, which at first con-

tains many cheesy flocculi, but after a time becomes thin and corrosive. The state of the atmosphere is remarked by some authors to possess influence over the appearance of the ulcer. In fair weather it may appear disposed to heal, but in damp, cloudy, and rainy seasons it presents a most unhealthy appearance. The bottom of the sore is uneven, warty, fungous, or ash-colored; it is extremely difficult to heal, but sometimes after suppurating for years the sore closes, leaving a disfiguring cicatrix. These ulcers frequently arise in glandular parts, after inflammation and suppuration. If the gland is merely swollen when the surgeon is called, by the exhibition of aur., baryt. c., cistus can., con., dulc., or rhus t., in accordance to presenting symptoms, suppuration may be prevented.

Hartmann writes: "To judge by the symptoms, the *cistus canadensis* seems to be a highly important remedy for scrofulous ulcers. It has swelling of the glands, also with suppuration; scrofulous ulcers, and other scrofulous ailments; violent chilliness with shaking, followed by heat, with redness and swelling of the ears, and swelling of the cervical glands; discharge of moisture and badly smelling pus from the ears; inflammation and painful swelling of the nose; caries of the lower jaw; even the swollen, loose, readily-bleeding, and sickly-looking gums. The frequent nausea, the diarrhœa after eating fruit, and the pains in the larynx, are indications of the anti-scrofulous nature of this drug."*

Dr. Hempel relates a case, in which the ulcerative process had invaded the nose, and one whole side of the face, threatening to totally destroy all the surrounding parts, and to relieve which American and European physicians of the highest standing had exhausted all the resources of their skill without any apparent effect, that was radically healed by using an infusion of *cistus canadensis* internally, and embrocations of the same plant externally. The patient was an interesting young lady of eighteen years of age.†

The ulmus rubra, bayberry, the cornus circinata, phytolacca and trillium, have all been used, especially throughout the western portion of our country, for the varied ailments arising from scrofula.

The more minute treatment of scrofulous diseases will be detailed in other chapters.

Dr. E. M. Hale‡ has found *cistus canadensis* better than calcarea when the patient is thin and scrawny, and stillingia should be used if a syphilitic taint is suspected.

CHAPTER VIII.

VENEREAL DISEASE.

History of Syphilis—Gonorrhœa—Gleet—Balanitis—Gonorrhœa in Women—Gonorrhœal Rheumatism—Gonorrhœal Ophthalmia—Sycosis.

History of Syphilis.—Under the name venereal disease we find gonorrhœa or blennorrhœa; the soft chancre or chancroid; and the "true chancre," or "hard chancre," or "indurated chancre," of Hunter, together with the many symptoms and appearances known as syphilis.

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* See Hartmann's Diseases of Children, p. 379. † Loc. cit., p. 380.

‡ New England Medical Gazette, vol. xii, p. 446, 1877.

The question concerning the origin of syphilis, has given rise to much argument, and to many learned discussions. The three suppositions that appear most worthy of notice are:

1st. That the disease was brought from America by the Spaniards.

2d. That it originated in Europe.

3d. That it has been observed from the earliest periods of human existence.

The first of these suppositions was promulgated to a great extent by Oveido, a Spaniard; indeed, he received from writers upon this subject the entire credit of having traced the source of the disorder. To whatever reputation, however, may attach to such research, Oveido was not entitled, inasmuch as Leonhard Schmauss, Professor at Saltzberg, in the year 1518, had declared the same fact. The opinion of Schmauss was adopted by Chevalier Ulric Van Hutton (known afterwards for his zeal and attachment to the cause of Luther) A.D. 1519. The assertion, nevertheless, of its American origin did not find very many supporters, notwithstanding it was strenuously advocated and enforced by Oveido. Among those, however, whose minds were impressed with its truth, were several individuals of much celebrity. If Oveido was quite sincere in the opinion he expressed, it is certain that feelings of a personal nature very much contributed to augment the warmth and energy with which he maintained his position.

Among the distinguished opposers of the American origin of this disorder was Van Helmont, who believed it to be a new disease, supposed its birthplace to be Europe, and that it was generated in the army of Charles VIII, at the siege of Naples. Howard, at a later period, supported the same opinion.

In the year 1680, Samuel Jansen, who had resided for some years in the West Indies, not having observed the appearance of syphilis endemically, supposed that it was brought by the slaves from Africa. It is well known that both Sydenham and Boerhaave favored this opinion, and the latter defended it warmly in 1751. But slaves were not carried to America previous to the year 1503, and at that time the disease was prevailing over all Europe.

An Italian alchemist propagated, also, a very curious *idea* concerning the origin of this disease. Lord Bacon credited the story, and endeavored by his writings to render it more plausible. "The length of the siege of Naples," says Leonardo Fioravanti, "having caused a famine among the French and Spanish troops, the merchants who brought food to the soldiers sold them various articles prepared from human flesh, and all those who made use of the horrible aliment were soon affected with syphilis, which was disseminated by contagion through Italy, France, and Spain." Finally, J. Astruc,* a man of much learning and great natural talent, but whose acquirements, according to Jourdan, have been greatly exaggerated, endeavored, and succeeded in many instances, in convincing the world that the disease was imported from America. He was supported, also, by Christopher Girtanner, a person of many and varied literary and scientific attainments. But Jourdan, taking up the arguments that were brought forward, disposes of them one by one in a most satisfactory manner. His pamphlet† bears the impress of deep thought, and of a vast amount of learning, toil, and research, and should be perused by every student who is

* De Morbus Veneris, Libri Sex, Paris, 1736.

† Historical and Critical Observations on Syphilis.

interested in this subject. He says (p. 44): "The question is generally put, did syphilis appear for the first time towards the end of the fifteenth century? The terms are not sufficiently explicit, since, as a preliminary matter, it is necessary to explain what is meant by syphilis. Now this definition, which has been neglected by all writers, is the only way of duly appreciating, judging, and reconciling the different opinions successively advanced on this subject. By the term *syphilis*, therefore, is to be understood: 1st. A general affection of the system, which presents itself under a most frightful aspect, with many particular modifications, assuming a real epidemical character. In this sense the word designates the disease which broke out towards the end of the fifteenth century. 2d. It may serve to express morbid symptoms arising from an intercourse with a disordered person, communicated in the same way to other individuals, and having with each other a more or less intimate connection. Now, if we use the word syphilis in this last sense, it can be incontestably proved, that from the remotest antiquity the diseases which it designates were known."

He then proceeds to prove his above statement with a "master hand," and mentions among others who have noted the disease, Guy de Chauliac. Peter Argelata says that pustules arise on the penis *ex materia "venemosa quæ retinetur et remanet inter præputium et pellem cutis exactione viri cum fœda muliere."* In the thirteenth century, Lanfranc, Salicet, and others, spoke of the same disease in terms which prove how far they considered it worthy of attention. There have been also many passages collected by Becket from manuscripts which make mention of it. What likewise proves that the diseases of that period were considered of a serious and formidable character is, that the authorities in order to prevent their propagation enacted severe laws, the penalties for the violation of which were rigidly exacted. Hence the regulations for the *houses of pleasure* in London in the years 1162 and 1430. Similar establishments and regulations existed in most of the large cities of Europe from the time of Charlemagne. Medical and historical writers make mention of diseases contracted at such houses, called *clapiers*. Jourdan quotes many authorities in favor of the affection having been noticed and mentioned by writers at a very early date,* but it is unnecessary that they should be named here.

He is also of opinion that the terrible epidemic which prevailed about the close of the fifteenth century, originated with the *Marranes* (hogs). This term was applied to those Moors and Jews who had entirely disregarded the teachings of Christianity, and refused to enlist under its banner; for this offence they were expelled from Spain by an edict of King Ferdinand, dated March, 1492. The persecutions were unremitting, and the tortures to which this unfortunate class were subjected were horrible in the extreme, to avoid which they concealed their belief, but secretly practiced those rules that were prescribed by their religion. They are described as living in the most disgusting and loathsome manner, and leprosy among them was alleged to be common. They were driven from their homes, not allowed to carry with them any of their property, and very many of them retired to the northern coasts of Africa, where they propagated a disease so terribly contagious, that of 170,000 families who crossed to Africa, 30,000 were destroyed. Jourdan says:† "When we compare the testimonies of the most veridical historians and physicians, we think it impossible to doubt its being derived from the Marranes, who were expelled from Spain before the discovery of America." Fulgosi, among others, tells us that it origi-

* See Leviticus, chap. xv, 2-27.

† Loc. cit., p. 99.

nated in Ethiopia, "*quæ pestis, ita enim visa est, primo ex Hispania in Italia allata, et ad Hispanos ex Ethiopia.*" At that time all the parts of Spain occupied by the Moors were called Africa, and afterwards Ethiopia. Infessura, who noticed the first ravages of the epidemic at Rome, calls it *pestis Marranorum: Mortui sunt quam plurimi ex peste et contagione Marranorum.* Beniveni, Benedetti, and Trascatorius derive it from Spain. John Trithamius, abbot of Spanheim, likewise informs us that it originated in that country: *habet suæ infectiones pestiferæ principium in Hispanio.* The period of its appearance exactly corresponds to that of the expulsion of the Marranes. Fulgosi announces its existence in Lombardy as early as 1492. We find it among the Germans in 1493 and 1494. John Pomarus says it appeared in Saxony in 1493. Henry Bunting affirms the same thing for Brunswick and Lunenburgh. According to John Sciphover, it broke out in 1494 in Westphalia, from whence it soon spread from the coasts of the Baltic Sea to Pomerania and Prussia; and, as mentioned by Linturius, it manifested itself in 1494 on the borders of the Rhine, in Suabia, Franconia, and Bavaria. Now the expulsion of the Marranes dates from the year 1492. These unfortunate wretches who left Spain, according to Fabricius, to the number of 124,000 families, or of 170,000, as mentioned by Mariana, lost, according to the same Fabricius and John Mariana, 30,000 families of a most fatal epidemic, which appeared to be of a peculiar nature. The disease not merely spread to Rome, as mentioned by Infessura, but also infected Naples, according to Zureta and Collenuccio, and even was propagated to the coasts of Barbary. Leo, the African, says, that the disease anterior to the landing of the Marranes was unknown in Africa. Paul Jovius attributes also the extension of the disease to these exiles. Finally, some passages from Peter Martyr, Francis de Villaloros, and Peter Pinctor, which, owing to their want of clearness, have been refuted by the partisans of the American origin, seem to indicate that the epidemic already existed in Spain during the last twenty years of the fifteenth century, consequently before 1490. It is not surprising that such considerable collections of people, whom the avarice of Ferdinand had deprived of all the necessaries of life, and consequently thrown into the most disgusting filth, the inseparable attendant on misery, should have spread wherever they passed a contagious cutaneous disease, complicated with scorbutic symptoms, which were necessarily produced by the dampness and the excessive heat of the weather. This is the idea we naturally form of the terrible epidemic of the fifteenth century.

The epidemic thus spread over all portions of Europe. In Germany* the propagation of the disease was principally attributed to the Lansquenets, a military rabble, who were constantly ready to sell their lives and blood to the highest bidder. In the latter end of the fifteenth century, the whole of Europe being engaged in war, the disease once propagated among the common soldiers, readily spread over the whole continent. A similar confusion prevailed in regard to the mode in which the disease was propagated. It was believed by many, that the virus could be carried in the atmosphere, or that any article which a person afflicted with the disease had touched, was capable of imparting the disorder. Fallopius supposed that the disease might be propagated by the holy water into which a syphilitic patient had dipped his finger.

In the year 1556, Fernel proved that the disease originated from a specific cause, emanating from some affected individual, and acting upon one in health; he opposed the idea of the transmission of the virus by the at-

* See Gollmann, On Diseases of the Urinary and Sexual Organs, p. 45.

mosphere, and denied the belief in cosmic or astrological influences; he also described with tolerable accuracy its mode of transmission. After a lapse of three hundred years, Fernel's picture of the syphilitic disease is still true, as is shown by the descriptions of the most enlightened and learned physicians of the present day.

Gonorrhœa, or a contagious secretion from the urethra in the male, and from the urethra and vagina in females, is a disease of very ancient date. It arises from impure connection, from contact of inflammatory secretions, introduction of instruments, etc., and may be divided into three stages. 1. That of incubation. 2. The inflammatory. 3. The subacute stage. When the discharge ceases, burning and pain disappear, and the parts regain their original condition; or if not properly managed a gleet may remain, which may last for months, nay, even for years.

The symptoms are as follows: A few days, generally from four to six, or even more,* after copulation, a tickling or slight itching is felt in the urethra near the frænum; this sensation continues one or two days, when the mouth of the urethra acquires an increased sensibility, becomes red and swollen, and there oozes or is discharged a limpid or yellow matter which stains the linen. When the running occurs the titillation increases and becomes more painful, especially during the emission of urine, which is followed by a smarting and burning in the affected part. In some persons the first symptom observed is the discharge of thick mucus; in these cases the patient experiences a painful scalding when passing water.

These symptoms usually increase for three or four days; sometimes, however, not sensibly, for eight to twelve days. The glans penis acquires a dark red livid color; the discharge becomes more profuse, the matter becoming of a yellowish-green color, the swelling of the glans and sometimes even of the whole penis becomes considerable, the patient experiences a frequent desire to void urine, and suffers, particularly when he has been some time in bed, lying on his back, from involuntary erections, so frequent as to disturb his rest.

In many cases the inflammation extends to the reticular substance of the corpus spongiosum; the erections, when this is the case, become extremely painful, the frænum being drawn down, while the body of the penis is forced upward, from extreme turgescence: such a condition is termed *chordee*. When in this state the vessels of the urethra are often ruptured, occasioning considerable hæmorrhage, while at other times the discharge is only streaked with blood. The prepuce is also at the same time so inflamed and swollen that it cannot be drawn back, or when retracted it cannot be returned.

In some instances the urethra discharges small clots or even fluid blood, and there are evident marks of an ulceration of the urethra.

The inflammation may increase to such an extent that there will be no secretion from the glands and the membranes lining the canals. All discharge then ceases, and it is to this form of the disease that some authors have improperly applied the term *gonorrhœa sicca*, or dry clap.

But the symptoms, their time of appearance, and their violence, vary greatly in different individuals. Mr. Hunter has well remarked† that "the variety of symptoms in a gonorrhœa, and the difference of them in different cases, are almost endless. The discharge often appears without

* Gonorrhœa may lie dormant in the system for a considerable time, or it may be retarded in its course by some other disorder attended with fever. For corroboration of this, see London Lancet, June, 1845, p 526. I also omit from the definition the term "specific" on account of the present unsettled nature of the question.

† Hunter on the Venereal, p. 61.

any pain, and the accession of pain is not at any stated time after the appearance of the discharge. There is often no pain at all, though the matter thrown out may be considerable in quantity and of bad appearance. The pain often goes off while the discharge continues, and will sometimes return again. An itching in some cases is felt for a considerable time, which sometimes is succeeded by pain, though in many cases it continues to the end of the disease. On the other hand, the pain is often troublesome and considerable, even when the discharge is trifling or none at all. In general, the inflammation in the urethra does not extend beyond an inch or two from the orifice; sometimes it runs all along the urethra to the bladder, and even to the kidneys; and in some cases spreads in the substance of the urethra, producing a chordee. The glands of the urethra inflame, and often suppurate. The neighboring parts sympathize—as the glands of the groin, the testicle, and the pubes—with the upper parts of the thighs and abdominal muscles."

In the worst cases, small indurations may often be felt in the course of the urethra, and the prostate gland partakes of the inflammation; in which event a sense of heat, weight, and fulness are experienced in the perinæum, with pain in the hypogastrium, dysuria, and tenesmus, particularly when the disease has spread to the bladder or its cervix. Abscess, fistula, and permanent disease of the prostate, or stricture of the urethra, are the occasional results of such complications. Phimosis, orchitis, and bubo, not frequently take place from the extension of the inflammation to the prepuce, testes, and glands of the groin, during the course of gonorrhœa.

In the majority of instances gonorrhœa is occasioned by impure coitus; but there are many discharges from the urethra which are occasioned by copulation with menstruating women, or those having leucorrhœa or some acrid discharge from the genitals. This, no doubt, is of frequent occurrence, and should be remembered by the surgeon before giving a positive diagnosis. The symptoms presented when the disease has been occasioned by the causes just mentioned are not different from those occurring from true gonorrhœal virus, and are often very intractable, and followed by a gleety discharge of very long duration.

On this subject Ricord, in his Letters,* says: "But when we go back in the most rigorous manner and with the severest criticism to the determining causes of the best-characterized gonorrhœas, we are forced to acknowledge that a virus is most usually wanting. Nothing is more common than to find women who have communicated blennorrhagias the most intense, the most persistent, the most varied and of the gravest character, who were only affected with uterine catarrhs, which sometimes were scarcely purulent. In other cases the menstrual flux seems to have been the only cause of the communicated disease. Finally, in a great number of cases, we find *nothing at all*, or only simple changes in diet; fatigue; excesses in sexual connection; the use of certain drinks—beer; of certain food—asparagus.

"From this arises that frequency of belief on the part of patients, a belief very often legitimate, that they owe their clap to a perfectly healthy woman.

"On this point I assuredly know all the causes of error, and I have the pretension to say, that no one more than myself holds himself on his guard against frauds of every kind, scattered in the path of the observer; but it is with knowledge of the cause that I advance this proposition: *women fre-*

* Ricord's Letters on Syphilis, p. 47.

quently give gonorrhœa without having it. I do not think I go too far in saying that women give twenty claps for one they receive."

Masturbation is also another frequent cause of urethritis; the passage of bougies; the internal administration of both mercury and cantharides; worms in the rectum, and other causes. I know of an instance in which sea-bathing invariably produced an attack of gonorrhœa in a gentleman living far in the interior of the country, who occasionally visited the sea-side during the heated term.

An outbreak of secondary syphilitic symptoms often occasions a discharge from the urethra. In such cases as these, particular attention should be given to the case, as the secondary secretions are virulent in the virgin subject, and would produce chancre.

Gleet, or the existence of a serous or muco-purulent, pale green, or colorless discharge from the urethra, is not an unfrequent occurrence after an attack of acute inflammation. It is commonly attributed to chronic inflammatory action. The most trifling error in diet, and particularly the use of spirits, wine, and pungent condiments, is generally followed in those affected with the disease by a frequent inclination to void water, a degree of ardor urinæ, and increased oozing of matter. This state often continues for years, and grows more and more aggravated, until at length a permanent stricture is formed, or thickening of the bladder, disease of the prostate, or even of the kidneys, becomes established.

Treatment.—There is a prophylactic treatment of gonorrhœa, which is often serviceable. It is also termed the "abortive treatment." The difficulty in adopting it chiefly arises from the fact, that in eight out of ten cases, the physician does not see the patient until the period of incubation has passed away, and the inflammatory condition appeared.

If the virus or iritating substance can be neutralized, or otherwise disposed of before it excites its train of distressing symptoms, the sooner it is antidoted the better.

An injection composed of nitrate of silver, ten grains to the ounce of water, and used once, or at most twice, will destroy a gonorrhœa; but such treatment must not be attempted if the symptoms of the inflammatory stage are beginning to show themselves; then other means must be used.

Some authorities, among whom are Bumstead, greatly prefer the application of a weaker solution of the nitrate, one or two grains to the ounce, the solution being used more frequently. This with me has not been marked with such good results as one single strong caustic injection.

The best syringes are of hard rubber, containing about half an ounce of fluid. The instrument should be twice filled, and the whole surface of the urethra be washed with the injection.

Glass or metal syringes are objectionable; the former are too easily broken; the latter are liable to vitiate the solution employed.

Before the use of the syringe the patient should urinate, or I frequently direct that a stream of water be thoroughly injected before having recourse to the medicated solution. By this the discharges are washed from the urethra, and the injection comes in more direct contact with the mucous surface. There is no doubt of the efficacy of this treatment, if it be employed at the proper time, nor, on the other hand, can there be a question of its hurtfulness if it be used after the inflammatory stage has commenced. I have known men who, living irregular and dissipated lives, after a suspicious coitus, immediately employed an injection of nitrate of silver, ten grains to the ounce, and for years never experienced a symptom of gonorrhœa. A typical case of this kind recently occurred: Two men had connection with one woman on the same night, one took the precaution to use the in-

jection; the other, somewhat overcome with stimulus, neglected to use it, and in three days was attacked with a virulent gonorrhœa. The other escaped.

When the inflammatory stage has begun, the most reliable medicine in our Materia Medica is aconite. It must be given in the first or second dilution, and frequently. This medicine does not allay the discharge, which often increases during its exhibition, but it subdues the inflammatory symptoms and gives the patient rest.

When burning begins, *cannabis* should be administered, and there is no doubt that it has a specific influence upon the disorder, and, according to a tolerably large experience, the twelfth or thirteenth dilution acts better than the tincture often employed. *Cannabis* in tincture relieves the burning and itching, but has not so much influence on the discharge. I recollect once curing a case of gonorrhœa, which had not yielded to injections and other allopathic and homœopathic treatment, with a few large-sized globules of *cannabis*[12]. There are many cases that neither *aconite* nor *cannabis* will reach; in such, if there is much *ardor urinæ*, *copaiba* should be prescribed. This may be given in five-drop doses of the first dilution, and taken until the odor is perceived in the urine. If the burning is excessive and *cannabis* has not relieved, *sepia* and *mercurius* are often indicated by corresponding constitutional symptoms.

Petroselinum is efficacious in claps, in which the *ardor urinæ* is very distressing. It has a remarkable influence over the urinary organs, and in cases of strangury, in which *cantharides* has failed, it has proved successful. *Capsicum* and *cantharides* are also useful medicines when there is strangury. If the inguinal glands are enlarging, and there is a greenish muco-purulent discharge, *mercurius sol.*, second or third trituration, given once in three or four hours will produce good results. Very often during the administration of these medicines, it may be necessary to give a few doses of *sulphur*, or sometimes *hepar sulphuris* may be more strongly indicated.

Sandalwood Oil.—This medicine in five-drop doses in the inflammatory stage is most useful, after aconite, when the burning is intense. It must not, however, be taken for more than four or five days in this dose, otherwise the physiological action of the medicine may be manifested.

With reference to the use of injections, as there are very many of our school who employ them, and I have frequently had from them good results, it is proper to notice them in this place. My friend Dr. William H. Holcomb, of New Orleans, employs the following formula:

℞. Plumbi acet., ... grs. iv.
Morph. acet., ... grs. iv.
Aquæ font, ... ℥iv.
M. ft. sol. S. Inject every six hours.

In addition to this he prepares a solution of two drops of the tincture of copaiba in one ounce of alcohol, and orders ten drops three times a day.* This treatment I have never employed, but Dr. H. speaks well of its efficacy.

Hempel, in his *Materia Medica*, recommends the chloride of platina.

A solution of the chlorate of potash, one drachm of the salt to eight ounces of water, injected every twelve hours, is also alleged to be a specific.

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* *Vide* United States Med. and Surgical Journal, vol. i, p. 231.

The following treatment has also been recommended: During the first stage the application of

℞. Ext. acet. opii, ... grs. xxx.
Aquæ, ... ℥ij.
M. ft. sol.

After the inflammatory action has been subdued the internal administration of the biniodide of mercury in the second trituration, and in the third stage, copaiba given until diuresis is produced.

Other injections are:

℞. Argent. nitrat.,	grs. iij.	Aquæ destil.,	℥vi.
℞. Acid. nitrat. merc.,	grs. ij.	Aquæ,	℥ij.
℞. Liq. zinci chlor.,	grs. ij.	Aquæ destil.,	℥ij.
℞. Vini rubri,		Aquæ puræ, āā,	℥iv.
℞. Acid. tannic,	grs. xx.	Aquæ destil.,	℥iv.

A successful treatment by injection, as reported by Dr. Bachelder, is a solution composed of

℞. Liquor zinci chlor., ... gtt. xxiv.
Aquæ font, ... ℥iv.
M. ft. sol.

He states that the cure is generally made in five or six days, and that the patients need no other medicine; he recommends the continued use of cold water injections for six or eight days after ceasing with the zinc solution.

I rarely have recourse to injections in gonorrhœa, and never during the inflammatory stage. I have had occasion, when the subacute period was approaching, and when I had tried many medicines in vain, to use injections, and I have employed many. Those which I use most satisfactorily are the following:

℞. Zinci sulph., ... grs. iv.
Zinci acetat., ... grs. iv.
Vini opii, ... ℥ij.
Aquæ distil., ... ℥vj.
M. ft. sol. S. Use three times a day.

Or

℞. Hydrast. sub. mur., ... ℥j.
Aquæ font, ... ℥v.
M. ft. sol. S. Use three times a day.

Dr. T. C. Gruber, of Lawrence, Kansas, reports* nine cases of gonorrhœa cured by *erigeron can.* He gives the medicine in tincture, and uses injections of the same.

My friend, Dr. Kenyon, of Buffalo, has given a detailed account of some remarkable cures made by *gelseminum*,† in cases in which the discharge had been suddenly and prematurely arrested by improperly used injections. In several cases constitutional symptoms were benefited as the discharge returned. I have observed a similar train of symptoms result from the use of the oil of sandalwood.

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* Western Homœopathic Observer, vol. iv, p. 172.
‡ *Vide* Western Homœopathic Observer, 1869.

Capsicum is recommended when the discharge is whitish and purulent, and ardor urinæ experienced when making water. Ferrum, pulsatilla, and also nux vomica are stated to be useful, when capsicum failed to relieve the symptoms quoted. Sulph. and merc. are considered the most useful in cases where the patient has previously been under a course of copaiba or cubebs. Nit. ac. is often very serviceable in gonorrhœa as soon as the inflammatory stage is over, but generally requires to be followed by sulph. if the pain has subsided but the discharge continues. When the inflammation has evidently extended far down the urethra, much benefit has been derived from the use of canth. and cann., and in some cases from nux vom. when the discharge is serous and scanty, the desire to pass water frequent and urgent, the act of urination painful and difficult, the stream of urine broken or forked, in short, when symptoms present the appearance of the formation of stricture or a tendency thereto.

In addition to the above medicines, nit. ac. may be mentioned as useful in gleet; likewise sep., lyc., cub., silic., calc., thuja, nat. mur., and dulc. When, in consequence of errors in diet, the use of wines, spirits, acids, etc., an increased discharge takes place, accompanied with frequent desire to urinate, with scalding pain, nux vom., or one or more of those medicines enumerated above, must be employed.

Tussilago petasites has been recommended as an efficacious remedy in recent as well as in chronic gonorrhœa.* If aggravation follows the first dose or two of the medicine, it must be given in a weaker or more dilute form. When there is a complication of gonorrhœa and chancre, or when the discharge from the urethra is found to proceed from chancres within the tube, merc. should be prescribed. And when there are condylomata on or in the vicinity of the genital organs, or there is reason to suppose that the discharge from the urethra is of sycotic origin, thuj. and nit. ac., or cinnabar, merc., or sulph. are the principal medicines with which the cure is to be accomplished. Against symptomatic buboes, carb. an. is considered as one of the most efficacious remedies. Silic. and merc. may also be named as likely to be useful in some cases.

If cystitis ensue in consequence of the extension of the inflammation to the mucous membrane of the bladder, canth. and cann. will claim the principal attention.

During the treatment of gonorrhœa, wine, spirits, and malt liquors should be abstained from. Pure cold water is the best diluent, and may be freely partaken. Active exercise should be shunned during the inflammatory stage, and when it cannot be wholly avoided, a suspensory bandage worn. If the inflammation be extensive, or the parts much swollen, confinement to the recumbent posture becomes requisite.

The more minute indications for the medicines that are serviceable, are as follows:

Agnus castus is especially adapted to a yellow purulent discharge from the urethra after the inflammatory symptoms have subsided, and also to cases of gleet, accompanied by want of erections and deficient sexual desire.

Argen. nit. is useful when the emission of urine is accompanied with burning, and if a sensation be experienced as though the urethra were closed, not allowing a free passage for the urine. It is also indicated by dragging and cutting pains in the tube, with feeling of soreness after micturition, hæmorrhage from the parts, with painful tensive erections (*chordee*).

Balsam cop should be exhibited when there is smarting, burning, and itching before and after micturition, with swelling of the orifice of the urethra, and painful soreness of the whole canal, with purulent discharge.

* British Journal of Homœopathy, vol. iii, p. 125.

Cannabis presents the following symptoms: Smarting pain, constant urging to urinate, with burning and stinging during micturition, titillation, gluing together of the external orifice of the canal by a moisture which is forced out on compressing the glans.

In regard to *cannabis*, it may be observed in this place that it is a medicine which accords in its pathogenesis with very many of the symptoms of gonorrhœa. Its specific suitableness to the complaint is attested by numerous physicians. In further corroboration of its efficacy, the author is assured by a practitioner who has had much experience in the treatment of gonorrhœa, that he has been not only gratified, but surprised at its efficacy in subduing the disorder. The symptoms which point to its use may be present at any period, but exhibit themselves in cases somewhat advanced, as well as in those more chronic. In the latter especially is its power apparent; cases that for two, three or more months, which had fruitlessly been tampered with by allopaths of high station, were immediately arrested and speedily cured. In truth, the disorder was checked by the first dose, consisting only of a few globules of the medicine, and a few more doses, at intervals regulated by the symptoms, accomplished complete cures. The attenuation, however, of the medicine is an important consideration in the treatment, the exhibition of the lower causing disappointment, while successful result is obtained from the higher potencies only.

The gentleman whose testimony has just been given, commenced with the second and third dilutions, but failed; and it was only by resorting to higher dynamizations, that he learned that the sphere of curative action for gonorrhœal disorder, exists in the preparations as highly attenuated as the thirtieth, the latter being the strength of the medicine which he then always administered.

Facts like these, attested by gentlemen of high social position, as well as of acknowledged ability, certainly convert the childlike smile of incredulity into that of imbecility, as expressed upon the countenances of individuals who, with so much pleasant self-sufficiency, fancy themselves the sole depositaries of all medical science.

Canth.—Cutting in the urethra during and after micturition; discharge leaving a yellow stain on the linen, which is increased as the disease becomes chronic. This agent frequently shortens the attack if administered as soon as the first signs of inflammation become apparent; it is also excellent for chordee.

Capsicum.—Burning at the meatus urinarius externus before, during, and after micturition, with cutting pain and sensitiveness to contact; pricking as with pins in the forepart of the tube, and thick, purulent, yellow discharge.

Cocc.—Tensive aching pain in the orifice of the urethra between the acts of micturition; also itching stinging near the fossa navicularis.

Ferrum.—Discharge of mucus from the urethra after a cold.

Merc. sol.—Burning pain in the corpus spongiosum when touching the penis. Inflammation and swelling of the forepart of the canal, with suppuration between the glans and prepuce. Redness and heat, with painfulness of urethra when touching the part, or when walking, accompanied by a severe pain in the forehead, the urine being voided in a thin stream. Itching and stinging pains, accompanied with greenish discharge, especially at night; secretion may not amount to more than a moisture.

Mez.—Stinging, titillating, with discharge of a little moisture from the urethra. Tearing and drawing through the whole canal, commencing at the perinæum; also painful soreness of the tube when touching it, partly before and partly during micturition, and discharge of watery mucus during exercise.

Nux vom.—Pressive pain at the meatus urinarius between the acts of micturition, accompanied by shuddering; sharp pressure, as with a cutting instrument, in the forepart of the urethra, also at the bladder, perinæum, and anus, with contractive pain between the acts of urination, and discharge of mucus.

Petroselinum.—Tingling and pressure in the region of Cowper's glands, especi-

ally early in the morning in bed, abating when standing or sitting; drawing and pressure in the navicular fossa, with discharge of a yellow, glutinous matter.

Puls.—Thin stream of urine, occasioned by contraction of the parts, with discharge of blood, swelling of the testes, and inflammation of the eyes, caused by suppression of gonorrhœa.

Merc. cor.—Inflammation of the meatus urinarius, with itching-smarting pain during micturition, the discharge being at first thin and watery, but afterwards thick and yellowish.

Sulph.—Burning in the forepart of the urethra internally and externally. In the first stage of the disease the medicine should be employed when there is redness and inflammation of the meatus urinarius, the urine voided in a thin stream, itching in the middle of the canal with constant desire to void the urine, with tearing and stinging between the acts of micturition, which is sometimes accompanied with tearing and stinging pain.

Stillingia.—This medicine has a specific action in many cases of chordee and threatened cystitis. In large doses it has produced such marked effects that it has been discontinued. Its symptoms are painful erections, with burning and itching during micturition

Thuja.—Burning in the urethra, or piercing stitches near its orifice between the acts of micturition; sensation as though a drop of urine were passing from the canal, with drawing and cutting pains.

During the treatment the strictest cleanliness must be observed. The penis should be often washed with tepid or cold water, and the rags that are used to prevent the discharge from staining the linen should be frequently removed and fresh ones substituted.

In his work on the new remedies, Dr. Hale records many medicines as useful in gonorrhœa and gleet; among them we find *eryngium aquaticum*, *hydrastis*, *phytolacca*, *sanguinaria*, *erigeron canadense*, and *stillingia*. The management of gleet is one of the *opprobria medicorum*. There is scarcely a physician in either school of ten years' practice who has not been troubled with the persistency of gleet. A drop or two of discharge will be found every morning agglutinating the lips of the meatus urinarius, and no matter what treatment be adopted, a "drop or two" will still appear. The medicines which apparently, with me, have answered best in this unsymptomatic complaint, were *sulphur*, *silicea*, *thuja*, *fluoric acid*, *cimicifuga*, and *sepia*. Dr. Hastings, in the *British Journal of Homœopathy*, speaks very highly of an injection composed of a solution of *agnus castus*, and records cases in which the treatment was efficacious.* I have not been so fortunate with it, having given it in many cases a careful trial without perceptible results.

Dr. L. J. Williamson states that he has employed with "magical effect" a No. 6 bougie smeared with a solution of *carbolic acid* and glycerin, eight grains of the former to half an ounce of the latter.

Injections of *bismuth*, one drachm to one ounce of water, have also been employed.

The persistent use of *sulphur*, however, has afforded me at times satisfactory results, but this, like other remedies often fails. I am acquainted with a gentleman who was troubled with this disorder for nearly three years, who cured himself permanently by using for two months an injection of equal parts of claret and water. Many methods of treatment, and very many substances have been used and lauded, but I frankly confess and avow that as yet gleet is one of the most incorrigible affections the surgeon or physician is called upon to treat.

Balanitis—Gonorrhœa Præputialis—Spurious Gonorrhœa.—This disease is called also *spurious gonorrhœa*, *gonorrhœa præputialis*, or *external blennorrhagia*, and is caused by impure coitus, and those discharges which give rise to gonorrhœa of the urethra. Persons who have an unusually

* Vol. xiii, p. 590.

elongated prepuce, or those who are not cleanly in their habits, are very liable to be attacked. There is first a sensitiveness of the glans penis, with itching, burning, and soreness, increased by friction from walking; the inflammation may be quite severe, and the swelling so tense as to prevent the escape of the discharge, which finally may give rise to a distressing abscess. The mucous surface, both of the glans and prepuce, secretes a fluid which varies in quantity and in consistency, and gives rise to excoriations in different parts of the implicated surfaces. The system does not suffer from this inflammation of the glans, and the disorder is more amenable to treatment than that previously described.

Treatment.—The first requirement is absolute cleanliness. If the swelling of the prepuce be so tense as to prevent its retraction over the corona glandis, the nozzle of a small syringe must be introduced underneath the fold, and the parts thoroughly cleansed; this ought to be done at least three times a day. A warm sitz-bath is very beneficial. As soon as the inflammation has subsided, which the internal administration of aconite generally causes, the prepuce must be carefully retracted, and the first trituration of mercurius vivus sprinkled upon the part. This must be repeated after each washing. I have rarely found other medicines necessary. Some authorities recommend washing the surfaces with a weak solution of either the nitrate of silver, the acetate of lead, or sulphate of zinc, and Mr. Langston Parker recommends the following formula for local application:

℞. Cerati simplicis, vel mellis,
Olei Olivæ, ää., ... ℥j.
Hydrarg. chloridi, ... ℈ss.
Ext. opii, ... ℥j.
M.

The patient to be kept as quiet as possible, and should confine himself to light and wholesome food. The various complications of gonorrhœa, as orchitis, stricture, and ophthalmia, are noticed in another place.

Gonorrhœa in women is more difficult to detect than in men, for many reasons, chiefly, however, from the fact, that there is so large a mucous surface lining the vagina, the uterus, and urethra, which often secretes a purulent discharge, with burning during micturition, in females who have never had sexual intercourse. Another cause of difficulty of diagnosis, and one which is alluded to by Bumstead, is the difficulty in obtaining a true history of the case. He says: "The history of women seeking advice from gonorrhœa, can rarely be ascertained with certainty, or the disease traced with accuracy to its source. It is notorious that a woman often receives the embraces of several men within a short space of time, and there are many reasons for her concealing important facts which a man would readily confide to his physician. Women also can have more intercourse than men, and fabulous stories are told of Messalina, who used in *one night* one hundred and sixty men, without having her passion gratified." Bechand Rival relates "that during the first French revolution, a beautiful and modest girl was ravished by twenty-eight hussars, and that the only bad effects of this violence were a slight irritation of the vagina, and a few scratches, which soon healed."*

I have seen a purulent discharge with inflammation of the vulva in young children of seven to ten years of age, in two instances accompanying verminous affections, and in three others appearing without any assignable cause. Several of these young girls were in such social position and were of such ages that the slightest shade of suspicion could not be entertained. From

* *Vide* Golmann's Chapter on Sexual Excesses, p. 209.

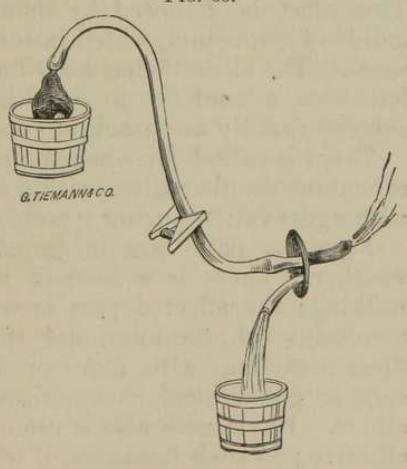
all these facts, in many cases there is an impossibility to pronounce positively as to the presence of gonorrhœa in the female.

The symptoms of gonorrhœa resemble those of other inflammations of mucous surfaces,—heat, burning, itching, swelling, and discharge, which latter varies at different times; it may be bland and without odor, or it may be and often is, as the disease advances, muco-purulent and offensive; oftentimes with swelling and irritation of the clitoris, and with increased sexual desire, coitus is very painful. If the inflammation extends into the vagina, the speculum should be employed to ascertain if chancre, either hard or soft, be present. The urethra may be implicated and the cervix uteri also by extension of the abnormal action. Thus we may have a urethritis, a vaginitis, a vulvitis, or an inflammation of the cervix uteri, either separately or coexistent in gonorrhœa of the female. The shortness of the urethra and the passage of urine over the labia often prevent the surgeon from ascertaining where the discharge arises, but by careful watching the point may be ascertained.

The most patent symptom of gonorrhœa in women is most undoubtedly urethritis; in fact when this is noticed contagion may generally be suspected. The diagnosis, however, as to *cause* is very difficult, if not impossible. On this head, Bumstead writes: "To a surgeon of the present day, acquainted with modern methods of investigation, mistakes are not likely to occur. With the recognition of the disease, however, our power, so far as diagnosis is concerned, *ceases*. It is impossible to go far *and determine its origin*. Many authors have attempted to give diagnostic signs as between gonorrhœa originating in contagion and that produced by other causes; but *they have almost signally failed to produce any that are at all satisfactory*, simply for the reason *that none such exist!* 'The microscope fails to furnish us with a means of distinguishing between gonorrhœal and simple vaginitis, and no symptom or combination of symptoms is absolutely conclusive on this point' (West). Acute inflammation and the presence of urethritis may render impure intercourse probable, but cannot be regarded as decisive; and what is wanting in the physical diagnosis must be sought for in the history of the case."*

Treatment.—The management of gonorrhœa in the female is not materially different from that of the male. Frequent ablution and injections of warm water must be employed, and in the earlier stages of the disease aconite or belladonna given according to the presenting symptoms. Cannabis, mercurius solubilis, cantharides, phytolacca, sepia, sulphur, thuja, and zincum are all often applicable. In employing enemata, the old-fashioned blunt syringe is of very little service. The vaginal douche, a fountain syringe No. 3, or the kind represented in the cut (Fig. 36) are far preferable.

Fig. 36.



This douche is used as follows: Having prepared the solution about to be injected, it must be set upon an elevated shelf or mantel. To one end of the india-rubber tube is attached a metallic cover, which must be filled with water and immediately dropped into the

* Bumstead on Venereal, p. 179. The italics are our own.

basin or uppermost tub. The lower end of the tube is attached to a hard rubber shield, from which projects the vaginal tube. It will be seen, that this siphon-like arrangement draws the water from the upper vessel, sends it into the vagina, from which it finds exit from the tube that empties into the lower tub.

Gonorrhœal Rheumatism.—This peculiar affection follows upon one or more attacks of gonorrhœal urethritis, and differs from ordinary rheumatism in several particulars. It is characterized by pain, weakness, and rigidity of the larger joints and surrounding muscles, the articulation of the knee being decidedly the most liable to the disorder.

The pains are increased by motion and the affected parts readily grow cold; the fever and swelling are not so marked as in ordinary acute arthritis; indeed in some cases these symptoms are almost imperceptible. The pains may become fixed in the loins, in the hips, or knees, but seldom in the thorax, although the heart cannot be said to be entirely free from the disease; the temperature of the body is not much increased, and the pulse seldom, after the first few days, exceeds eighty beats per minute. The disease continues for an indefinite period, and sometimes becomes chronic and even incurable. In such cases patients are rarely free from pain, and are very sensitive to damp and changeable weather. The affected joint is occasionally so debilitated that it is powerless, resembling the condition produced by paralysis; or in some cases the joint presents the appearance familiarly known as white swelling. The latter, however, generally is noted in persons of a strumous habit. In gonorrhœal rheumatism it is rare to find suppuration of the bursæ or that thickening and rigidity of the ligaments which belong to ordinary chronic rheumatism, although cases are upon record where suppuration and death have occurred. The eye is liable to be affected with the disease, and gives rise to very troublesome symptoms. Fuller says, as quoted in a footnote by Bumstead: "In true rheumatism the eye seldom suffers, so seldom that I find no record of any affection of that organ in more than 4 out of 379 cases of acute and subacute rheumatism admitted into St. George's Hospital during the time I held the office of Medical Registrar. But in rheumatic gout the eye is not unfrequently affected."

Treatment.—The best medicines for gonorrhœal rheumatism are aconite in the first stage, if the attack be ushered in by much sexual excitement. This must be followed by clematis erecta, sarsaparilla, or thuja (or the iodide of potassium, which latter possesses a wonderful power over the disease). The clematis has been found almost specific in cases in which there has been a tendency to orchitis, and in which the rheumatic symptoms succeed rapidly an attack of gonorrhœa.

Thuja is called for when the pains are tearing and pulsative, or, as from subcutaneous ulceration, with a sensation of coldness or torpor of the part, with aggravation during repose, or in the warmth of the bed.

Veratrum pains are increased by the warmth of the bed, and by wet weather. There is a bruised feeling in the joints, which is lessened by walking; the affected part is weak and trembling. Sepia, euphorbium, mercurius sol., stannum, and rhus, are also of service. I have used all these medicines with more or less effect, but, according to my experience in gonorrhœal rheumatism, the actea racemosa is preferable to all others. Phytolacca also is useful. In some cases all medicines appear ineffective; in such instances, if we have reason to suspect the suppression of the gonorrhœal discharge, gelseminum will be serviceable. My attention was called to this medicine by Dr. Kenyon, of New York, who prepared a paper on its action for the *Western Homœopathic Observer*. One case is

especially typical, a portion of it reads thus: "In the evening I was sent for again, and found him with violent pain in the left ankle and foot, especially through the instep; with considerable redness, but not much swelling; exceedingly sore; violent fever, pulse 140, and sharp; tongue very dry; considerable pain in back of the head and left shoulder, with some pain in the left wrist. He then told me that he had gonorrhœa for two weeks, and the glands in the groin were considerably swollen; had been taking mercurials, and two days previous, by the advice of a druggist, he had used an injection of the permanganate of potash, which in six hours entirely arrested the discharge. I found the prepuce enormously swollen, the glans very red and inflamed, and the orifice of the urethra dry and hot. Since the injection he had intense pain and burning on urinating. I gave him gelseminum tincture, two drops every hour, and in the morning found the gonorrhœa re-established in full bloom, and all the other symptoms correspondingly improved. Two days after, his rheumatism was well, and he had no more chills or fever. Sulphur c. m. soon cured the gonorrhœa."

The doctor further states that after the discharge had been re-established by the gelseminum, in no case was there the usual burning or scalding during micturition, nor any tendency to pass into gleet.

Kalmia latifolia I found useful in a very obstinate case, where the pains were aggravated by movement, and when the patient was not relieved by bryonia. Daphne, asafœtida, and the iodide of potash are sometimes indicated.

In some cases, notwithstanding the best-directed efforts of the physician, the pains and stiffness remain, the lameness becomes almost constant, and every accession of cloudy, damp, or rainy weather renders the patient miserable. They become sick both in mind and body; they grow irritable and morose, appetite disappears, and all the functions of the body are more or less impaired. For this condition I believe there is a means of cure; it is expensive, but more certain than any other with which I am acquainted. It is a visit for two successive seasons to the Hot Springs of Arkansas. These waters possess a wonderful effect over gonorrhœal rheumatism, as well as over syphilitic, and I have known patients who had, when starting, to be carried to the conveyance, or hobble painfully on crutches to the steamboat, return, to the best of my knowledge, cured.

Gonorrhœal ophthalmia somewhat resembles the purulent variety, and is occasioned either by the direct application of gonorrhœal matter or by metastasis. The mucous membrane of the eyeball and lids is the seat of violent inflammation, and there is a profuse discharge of purulent matter, resembling that which issues from the urethra in gonorrhœa. This variety of ophthalmia is said to be the most violent and destructive to which the eye is subject. It often destroys the sight in a short period of time, and frequently when the patient applies for relief, the disease is so far advanced that the organ is irreparably injured.

In this affection there is a great degree of vascular congestion, chemosis, excessive tumefaction of the conjunctiva, and palpebræ. In the first stage, which is generally short, the inflammation is confined to the conjunctiva, and the usual symptoms of such pathological condition are present,—soreness, stiffness, photophobia, etc. After a time, however, the disease extends to the cornea, and the patient experiences severe, often excruciating, pain in the orbit and head, which is aggravated by exposure to light; there are also constitutional symptoms present,—shivering, fever, delirium, etc. If the disease still advance, the inflammation extends from the mucous membrane to the cornea and globe of the eye. The tumefaction of the orbicu-

lar conjunctiva is often so great that it laps the cornea, effusion takes place in the lids, and the swelling may be so great that it is impossible to obtain a view of the cornea; this tumefaction declines after a time, and both eyelids may become everted, the convex edge of the tarsal cartilage being pushed forwards by the swollen conjunctiva. The effects of gonorrhœal ophthalmia are as follows: suppuration, ulceration, and sloughing of the cornea, interstitial deposit, escape of the humor, obliteration of the anterior chamber, staphyloma, prolapsus iridis, corneal opacity, and obliteration of the pupil.

According to Hastings, three distinct forms of ophthalmic inflammation occur in conjunction with, or dependent on, gonorrhœa, viz., acute inflammation of the conjunctiva; mild inflammation of that membrane; inflammation of the sclerotic coat, sometimes extending to the iris.

Treatment.—As the same tissues are affected in the first stages of gonorrhœal ophthalmia as are primarily involved in ophthalmia neonatorum, the medicines that are adapted to the one disease are in a measure suited to the other. The great activity of the inflammation, and the more intense febrile disturbance accompanying it, render the employment* of *aconite* indispensable at the commencement of the disease, and the most striking beneficial results are said to have followed its administration.

Arg. nit., sulph., merc., cham., puls., rhus, and, perhaps, ignat. or bry. may be indicated.

When the tissues that are more deeply seated become involved, when the pains are pressive, and there is throbbing in the eye, *bell.* should be employed. This medicine may also be used in alternation with *aconite.*

Arsenicum is indicated when the pains are severe, occurring in paroxysms, when there are violent stabbings in the eye; the eyeball feeling like a coal of fire. Dr. Dudgeon recommends highly a solution of nitrate of silver as homœopathic to gonorrhœal ophthalmia, as well as to the severe forms of ophthalmiæ catarrhales. The solution he recommends is composed of from two to four grains of *arg. nit.* to an ounce of distilled water; a small quantity of this solution is carefully introduced beneath the eyelids with a camel's hair brush once a day, every two, three, or four days, according to the severity of the symptoms.

Besides this topical application, he has derived advantage from the local use of weak solutions of euphrasia, arsenicum, rhus and mercurius. On this subject Dr. Dudgeon writes that, judging by analogy, equal advantage might be derived from the local use of the other medicines in these local diseases. He says, further: "The mode in which I usually employ the remedies locally, is to mix a drop or two of the mother tincture, or of the 1st, 2d, 3d, or 4th dilution, or of the dilution taken by the patient internally, with a teacupful of water, to be applied one, two, or three times a day to the eye with a soft rag."

Tussilago petasites is said by Dr. Rosenberg to have proved effectual in gonorrhœal ophthalmia; but Dr. Dudgeon remarks that the case given by the former in illustration of the virtues of *tussilago* was not a genuine ophthalmia gonorrhœica, but a species of blepharophthalmia, with scrofulous or other dyscrasic complication.

Acid. nit. is useful when the anterior chamber looks as though filled with a dirty-looking pus, and the whole eye appears to threaten disorganization. If symptoms of iritis develop themselves, aconite in alternation with corrosive mercury are very useful. Thuja and macrotin have also been employed,

* Dudgeon on Diseases of the Eye, British Journal of Homœopathy, vol. vii, p. 4.

but the *argenti nitras*, both internally and externally, as used above, are the most sure in the treatment.

Sycosis—Condylomatous Venereal Disease—Vegetations.—By these terms are understood a certain cutaneous affection, distinguished by warty and condylomatous excrescences; these morbid growths making their appearance in males upon the glans and under the prepuce, and in females about and in the pudenda; most frequently, however, on the inner surface of the labia majora, or at the junction of the labia minora. They arise from impure coitus, and the idea of their independent nature has been disputed by many scientific men of both schools. They present different appearances, sometimes resembling warts, sometimes figs, at others cauliflower, the cock's-comb, or are of a pear or raspberry shape. Their pathological condition is a morbid thickening of the chorion, rete mucosum, and epidermis, with great enlargement of the papillary body.

The genitals are not the only site, but they sometimes appear at the verge of the anus, the wrist, navel, the neck, the angles of the mouth, and the perinæum.

In the majority of cases they are spongy, soft, and readily bleeding, and are liable to return after cauterization or ligature. After their removal by these methods, secondary disease has been known sometimes to arise, particularly a variety of pseudo-rheumatism, or whitish sensitive elevations appear in the mouth, on the tongue, palate, and lips, or tubercles in the armpits, about the cephalic region, and other parts.

These morbid growths are often accompanied with a gonorrhœal or gleety discharge, and secrete a fetid fluid, the odor of which is *sui generis*, resembling herring pickle, and has a sweetish taste.

Many homœopathic physicians agree with Hahnemann in opinion, in its being a disease distinct in its nature and not a sequence; although the majority believe it to be a consequent of the venereal. Raue mentions having treated three cases of the kind, two young men and a girl, the latter aged nineteen. The males were treated unsuccessfully for a gonorrhœal affection, and in two weeks condylomata appeared. The growths manifested themselves in the girl without her having any previous affection, and they were cured with thuja.

It has been suggested by those who believe in the distinct nature of the disease, that it originally may have been syphilitic, retaining a separate form, in the same manner that an ill-managed itch leaves herpes, and if this latter be communicated, the disease retains the secondary form of herpes.

Treatment.—*Thuja* is no doubt the specific for this disease, and many cases I have cured with it. I have always prescribed it in the third potency, and have directed the warts to be touched with the tincture every night. The exhibition of this medicine must be steadily continued for at least three weeks. It has been necessary in some cases to give for a week, calcarea carb., the third potency, every night and morning, and then return to thuja.

Flat condylomatous growths with rather broad bases, and those accompanied by gonorrhœal discharge, are especially acted upon by thuja. It is also well adapted for cauliflower growths.

Nitric acid is applicable for pedunculated and pen-shaped condylomata.

Sabina is also employed successfully in some cases, especially when there is burning and itching. Raue gives the following characteristics:

Fig warts complicated with gonorrhœa require: thuja, merc. corr., cinnabar, nit. acid, sulphur, lycopodium.

With chancre: cinnabar, nit. acid, phosph. acid, staphis., thuja.

Flat: magn., nit. acid.

Exuberant, like cauliflower: thuja, staphis.

Fan-shaped: cinnabar.
Pedunculated: lycop., nit. acid.
Conical: merc. sol.
Dry: thuja, staphis., merc. sol., merc. corr. sub., nit. acid., lycop.
Moist, suppurating: nit. acid, thuja, sulph., euphrasia.
Soft and spongy: sulph.

If sycosis be complicated with other chronic affections, the remedies for such complications are to be selected. A radical cure is to be expected only from a precise treatment.

CHAPTER IX.

CHANCROID—SOFT CHANCRE.

Definition—Characters of—Seat—Phagedenic—Chancroids in Urethra.

The variety of appearances presented in different persons affected with syphilis, has, since the time of Hunter, been ascribed to a sort of reaction of the organism upon the virulent principle—the chancre being the seed, the constitution the soil, and, in proportion to different conditions of the latter, was the product of the former. In other words, the doctrine of the unity of the virus was that generally accepted and acknowledged by Ricord himself in his *Letters*, although not without some conditions or modifications. He says (*Letters*, p. 149): "Up to the present time we are justified in denying the existence of more than one virus." This idea, however, appears not to have been certainly believed even by the great syphilographer himself, for, on one occasion, when he was reproached by M. Auzias Turenne with having abandoned "the flag of Hunter," although he defended himself, he was not positive in his assertions as to the unity of the syphilitic virus.

In a later work, however, he tells us, "The chancre is no longer a morbid unit, but a mixed manifestation belonging to two distinct pathological species." The one of these being the simple chancre, the other, the indurated or infecting chancre. The latter creates constitutional symptoms, the former is one (p. 34) "with soft base, an affection purely local, which limits its effects to the region which it attacks, which *never exercises a general influence upon the system*, which *is never accompanied by constitutional affections. In other words, it is a chancre which does not affect the economy—a chancre without syphilis.*" This is the chancroid.

We are now enabled to say to the unfortunate father, who comes in trepidation and exhibits a chancroid, "Sir, be not alarmed; the disease will not be transmitted to your own constitution, or to those children hereafter to be begotten by you." It will also be of service to many practitioners, if it will cause them to desist prescribing massive doses of mercury, which are not necessary. With this understanding, let us return for a moment to the question of the origin of syphilis, and recollect the statement of Jourdan, viz.: that the disease existed at an early period, and also originated epidemically in the fifteenth century. This theory of a double virus is also received and criticized by Bassereau. The simple chancre, then, is the "issue," the "uncleanness" mentioned in Holy Writ; the "contagious ulcer of the genitals" of Celsus, Galen, etc., and the new disease that appeared about the fifteenth century, is the infecting chancre and its constitutional manifestations.

At the International Medical Congress, held in Philadelphia in Septem-

ber, 1876, of which Dr. F. J. Bumstead was reporter on syphilis, the following conclusions were arrived at, after a full and comprehensive discussion:

1. The virus of venereal sores is dual.

2. Venereal sores may be due to the inoculation of the syphilitic virus, and also to the inoculation of products of simple inflammation.

3. These two poisons may be inoculated simultaneously.

4 (additional). The present state of science has demonstrated that suppurating inflammatory lesions resembling chancroids, may be produced on various portions of the body by inoculation with simple pus from various lesions.

With such an understanding as this, it must become a matter of the utmost importance to the physician to be able readily to distinguish between these two varieties of ulceration; and in the last work of Doctor Ricord we have rather minute details as to its appearance. He says:

"The simple chancre whose base remains soft, or only presents an inflammatory thickening, which does not react upon the glands, or which influences them in a peculiar manner, by producing almost certainly an inflammatory adenite, acute, mono-glandular, suppurating, and furnishing most generally an inoculable pus.

"Chancre with edges neatly shaped and cut perpendicularly; the floor irregular and wormeaten.

"Chancre ordinarily multiple or multiplying itself by a series of inoculations of the neighboring parts.

"Chancre with virulent pus, contagious *par excellence*, pursuing during a long period the characters which constitute its specificity.

"Lastly, a chancre with a destructive and invading tendency; the form of ulceration the most apt to experience the phagedenic complication."

These directions are explicit; and when we come to remark the characters of the indurated variety, and the greater frequency of occurrence of simple chancre—that there are some parts of the body where simple chancres do not appear, and the infecting have been discovered, and also the relative frequency of bubo in the different varieties,—I believe that more light than has yet been thrown upon the diagnosis of these venereal ulcers, and more systematic treatment will be the inevitable result. M. A. Fournier states that the statistics collected by himself during three months among the patients at the Midi show the following:

Numbers of chancres seen,	341
Chancres indurated and infecting,	126
Chancres simple, non-infecting,	215

And again:

Patients affected with simple chancre,	207
Simple chancre with bubo,	65
" " without bubo,	142

The above statistics should be carefully treasured for diagnosis.

Simple chancres are not generally found upon the head. Indeed, Ricord has asserted that they are never found in that locality. Indurated chancre can be deposited anywhere on the surface of the body. Here, again, is a remarkable fact—a curious circumstance in the history of chancre, which cannot be explained. Ricord himself most positively states the fact of the immunity of the cephalic region from the soft chancre; and if we even may suppose him to err in regard to the invariability of location, it still remains an unexplained mystery, that during twenty-five or thirty years of constant daily attendance upon the number of patients presenting themselves for treatment, with all varieties and forms of syphilis, he should

not have been able to detect a simple cephalic chancre. He is very positive on this subject. He remarks: "I have shown to you in my wards numerous examples of the soft chancre developed upon different regions of the body, upon the genital organs, upon the thighs, upon the legs, the arms, the abdomen, the back, the chest, etc. I have shown them to you everywhere except on one point,—the cephalic region. It is a fact, gentlemen, that during five-and-twenty years of practice, I have never met with a single well-authenticated case of soft chancre developed upon the face or upon the head."

M. Fournier has drawn up a table of observations made upon 824 patients, in whom the seat of the chancre has been noticed with precision. This is so interesting that it is given in full.

Patients affected with,—	Indurated.	Simple.
Chancres on glans and prepuce,	314	296
Chancres on integument of penis,	60	15
Multiple chancres on the penis, that is to say, presenting simultaneously chancres on the prepuce and integuments, the integuments and glans, etc.,	11	17
Chancres on the meatus urinarius,	32	9
Intra-urethral chancres, which cannot be perceived by the forced separation of the lips of the meatus; diagnosed by inoculation, by the touch, by lymphangitis,	17	3
Chancres on the scrotum,	7	
" " peno-scrotal groove,	4	
" " arms,	6	2
" " lips,	12	
" " tongue,	3	
" " nose,	1	
" " palatine membrane,	1	
" " eyelids,	1	
" " fingers,	1	
" " leg,	1	

The above is a curious table, and when carefully studied, will assist in the establishment of a correct diagnosis, not, probably, with the utmost precision, but may prove indicative of the nature of the sore, when other symptoms are perhaps obscure. It may in other cases add another confirmatory evidence to a doubtful diagnosis.

A peculiarity of the chancroid, also, is found in the fact, that its admixture with another virus does not impair its power, and that, as has been before said, it is very likely to assume a phagedenic complication.

A phagedenic chancroid is usually very rapid and destructive in its progress, increasing in *extent* but not in *depth*, and accompanied with severe pain. Its extension is irregular and serpiginous. It occurs generally in constitutions worn out by intemperance, and follows very often irritating dressings which have been injudiciously applied to irritated or inflamed chancres, especially mercurial ointment. It is called the black slough, in England.

There is a form of phagedenic sore called the *diphtheritic* or *pultaceous*, which is exceedingly chronic (Ricord has seen it last for seven years); it is covered, either entirely or partially, by a pultaceous diphtheritic secretion. The base is œdematous, and the edges are elevated, irregular, and serrated; it is surrounded by a dull purple areola, and it increases by successive ulceration of the depending parts. The constitution becomes seriously implicated and the patient finally sinks. This form of chancre occurs in ill-fed, badly-lodged individuals, in whom there is previous organic disease.

In some cases, chancroid becomes *gangrenous*. In such a case the de-

struction of the tissue proceeds so rapidly that the whole glans is destroyed in a short period.

Chancroids of the Urethra.—The presence of the virus in the urethra gives rise to chancroids, which are generally found at the fossa navicularis, and may in some instances be visible by stretching widely apart the walls of the canal, or by the use of the endoscope. When lower down, they are sometimes very difficult to diagnose. The discharge is generally not so profuse as in gonorrhœa, and by pressing the finger along the under surface of the urethra, a distinct spot will be indicated more painful than others. If with these symptoms a symptomatic bubo be present, additional light is rendered to the diagnosis.

Treatment.—It necessarily follows from the above detailed account of chancroid, that a merely local treatment is necessary, unless there be some indications by symptoms, for the administration of internal medicine. The sooner the sore is cauterized the better, and the less likelihood will there be of the formation of bubo.

I believe it was the general practice of homœopathic practitioners some years back, adhering to the doctrine of immediate constitutional contamination, and not being acquainted with the duality of the virus, to commence with the internal treatment of the disorder, the medicines most generally used being the mercurial preparations, administered both internally and externally; the latter by sprinkling mercurius solubilis upon the ulcerated surface. Since, however, a new pathology has been adopted, a different method must be resorted to; for the chancroid, a local treatment; for chancre, as before, immediate constitutional medication.

It is impossible for thinking, reading, and observing men to ignore all the teachings and experience of those who have devoted so much time in examining, testing, and treating the disorder I have been considering, and I cheerfully receive this accumulated evidence of large experience and accumulated facts, with that thankfulness which all should experience who are desirous for the progress of truth and science. Therefore, in acknowledging the correctness of Ricord's views of the nature of chancroid, no want of faith in the homœopathic doctrine should be imputed, nor in the treatment of the simple venereal ulcer upon the principle of Ricord, can we be charged with deviating from the law of *similia*.

Let us examine this matter thoughtfully. Let us test it with our judgment and with our daily experience.

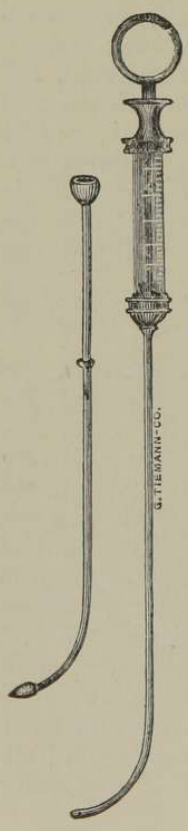
We are informed by a man of acknowledged reputation and talent, who has spent thirty years in investigating all the minutiæ of venereal disorders, who has been placed by governmental direction as the chief of a hospital devoted to the treatment of the disease, and who is supported by many of the most competent and learned men of the times, that the simple chancre is a local sore—that it is the product of a virus highly contagious in character—nothing more, nothing less. Thousands of cases can be brought forward to establish the truth of this assertion, and the records of the hospital furnish evidence of the fact, which is confirmed by successful treatment, and this treatment is *par excellence* the abortive. "Ah!" says the opponent, "where is your principle of *similia similibus?*—where are your medicines given in infinitesimal doses?" In reply to which I would say: "Recollect, in the treatment of the simple chancre, of the local sore (and of this only I am speaking), we have not an ordinary ulcer; we have locally poisonous pus to encounter." The treatment is essentially surgical in its character.

What sane man, when called to a case of poisoning with arsenic or corrosive sublimate, or lead, or zinc, would commence with the administration

of homœopathic medicines before he had antidoted or destroyed the noxious substance in the stomach? And would he be less the homœopathic physician because he administered, to neutralize the poison, tablespoonful doses of the hydrated peroxide of iron, or the sulphate of soda, at five or ten minute intervals? The treatment of the simple, or the non-infecting chancre, must tend to the rapid destruction of the poison, or, in the words of the *Syphilograph* (p. 35), "To reduce the specific ulceration to the state of a common ulcer, and to transform a wound possessing a special principle for its maintenance, into a wound which has no longer such a resource." With the indurated chancre the treatment must be different.

In reference to the caustic to be employed, Ricord says: "Reject at once all mild caustics, which only act more or less as anodynes. That which is required in this instance, is a destructive agent. To which, then, should we give preference? I have successively tried the Vienna paste, potash, nitric acid, the actual cautery, etc. All these have inconveniences which I need not point out to you, as I have to propose to you a new agent particularly efficacious. This caustic consists of sulphuric acid, mixed with powdered vegetable charcoal, in the proportions necessary to form a half-solid paste." Here, then, is the substance to destroy a poison, to convert a chancre into a simple wound, which will proceed rapidly to cicatrization. I believe this treatment to be the correct one; and since the first perusal of these clinical lectures in July, 1860, I have had opportunities to test its efficacy in very many cases of chancroid, in both private and hospital practice, and with satisfactory results. Define well the chancroid, find it to be certainly the non contagious ulcer, and no internal medicine will be required.

FIG. 37.



Professor Bumstead employs the nitric acid, which may be used with a glass rod, or with a small piece of wood.

Canquoin's paste is used by Diday, and is made of chloride of zinc and flour in equal proportions.

An excellent application can be made of chloride of zinc, flour, and the submuriate of hydrastin, after the manner recommended by Marsden and MacLimont for the removal of tumors.

As soon as the eschar has separated, lint saturated with aromatic wine may be used as a dressing. I have also used with advantage a preparation of glycerin and carbolic acid, in the proportion of ten drops of the latter to an ounce and a half of the former.

Whatever application be made, a most essential part of the treatment is cleanliness. Frequent washings of the part with castile soap and water, and the frequent substitution of clean for soiled dressings.

For this purpose, if we have reason to believe that the ulcer is deep in the urethra, the syringe of Bumstead, modified by Dr. R. W. Taylor, of the New York Dispensary, *vide* Fig. 37, is very efficacious. It consists of a hard-rubber tube, and is six inches long, having a longer curve than the short one of Thompson, at the end of which is an acorn-shaped bulb or head. This bulb is perforated upon its tapering sides by twelve very minute holes, which are arranged in four rows of three holes each, placed equidistantly around the head. The apex of the bulb is somewhat rounded, so that in introduction the folds of urethral membrane are not wounded; its base also rounds off, and presents

a shoulder before it merges into the shaft. The tubes are made of various sizes, corresponding to Nos. 4, 6, 8, and 10 of the English scale, while the widest portion of the bulb is two sizes larger than the shaft. There is also a button of hard rubber which slides upon the shaft, by means of which precision of injection is obtained.*

There are many advantages gained by the use of this excellent instrument, in those cases which require direct applications to deep portions of the urethra.

CHAPTER X.

SYPHILIS—GENERAL CONSIDERATIONS—CHANCRE—DIFFERENTIAL DIAGNOSIS BETWEEN CHANCRE AND CHANCROID—BUBO—CONSTITUTIONAL SYPHILIS—AFFECTIONS OF THE SKIN—TERTIARY FORMS—SYPHILITIC IRITIS—SYPHILIS OF THE LARYNX—SYPHILIZATION—FUMIGATION—INUNCTION—INFANTILE SYPHILIS.

SYPHILIS is a disease caused by a morbid principle or poison, which, applied under certain conditions to any portion of the human body, will produce definite and characteristic phenomena; this principle being absorbed and carried into the system will, during the existence of the local or primary symptoms, and for an indefinite period subsequent to their cessation, contaminate the economy; and, finally, this principle is capable of being transmitted hereditarily, and that, too, at a period when its presence in the system is not revealed by any external sign. This capability of quietude for a number of years within the organism, without producing in the meantime any appreciable effect upon it, is a character not peculiar to the syphilitic poison. Another feature also is, that one attack of the disease in the majority of instances will protect from another.

Mr. Hutchinson and many others believe that syphilis is a specific fever, which has a period of incubation, an exanthematous stage and sequelæ, that it is a disease of the blood during the exanthematous stage (secondary), as shown by the symmetrical eruption; that the sequelæ (tertiary symptoms) are not due to a disease of the blood, as is shown by their being non-symmetrical and non-contagious; that the secondary stage is due to the multiplication of germs; that the tertiary growths are due to the development of some localized products left by the secondary stage; that the tertiary deposits differ from the secondary, in being purely local affections; and that the pathology of syphilis is only to be explained by the hypothesis of a *syphilitic yeast.* To these views, Sir James Paget says, that the action of specific remedies on tertiary symptoms, and the inheritance of syphilis by children begotten by parents in the tertiary stage, show that it is a blood disease in all stages; that blood diseases do not necessarily show symmetrical eruptions, typhoid fever for example; that the "cryptogamic germ poison" is purely hypothetical, that there is no evidence that deposits are left over from the secondary stage from which gummata can develop, and that his explanation of syphilitic inheritance, upon the theory that germs still hold possession of the testis and ovary when they no longer exist free in the blood, is purely imaginary, and has no basis of observation.

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* American Journal of Syphilography and Dermatology, Oct. 1870.

Mr. Hutchinson* affirms that a mother can be infected from the fœtus in utero, and become syphilitic without symptoms, thus communicating the disease to a second child without showing any manifestations herself.

Dr. F. J. Bumstead, in an article† criticizing Mr. Hutchinson's expression of views on this subject, asserts that the term "duality of syphilis" really signifies a duality not in syphilis, but in what had been known as syphilis and called by that name. Otherwise, he observes, we must adopt the ridiculous supposition, that so-called "dualists" believe in two kinds of syphilitic virus, whereas they have simply maintained that there exists, independent of the syphilitic virus, another contagious principle giving rise to a local sore known as the chancroid. If Mr. Hutchinson intends to limit the power of producing the soft chancre to contagion with inflammatory products arising from *syphilis*, Dr. Bumstead considers him in error, since sores precisely similar to the chancroid have been produced by other inflammatory products. Mr. Hutchinson's view, however, that the chancroid, instead of being dependent upon a distinct specific virus, incapable of spontaneous generation, is the result of inflammatory products, and hence that, if every chancroid now existing were exterminated, new chancroids would arise; this, Dr. B. thinks, has strong arguments in its favor, and may be looked upon as a step in advance, suggesting an interesting analogy with the history of gonorrhœa during the last fifty years. Finally, Dr. Bumstead declares his belief that "dualism" still lives, and that Mr. Hutchinson is, in fact, one of its most advanced apostles.

The classification of venereal diseases is as follows: 1. Primitive or direct, when they occur at the inoculated spot, from the immediate action of the virus. 2. Successive, when they originate in the latter, and are produced elsewhere by absorption, or contiguity of tissue, or accidental contact, as chancrous bubo, and the conversion of neighboring abrasions, or leechbites, into chancres. 3. Secondary, when the skin and mucous membranes are affected after the reception of chancrous matter into the system; and 4. Tertiary, when the cellular, fibrous, and bony structures are the seat of the constitutional symptoms. 5. Diseases unconnected with syphilis.

Concerning this classification, however, it has been remarked, that it is unphilosophical, and wanting in simplicity, and that many of the grounds on which it is founded are incorrect and untenable. The first two may certainly, without violence, be included under one head; the second and third divisions are not susceptible of separation on the grounds given by Dr. Ricord. The so-called tertiary symptoms may arise without the necessary intervention of the secondary. Dr. Ricord asserts, that whilst the former may be transmitted hereditarily, the latter cannot be, except in a degenerated form, as scrofula. This, however, is not well substantiated, and many of the profession believe both secondary and tertiary syphilis equally liable to propagation by inheritance. With regard to the fifth class, viz., "diseases unconnected with syphilis," it is difficult to understand what is meant.

The whole subject may be much simplified by dividing it into primary, secondary, and tertiary.

Before proceeding further, it is well to mention here a peculiar fact: that great and multiform as are the effects of the syphilitic virus; acknowledged as it is by the whole profession to possess a power so mighty that almost every structure of the human body is obnoxious to its effects, skin, bone,

* Month. Abstract of Medical Science, May, 1876.
† N. Y. Med. Record, June 17th, 1876.

muscle, tendon, and periosteum; that it is not confined to the person attacked, but may be transmitted hereditarily from generation to generation, yet the most powerful microscope cannot find it, nor can the most carefully conducted chemical analysis detect it. This may be an argument in favor of infinitesimal power, and certainly is one that cannot fail to be acknowledged by every physician and surgeon.

Syphilis, as a general rule, *occurs but once in the same person during a lifetime*, although there may be, no doubt, exceptions (which, however, prove the rule), as are noted in measles, whooping-cough, scarlatina, and other disorders; but it must be here borne in mind, that a person who has suffered from a syphilitic attack, is not protected from another from the chancroid, nor, on the other hand, does a succession of chancroids prevent syphilitic inoculation. Diday, as quoted by Bumstead, page 394, says:

"1. As a general rule the syphilitic, like other kinds of virus, does not exercise the same action twice in succession upon the same individual.

"2. When applied (under such conditions as to permit absorption) to a syphilitic subject, this virus produces no effect. Applied to a subject who has had, but who no longer has, syphilis, it produces a modified form of syphilis.

"3. The more feeble the first attack, and the longer the time that has since elapsed, the more energetic will be the action of the virus, and the more severe will be the second attack of syphilis, and *vice versa*."

True chancre is often superficial, and is then rather more difficult to diagnose, especially in the earlier stages, but the induration and hardness of the ganglia assist materially in the case.

The true chancre is excessively indolent; the surface is smooth and lardaceous; the parts seem to have been taken out with a gouge; the edges of the chancre are gradually lost in the floor of the ulceration, and the induration extends above and around it. The solution of continuity is generally single, although this is not invariably the case; it has no disposition to invade the neighboring structures, but soon defines its limits, and always has enlargement of the inguinal glands, which become in a short period indurated, although rarely proceeding by themselves to suppuration. Among the indurated chancres treated by M. Ricord during the whole year of 1856, three only were found accompanied with suppurating buboes. In these three cases, the suppuration was only produced consecutively to a strumous degeneration of the glands, the pus being twice tested by inoculation, and found negative.

Ricord says (p. 88): "There can be no infecting chancre without an indurated symptomatic bubo. This may be called, without hesitation, a pathological law." And again: "Never neglect, therefore, when examining a patient affected with constitutional disease, who denies suspicious antecedents of every kind, to interrogate the glands. Specific adenopathy is, for the infecting chancre, an effect which follows its cause."

These, then, are the chief points in the differential diagnosis of the two great divisions of chancre, and so far as they can be gleaned from a careful study, backed by considerable experience, they have been concisely expressed. The establishment of a correct diagnosis between the chancre and chancroid is of such importance to those who expect to treat chancre successfully, that the distinguishing marks have been arranged and placed side by side; and, at the same time, the peculiar nature of the adenite following each, is also embraced in the classification, to facilitate, if possible, their more ready recognition. It must be remembered, that the appearance presented by the two varieties of chancre are similar in their very early stages. We then have the following

DIFFERENTIAL DIAGNOSIS OF CHANCRE.

SIMPLE NON-INFECTING CHANCRES.	INDURATED INFECTING CHANCRES.
1. Never, excepting in exceptional cases, noticed upon the cephalic region.	1. Every part of the body liable to invasion (therefore chancre on the head may be pronounced infecting).
2. Develops rapidly.	2. Develops slowly.
3. Surface irregular; floor fretted, or wormeaten.	3. Surface smooth; floor lardaceous.
4. Edges neatly shaped, cut perpendicularly, as if cut out with a punch.	4. Edges sloping, as though made by a gouge.
5. Edges undermined.	5. Edges adherent.
6 Border abrupt.	6. Border gradually lost in the floor of the ulceration, giving to the ulcer the appearance of a cupola.
7. No induration.	7. Induration surrounding the ulcer on all sides, forming for it a kind of bed (pathognomonic).
8. No induration.	8. Induration commences from the first (if not produced in a few days, will not become so).
9. Suppurates profusely; the suppuration being one of the most fertile sources from which the pus is derived.	9. Suppurates little, producing but a small quantity of serosity, most frequently sanious and ill-formed.
10. Pus in the highest degree contagious; persisting during the entire existence of the chancre.	10. Pus rapidly loses its specificity, at all events for the infected subject, who in a few days becomes refractory to inoculation with his own virus.
11. Generally multiple from its origin, or becomes so by inoculation.	11. Generally solitary, in most cases a single chancre giving rise to contagion.
12. Tendency to invade the neighboring structures.	12. Inverse disposition; its limits soon defined.
13. The simple chancre is most likely to undergo the phagedenic complication.	13. Rarely assumes the phagedenic deviation.
14. In virgin subjects, transmitted in its form—that is a simple chancre.	14. Transmitted in its species in virgin subjects, that is to say, an indurated chancre.
15. Transmitted to syphilitic subjects, either as a simple or an indurated chancre; the form which is reproduced probably depending on the nature of its origin—that is to say, the chancre which gives birth to it.	15. Transmitted to previously infected subjects, under a form of a chancre with a soft base, analogous in appearance to the complication.
SIMPLE NON-INFECTING CHANCRE. BUBO.	**INDURATED INFECTING CHANCRE. BUBO.**
16. Not necessarily present.	16. No infecting chancre, without an indurated symptomatic bubo.
17. Monoglandular.	17. Affecting several, or all the glands.
18. Suppurating almost certainly, and furnishing most generally an inoculable pus.	18. Extreme hardness; independent of each other; no tendency of themselves to inflammation or suppuration.
19. No fixed period of development.	19. Produced in course of first or second week; rarely noticed later; generally coincident with induration.

A peculiar feature in chancre is the rapid zymosis that takes place, which, however, is in the main denied by some syphilographers, among whom is Ricord. He says,* "Of all the chancres which I have *seen cauterized*, or *cauterized* myself, *not one* has ever been followed by the special symptoms of constitutional syphilis. From this it would appear that during the first four days which follow contagion the syphilitic seed has not sufficiently implanted its roots in the economy, and that, if you are in time to destroy it, you ward off the general intoxication—you kill the syphilis in its germ." The last few words of this quotation give evidence that Ricord believes the chancre to be the primary cause, and not an effect. Would cauterizing the bite of a mad dog when the hydrophobic virus had been circulating in the system for months prevent hydrophobia? Would cauterizing the snake-bite when the system showed evidence of a thorough zymotic influence relieve the patient? There is at present the greatest amount of evidence to show that the application of escharotics immediately after the introduction of the poison does not prevent syphilis. Diday, Bumstead, and Langston Parker have proved by experiments, that a most thorough cauterization, even to the depth of half an inch, but two hours after the appearance of the ulcer, was followed by severe syphilitic symptoms.

Treatment.—The treatment of chancre is in direct contrast with that recommended for chancroid; the former was antidoting a local poison by the application of caustics, which are hurtful to the true chancre. The ulceration gives the evidence of the constitutional disease; it tells us that the system is affected, and that constitutional means must be employed. Syphilis being immediate after the impure coit, and the chancre the evidence of the poison, the sooner the treatment is begun the better. In the majority of instances, however, relief is not sought until the initial lesion has developed itself. I have been very successful with a comparatively simple method of treatment. In the first place great attention must be paid to cleanliness, the chancre must be carefully washed with castile soap and water, and upon it a pledget of lint laid, moistened with calendula solution, one part of the tincture to four of water. This must be changed three times a day. I then administer two grains of the first decimal trituration of the *protoiodide of mercury* every night for one week. The next week, every other night; the third week, every third night, and then continue at intervals until the sore has healed, which will generally take place in about six or eight weeks. The patient must be told to have patience, the case be thoroughly explained to him from its commencement, and, I believe, in the majority of cases, the treatment will be successful. I have experimented with the deutoiodide and red oxide, with cinnabar and Hahnemann's solubilis, but must give the preference to the preparation I have recommended. In many cases of syphilis the patient is excessively weak, and morbid states of the appetite and spirits manifest themselves, for which appropriate medication, as symptoms present, must be resorted to. As a general rule, the second trituration of *ferrum*, three grains given every morning, and a similar quantity at night, will be of great service. When the chancre appears to remain *in statu quo*, I am in the habit of touching the sore with the ointment of nitrate of mercury, mixed with five parts of simple cerate; or of applying lightly nitric acid. When there is a tendency to phagedæna, then the bichloride of mercury must be used as low as the second decimal, given often, and, perhaps, if there be a tendency to gangrene, alternated with the second trituration of the iodide of arsenic. I am aware that this treatment may be looked upon by many as

* Work on Chancre, p. 147.

rather "low;" but I am guided by a somewhat large experience in the disease, and am forced to the conclusion that medicines must be given materially, and repeatedly, if we desire to effect perfect cures. No one can deny that the pathogeneses of the preparations of mercury and arsenic resemble in almost every particular the diseases we are expecting to combat, and I would have all interested, give the mercury treatment just recommended, a fair trial.

Dr. Attomyr observes: "Syphilitic patients, with very few exceptions, are young unmarried men, who either board at the hotels or sit at table with their relations or probably superiors. In either case it is unfortunate for the observation of homœopathic diet. To this must be added the fact that patients conceal their disorders, and in order not to excite suspicion, dare not venture on the slightest aberration from their accustomed diet. In consequence of these adverse dietetic circumstances, I resolved in treating such patients to administer larger doses than usual.

"I am still of opinion that the lower dilutions recall reaction quicker, but that their effects are less extensive and permanent than the higher. Four grains of calomel in the space of a few hours operates violently and excites diarrhœa, while the same four grains, if taken in minute portions, results in an indisposition, which continues several days, and in more intense commotion of the organism. I moreover concluded from these premises that the larger doses could be repeated more frequently, which would seem essential, on account of the necessarily dietetical errors. Within the period of two years I treated one hundred and fifty-six patients laboring under venereal disease. Every physician knows how it is with office practice, how difficult to learn anything, or obtain any certain experience in this manner. Generally one-half of this class of patients stay away, so that it is impossible for us to decide with certainty upon the termination of their disorders. The one remains away because the effects of the treatment did not fulfil his anticipations, the other (and among syphilitic patients the majority), because he is approaching convalescence, and is desirous of avoiding the *burdensome thanksgiving* of his cure." Dr. Attomyr also states that out of the one hundred and fifty-six patients, so many did not return to mention the success of the treatment, that only eighty-four can be cited as being perfectly cured.

The medicines that have been found most efficacious in the treatment of syphilis are: Merc. sol., merc. corr., acid. nit., hepar sulph., acid. phosph., lyc., sulph., silic., ars., carbo veg., thuj., and sepia.

The selection of the potency should in a measure be guided by the idiosyncrasy of the patient, although perhaps in the generality of cases the lower dilutions are more effectual, and in many instances this may be owing to circumstances mentioned by Dr. Attomyr.

Mercurius sol. is adapted to those chancres that present an indurated base and margin (of course this medicine must not be prescribed if the patient has previously been subjected to its action in massive doses), and covered with a tenacious, thin, offensive matter. Dr. Laurie says: "We should certainly most unwillingly dispense with this valuable remedy in such cases, notwithstanding the bad repute it has acquired from the frightful effects which have so frequently arisen from its abuse in the hands of our allopathic brethren. Such results can never take place in homœopathic practice, assuredly not in the hands of any one at all deserving of the name of a homœopathic practitioner. Where the health of the patient is remarkably good, and the sore neither of long duration, nor has in any way been aggravated by previous treatment, we have repeatedly succeeded in effecting a cure in from ten to fourteen days by means of merc. viv. 6th, a few globules

(about a dozen) night and morning, for about five or six days. And subsequently, on the ulcer assuming a healing aspect, every second or third day. In other cases, especially in torpid constitutions, it was found requisite to have recourse to the third, second, and first of merc. corr., giving one-fourth to half a grain daily, until a copious discharge of healthy pus supervened, or the excavations began to be filled up with healthy granulations. As soon as either the one or the other of these changes took place, a pause of three or four days was made. At the expiration of that period, a few more doses were generally sufficient to effect a cure in the last-named instances; but in the former, if no signs of granulation made their appearance (which, however, was rarely the case), a dose or two of sulph. 6th produced a favorable effect."

Merc. sol. is also adapted to the following appearances: red chancre on the prepuce; spreading and deeply-penetrating ulcers on the glans and foreskin; pale-red vesicles on the glans and prepuce, forming small ulcers after breaking; readily bleeding chancres; distressingly painful chancres, secreting a quantity of yellowish-white fetid pus; small chancres with a cheesy bottom, and inverted, red edges; inflamed, round, chancrous ulcers, with swelling of the vagina; chancres with edges resembling raw flesh; slightly painful ulcers, sensitive to the contact of the linen; vesicles at the forepart and on the sides of the glans, spreading and penetrating rapidly; ulcers of the glans and prepuce, with cheesy, lardaceous bottom, and hard edges; a number of small red vesicles at the tip of the penis, behind the prepuce, breaking after a fortnight, and forming small ulcers, which secrete a strong-smelling, yellowish-white matter, which stains the linen; afterwards the large ulcers bleed and are painful when touched; from these latter the whole body was sympathetically affected. These sores were circular, their edges presented a raw appearance, and the bottom of the ulcer was covered with a cheesy secretion.

When granulations appear in the ulcer, but instead of being florid, and firm, are prominent, pale, and flabby, nit. ac. is an excellent medicine.

Merc. corr.—Chancres with ichor adhering to the bottom of the ulcer so firmly that it cannot be removed by washing. Ulcers with thin pus, leaving a stain upon the linen, as from melted tallow.

Arsenicum may prove serviceable when, after the administration of mercury, the sore has appeared to improve somewhat; has nevertheless filled up with florid and too elevated granulations, with edges remaining hard and very irritable, bleeding at the slightest touch, the discharge being thin, acrid, and offensive. Sulph. and nit. acid may also prove serviceable for such conditions.

Ars. is well adapted likewise to phagedenic gangrenous ulcers, its symptoms are: gangrenous ulcers with bloody edges and corrosive pus; ulcers with copious secretion of watery fetid ichor; painless ulcers with hard edges and lardaceous base; stinging chancres with white places in the middle of the ulcer; gangrenous chancre on the glans penis.

When there is excessive pain, swelling, and inflammation, and these symptoms do not yield to the action of mercurius, sulph., or aconite, or, if the sufferings be severe, these in alternation, may be prescribed. When the irritation is excessive, and the pain very great, the granulations unhealthy and readily bleeding, *nit. acid* may relieve. It is suited to chancres of the orifice of the urethra, prepuce, and its margin, with bloody, fetid, ichorous pus; small chancres without inflamed borders, flat edges, and considerable swelling. Chancrous ulcers, erosions, with flat edges, without inflammation, but with violent lancinations, increasing towards evening, preventing sleep, and becoming insufferable in the morning on account of violent erections.

Small itching vesicles on the prepuce, bursting in a few days, and becoming covered with a small dry scurf; deep ulcer on the corona glandis, which looks clean, but secretes a strong-smelling matter; burning of the inflamed and swollen prepuce, the inside of which is denuded of the epithelium, with small ulcers secreting an ichor that has a pungent nauseous odor, and stains the linen.

In some cases, when the irritation and pain are excessive, the exposure of the part to the vapor of hot water, together with a spare diet and the recumbent position, greatly relieve the patient. When the ulcer is not very painful, the dressing may consist of a small piece of lint. When the chancre is located under the prepuce, and the latter is much swollen and inflamed, an injection of tepid water should be thrown between the parts. This practice is recommended by the most experienced practitioners of our school. "The remedies," says Dr. Laurie, "that we employed against the ulcer with raised edges were: acid. nit., hepar sulph., sulph., arsen., silic., carb. veg., lyc., acid. phosph., sepia., merc. Most of the cases treated had already existed from six to eight weeks and upwards, and had been subjected to a smart mercurial course, both outwardly and inwardly. *Acid. nit.* and *hepar sulph.* were very generally required; to the former the preference was given when the gums were severely affected, and when aching pains were complained of in the bones; the sore itself not painful, yet disposed to bleed easily and profusely, presenting no signs of central granulation, and having the margins elevated and spongy-looking. When there was a tendency to the production of condylomata (sycotic complication), with secretion of a thin sanious discharge, sulph. or thuj. was sometimes required after acid. nit. had effected all the benefit it seemed capable of. The former when cicatrization proceeded slowly and imperfectly, and the latter (both outwardly and inwardly) when excrescences continued to form and discharge profusely. Hepar proved particularly useful when the mouth and gums exhibited unequivocal signs of mercurial action, and when the sore was painful, irritable, and had assumed a disposition to spread rapidly. Silic., and at other times nit. ac., were sometimes called for to complete the cure, after hepar had subdued the more prominent symptoms of mercurial aggravation, and given a healthy character to the sore. Sulph., as has already been observed, is sometimes of much utility in promoting healthy granulation in the Hunterian chancre, and is also of great service in sores which present a red or bluish margin, and display a tendency to take on a bad character; but it is especially in the treatment of the superficial ulcer with raised margins that we have derived the most satisfactory results from its employment. When a sore of that character occurred in a strumous habit or in persons of lymphatic or bilious temperament, or who were subject to hæmorrhoidal attacks and obstinate constipation; when, moreover, the edges of the sore were spongy, very sensitive, and prone to bleed rather copiously, however gently the prepuce might be drawn back; and, finally, when the secretion from the ulcer was thin and ichorous, or thick, yellow, and rather copious, but the centre of the ulcer flat, and presenting no signs of incarnation, we never failed to derive the most satisfactory results from the employment of *sulph.*"

When the patient has been mercurialized, the breath emitting the peculiar fetor it assumes in those medicated with mercury, and the ulcer presents a blue appearance, carbo veg. may be useful.

When the sore has been retarded in its healing process by intemperance, nux or puls. should be prescribed, and afterwards the medicines most adapted to the specific disease.

Phosph. acid and lycop. are very serviceable when the sore has been very obstinate, and presents the appearance of an indolent ulcer.

If the margins of the chancre are elevated, and the sore appear to resist the ordinary administration of mercury, and still there are some symptoms of that mineral present, *merc. præc. rub.* may be employed; and if the middle portion of the chancre should be raised, and appearances indicate the formation of condyloma, *cinnabaris*, first trit., should be administered, or, as has been before mentioned, thuj., providing the symptoms correspond.

If the sore exhibit a disposition to heal, but still a certain degree of induration remain, the iodide of mercury, second or third trituration, at first at short, then at longer intervals, will remove the remaining hardness.

Beside the employment of arsen. in phagedenic chancre, merc. præcip. rub. is a very efficacious medicine. At a later period of the disease, Hartmann has found more energetic and penetrating mercurial preparations necessary. He says,* "Among these calomel is excellent, were it not for the ptyalism which it is apt to excite, and for the illusory disappearance of the ulcer under this agent. For these reasons I resort to merc. corr., commencing with one-tenth of a grain several times a day, and increasing the dose gradually until the spreading chancre is arrested."

Aur., caust., china, dulc., and staphis., may also sometimes be requisite in the treatment of chancre.

Bubo.—After what has been already written regarding buboes and their relative frequency and appearances in the chancroid and chancre, the subject will receive but a limited notice. The proper study of these adenoid troubles must be in connection with the disorders of which they are concomitants.

Bubo always takes place in those lymphatic glands in the immediate neighborhood of chancre, while the deeper-seated and remote glands remain uncontaminated, or at least do not enlarge or suppurate. As chancre generally occupies some part of the penis, the glands of the groin are the ones most commonly affected. Sometimes several glands are enlarged and form a cluster; but according to Mr. Hunter one gland only is usually affected. A suppurating bubo does not invariably follow a chancre, and yet the system is not less liable in such cases to contamination. This circumstance, amongst others, has induced some surgeons to believe that bubo does not arise, as is commonly imagined, from the absorption of venereal virus, but from an inflammation in the extremities of the lymphatics excited by chancre.† Bubo seldom arises from a chronic chancre, but usually makes its appearance soon after the sore is established. It is more frequently observed to follow venereal ulcers on the prepuce or frænum, than those situated on the glans penis,‡ and is late or early in its appearance according to the degree of inflammation existing in the sore. Oftentimes a bubo remains stationary for weeks, neither tending towards resolution nor suppuration; in general, however, it is of a bright scarlet color, exceedingly painful, and suppuration is speedily established. Sometimes erysipelatous inflammation is present.

The ulceration which follows a bubo does not differ from that of common chancre, and the matter from it is equally infectious. The bottom of the ulcer is hard and solid to the touch, and the surface either of a dark-red or brownish color, or of a yellowish cast.

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* Chronic Diseases, vol. ii, p. 227.

† See Allan's Surgery, vol. i, p. 200.

‡ Gibson's Institutes and Practice of Surgery, vol. i, p. 339.

Very extensive ulcerations now and then follow a bubo. I have seen instances in which each groin and the greater part of the pubis have been laid bare by the severity of the affection. In certain constitutions buboes degenerate into insensible and very troublesome fistulæ that are exceedingly perplexing to treat. In some instances the skin covering a bubo entirely closes, but not uniting with the parts beneath, leaves a hollow from which in a short time a thin serum is discharged through small holes or pores formed in the skin. In such cases, the integuments generally assume a leaden or bluish color, and present an unhealthy aspect.

Buboes, or swelling of the inguinal glands, frequently arise from other causes than the absorption of syphilitic virus. For example, from wounds or injuries of the foot, from colds, fevers, and from irritating applications. Such swellings are very difficult to distinguish from the true venereal bubo. The surgeon, therefore, must carefully inquire into the history of each individual case before he ventures to give a decided opinion respecting its nature.

In the *treatment* of syphilitic bubo, there are three objects to be attained: 1st. To prevent their development (prophylactic treatment). 2d. To disperse the tumor. 3d. To heal the ulcer after suppuration and discharge of the pus have occurred. The prophylactic treatment implies: 1st. A rapid cure of the primary chancre. 2d. The prevention of a return of the ulcer. 3d. Perfect rest of the diseased part. To accomplish these objects the principal medicines are merc. sol., kali hydriod., silic., calc. carb., acid. nit., graph., and thuj.

When the swellings are either small or of considerable size, but neither excessively painful, merc. has been of great service, administered in the second or third trituration, a quarter of a grain night and morning, until improvement is manifest.

If the bubo be excessively painful, bright red, with intense inflammation, bell. will in all probability allay the sufferings.

After suppuration is established, silic. frequently cures the complaint.

If the patient has been subjected to the use of mercury, and the tumor is hard, hepar may hasten suppuration, and thus produce relief. If the mouth and gums of the patient are affected by previous drugging, and there is lancinating pain in the hard tumor, staphis. will be an excellent medicine, or acid. nit., aurum, carb. veg., or sulph. may be indicated; spongia officinalis and spongia palustris have proved of striking efficacy in some cases of indurated glands, either of a scrofulous or venereal origin.

Asaf., hydriod. pot., or staphis. may particularly be called for in cases which have evidently been aggravated by the previous use of mercury in massive doses.

Bell., hepar, silic., sulph, carb. an. are important medicines in treating sympathetic bubo; the indications for their administration have already been alluded to.*

So soon as suppuration has been fully established, the matter should be freely evacuated, and this is best done with a fine sharp-pointed curved bistoury. The point to be inserted with the cutting edge upward, and a free incision made. Sometimes in making the operation, an arterial twig may be severed, which may be generally secured by torsion, or the bleeding arrested by pressure. Care must be taken not to allow any of the pus to come in contact with abrasions, or any mucous surfaces. The cavity must then be freely syringed, thrice a day, with a solution of calendula, one part

* For an excellent description of inguinal bubo see Hahnemann's Lesser Writings, p. 76.

to three, and a compress placed over the wound, and held *in situ* by a bandage. An indolent bubo takes a long time to heal, and requires a careful internal as well as local treatment.

Constitutional symptoms of syphilis present themselves in several forms, which usually appear in regular succession. The parts that appear to be first affected are the skin and throat; in the generality of instances, the latter is earlier attacked. After these, periosteum, bones, fasciæ, tendons, eyes, and ears become involved.

There has been a good deal of discussion among syphilographs as to the contagion of the secondary symptoms. There is, however, incontestable proof that some of these appearances, especially the pustular eruptions, are capable of inoculation, and also, that *this secondary contagion will produce a chancre; that constitutional syphilis will pursue its regular course of evolution, whether it originates from a primary or secondary symptom—in the latter case, as in the former, the chancre being the primary manifestation.*

The first development of constitutional symptoms will, in many cases, be ushered in by *syphilitic fever* or by pallor of countenance, swelling of the submaxillary glands, and shifting pains, apparently of a rheumatic or neuralgic character, in different portions of the body. When the *tonsils* are examined, they may be found to be the seat of an ulcer, which is coated with an ash-colored or brownish matter, that causes the sore to present a foul and unhealthy appearance, while the surrounding edges are slightly inflamed and of a coppery hue. In the more advanced stages the ulcer is excavated, or, as Mr. Hunter has expressed it, "dug out;" if the ulceration still advance, one or both tonsils, the *velum palati*, membranous portion of the Eustachian tube, and even the epiglottis may be entirely destroyed, giving rise to permanent deafness, incessant cough, and endangering the patient's life from suffocation, by permitting food and drink to enter the larynx. In many instances, a communication is established between the nose and mouth, from the ulceration having destroyed the soft parts and bones of the palate. At other times the disease travels along the Schneiderian membrane, undermines the septum and cartilaginous portion of the nose, destroys the periosteum covering the thin and delicate bones, which are soon rendered completely carious, and crumble away, destroying the nose, and thereby causing pitiable disfiguration, and reducing the patient to a condition often loathsome, with foul and fetid matter flowing perpetually from the nostrils or into the throat, and a breath so extremely offensive as to render the sufferer hateful to himself and disgusting to others,—*Ozæna syphilitica.*

Syphilitic Fever.—This peculiar eruptive fever generally precedes, with more or less distinctness, the appearance of constitutional affections of the skin and mucous membranes. In many instances, the whole skin becomes discolored, or mottled, or covered by an efflorescence; at other times, circular patches appear in distinct spots on different parts of the body, each of which proceeds from an indurated lump of a pale-red color. The patch slowly enlarges, and in a little time its centre becomes flat, and incrusted with whitish scales. These gradually desquamate and are succeeded by others of a similar appearance, until finally the skin cracks and discharges a puriform secretion, which, hardening on the surface, is converted into a *copper-colored* scab. This seldom extends beyond half an inch in diameter, and after a time drops off, exposing an ulcerated surface, which gradually spreads and deepens, and becomes covered with a thick, fetid, greenish matter.

The parts of the body most liable to be attacked by venereal eruptions,

are the back of the neck, the forehead, breast, and groin; sometimes, however, the palms of the hands and the soles of the feet are affected.

Exanthemata Syphiliticæ.—Roseola is one of the most frequently occurring of the exanthematous eruptions, and may accompany other secondary symptoms; the spots are of a "*coppery red*," and are scattered over the trunk and extremities without any very determinate figure. They become very apparent after exertion, breathing, or sweating, but can easily be made to disappear by the pressure of the finger. The eruption is not generally accompanied with much itching, makes its appearance without constitutional disturbances in the space of a few hours, and in a few days the spots fade and become of a yellowish hue.

Maculæ Syphiliticæ.—These "spots" are more frequently seen on the face and head, although I have noticed them on the trunk and extremities. They are oval or sometimes irregular in shape, and of a yellow coppery color, differing from the exanthemata in the latter, being of a redder hue. These spots are often darker in the centre than at the circumference, and they do not entirely disappear upon pressure; they may become extremely dark when they have existed for some time.

Syphilitic Pustules.—There are several forms of pustular disease which follow constitutional syphilis, and among them we find *syphilitic rupia*. These pustules, the bases of which are bullous, become covered with large and prominent incrustations, which are black and rise in the shape of a cone. This scab finally splits, and becomes loosened irregularly around its circumference, and finally drops off, leaving an open sore, secreting a peculiarly offensive pus. The skin surrounding becomes of a purple hue, but is not ulcerated. The ulceration, if unchecked, continues to extend beneath the scabs, upon pressing which, the discharge exudes. Very many of these may appear on one patient, and they are often very intractable. I recollect a woman whom I attended in consultation with my friend Dr. Comstock, who had at least a dozen of these sores upon her person.

Syphilitic Papulæ.—This form of cutaneous disease has been noticed to appear suddenly with erethism or in a successive and slow manner. The elevations are firm and solid, contain no fluid, and are of a yellowish or coppery color. They are sometimes crowded together and present the appearance of confluence. They do not itch and desquamate often. In other instances they are of a brownish, livid, or violet color, and may ulcerate at their summit. These eruptions are generally circumscribed.

Syphilitic squamæ are more or less round in shape, like the other eruptions, of a coppery color, and appear in patches; there is slight itching in some cases; in others none. The patches are from six to eight lines in diameter, and appear from six to eight weeks after the cure of the primary sore. They are distinct, irregularly rounded, slightly prominent, and covered with a thin scale, which, when detached, shows the skin beneath them smooth and shining. In the palms of the hands and soles of the feet the *syphilitic psoriasis* is distinct. A number of spots, three or four lines in diameter, not very prominent, appear, and small scales of epidermis are regularly thrown off from the palms of the hands and soles of the feet. Where the disease has existed for a considerable time, the skin cracks in different directions, and rhagades form, which are very much increased by the motions and constant uses of the hand. This disease is often accompanied with somewhat similar eruptions about the axilla, the thighs, scrotum, labia, and on the margins of the anus and the commissure of the lips.

Syphilitic tubercles are of a livid and coppery red color, smooth, and sometimes covered over with dry or moist scales. They appear in clusters,

or are scattered and degenerate into open sores; they are from the size of a small pea to that of a walnut.

These tubercles are found about the alæ of the nose, and in this position rarely ulcerate. The scrotum, also, is often affected, and in this locality they are generally isolated, are quite circular, and more prominent than in other portions of the body. This form of growth may also exist with sycotic disease. Sometimes there exist beneath the skin, and deep in the cellular tissue, *subcutaneous syphilitic tubercles*, which may perforate the skin and form ulcers with ragged edges and a whitish base.

STAGE OF GUMMATOUS PRODUCTS.

It is a difficult matter to draw a line of demarcation between what are termed the secondary and tertiary symptoms of constitutional syphilis. The division is, it appears, merely arbitrary. The time of the appearance of secondary symptoms is generally fixed at six or eight months from the healing of the chancre, symptoms appearing thereafter being considered as tertiary syphilis. The deeper structures are then invaded by the poison, and the periosteum, bones, eyes, testicles, and other parts give evidences of the disease.

The most peculiar formations, however, are known as *gumma*. A gumma is a nodule in the connective tissue, which, according to Green,* presents the following appearances:

"The gummata consist of atrophied and degenerated elements imbedded in a scanty and obscurely fibrillated stroma. The central portions of the growth are composed almost entirely of closely packed granular débris, fat-granules, and cholesterin, amongst which there may be an exceedingly scanty fibrillated tissue. Surrounding this, and directly continuous with it, is a more completely fibrillated structure, while the peripheral portions of the growth, which are continuous with the surrounding tissue, consist entirely of small round cells resembling granulation-cells and lymph-corpuscles. The bloodvessels, which only exist in the external portions of the growth, are very few in number."

The main difference between the secondary and tertiary stages appears to exist in the fact, that in the former, the new formations are composed of fibrin, or a very similar element, while in the latter, the gummata resemble granulation-tissue prone to break down and to ulcerate.

The *periosteum* and *bones* are often contaminated at this stage.

All the bones do not appear to be equally susceptible of impression from absorption of the virus; those thinly covered by integuments, or situated near the surface of the body, as the cranium, clavicle, sternum, tibia, radius, and ulna, are most liable to suffer. The first evidence that the patient experiences, as indicative that the disease has reached the bony structure, is an enlargement or a tumor, called a *node;* this increases slowly, never attains much magnitude, and is seldom painful until it has existed for a considerable time. Finally, however, the integuments covering the tumor become red and inflamed; deepseated and acute pain is felt in the part, and extends from it to a considerable distance, often throughout the limbs; the sufferings are extremely aggravated at night when the patient becomes warm in bed. In a greater or less time the swelling loses its hard and solid consistence, becomes soft and fluctuating, ulceration takes place on the most prominent part and soon opens a communication with the interior, and a discharge ensues of an ill-conditioned glairy matter. The bone may

* Pathology, p. 120.

now be felt rough and bare, and it may become completely carious. When the node is seated on the skull, both tables are often perforated with numerous holes, and resemble in some respects a piece of wormeaten wood.

Patients who have suffered from repeated attacks of syphilis, and have taken large quantities of mercury, often have the veins greatly enlarged and thickened throughout their whole extent. When examined, also, such veins have been found to be much heavier than usual. When a node proceeds from inflammation of the periosteum alone, the swelling may be frequently removed.

Venereal warts, "*sycosis Hahnemanni*," often follow chancres, and usually are found in the same situation. They arise by a narrow neck or pedicle, and are expanded on the surface, resembling a mushroom. They are sometimes exceedingly painful, and bleed profusely on the slightest touch. Frequently the whole glans penis or vulva are completely covered by these excrescences.

Condylomatous tumors usually occupy the verge of the anus. They are firm and fleshy, broad at their bases, irregular on the surface, and often ulcerate and become very troublesome.

Alopecia does not invariably follow the secondary symptoms of syphilis, even when the system is thoroughly contaminated. In many cases, however, large quantities of scurfs or scales form about the roots of the hair, which are soon loosened and drop out, leaving the scalp perfectly bare. The eyebrows also not unfrequently fall off, and are seldom regenerated.

The further details of diseases of the bones, phimosis, paraphimosis, orchitis, etc., will be found in other chapters.

Treatment.—Syphilitic sore throat, which generally arises from the continued *abuse* of mercury in the primary disease, is successfully combated by nit. acid, aurum, carbo veg., or lycopodium.

When the patient complains of dryness and scraping in the throat, with swelling and inflammation of the tonsils, *hepar* is an excellent medicine; when, however, there are superficial ulcers of a grayish color situated within the buccal cavity, *nit. acid* may be employed. After the exhibition of these medicines, when the more violent inflammatory symptoms are mitigated, silic. or sulph. will often complete the cure.

If, during the first stages of the disease, mercury has not been used in massive doses, this medicine is frequently sufficient in itself to produce the desired effect. Kali hydriod. and merc. iod. are also useful in this affection, as are also ars., iod., aurum, bell., and staphis.

In the treatment of secondary syphilis, mercury is the chief medicine, particularly for the syphilitic eruptions. "Allopathic physicians," writes Hartmann, "use iodium and sarsaparilla for these eruptions, which homœopathic physicians only use for syphilis complicated with mercurial symptoms." The principal mercurial preparations which are of service in the treatment of these secondary syphilitic diseases, are, merc. præ. rub., merc. corr., cinnabaris, merc. nitras.; though the other preparations may likewise be useful. Besides mercurials, we have thuj., nit. acid, hepar, clematis, staphis., phos. acid, mez.

The selection of the remedy does not depend upon the seat of the sore, but upon the nature of the ulcer. A mercurial preparation will have to be used, and the medicine will have to be given in much larger doses than ordinary, otherwise the fauces, mouth, nose, etc., may all be destroyed. The medicine required is sometimes indicated by the attendant syphilitic appearances in other parts of the body; for instance, merc. præcip. rub., cinn., merc. nitras., nit. ac., and thuja are demanded, when out of the secondary exanthematous ulcer, whether it be indurated or phagedenic, con-

dylomata have developed themselves. If accompanied with bullæ, merc. corr. is the principal remedy, unless merc. præcip. rub. or viv. is more specifically indicated; if complicated with mercurial ulcers in the mouth and throat, iod. and nit. ac. deserve the preference.

If, after the secondary syphilitic ulcer is cured, there should be still a remnant of the secondary syphilitic eruption, some other medicine must be chosen. Lepra and psoriasis syphilitica will frequently yield to dulc., clem., lyc., mez. or calc. The scurfy eruption to lyc. and calc., or to conium, graph., ranunc.

The tuberculous, require often argent nit., thuj., kreas., zinc., if deep-seated. Ars., thuja, especially if spongy, or clematis. The exanthemata to bella., apis mel., merc., nit. acid, canthar.

The symptoms, however, in each case, must be thoroughly studied, by means of the repertory and codex.

The medicines for venereal nodes are, asaf., acid. phosph., aur., calc., mez., silic., and sulph. The intolerable aching pains in the bones are relieved, generally, by mez., nit. acid, staphis., aurum, or sulph.

Dr. Hale recommends, phytolacca dec., corydalis, rumex, sanguinaria, stillingia, and other remedies for syphilis. I have not employed them, and must refer the reader to his work on the *New Remedies*.

For alopecia, lyc. is almost a specific; if its use is not followed by success, nit. acid., petrol., or phosph. may be serviceable.

Condylomata are controlled by merc. sol., thuj., or sabina, and also with aurum, causticum, and phosphoric acid.

To onychia syphilitica the following medicines are adapted: Ars., graph., hepar, merc., lyc., and petrol.

When the skin appears unhealthy, the slightest cut degenerating into painful rhagades or ulcerated fissures, merc., sulph., lyc., acid. nit., hepar, are very useful medicines.

I desire here to mention a fact which has occurred to me in my own practice in regard to the exhibition of iodide of potash: I cannot obtain any result from it in any potency above the second and third, and find the farther away I go from the substance, the less are its effects visible. This I am bound to admit, nor can I explain it. It is impossible, in my experience, to successfully manage the varied manifestations of constitutional syphilis without the use of the kali hydriod. Its action is most wonderful in many instances, and what mercury is to the primary, so kali iod. is to constitutional or general syphilis. For other indications for the use of medicines the student must consult the repertory and symptomen codex.

Podophyllum is most highly lauded by Dr. Adrian Stokes in all the forms of syphilis. "In recent as well as in the secondary and tertiary forms of syphilis, *he who fails with podophyllum judiciously used* need not hope to *get any help out of mercurials.*"*

Syphilitic Iritis.—This affection is intermediate between secondary and tertiary syphilis. By Ricord, it is supposed to belong to the former, and Gollmann coincides in this opinion.

The *iris* is the primary seat of the disease, although, if the symptoms are violent, the other tissues of the eye may be involved; in most cases but one eye is affected, and the organ presents many of the properties and appearances of common iritis. When syphilitic ophthalmia is accompanied with sclerotical injection, the latter is said to depend upon an accidental rheumatic complication; however, sometimes among the anatomical signs of ophthalmia syphilitica is noticed a zone of violet red, from a line to a

* B. J. H., vol. xxii, p. 80.

line and a half in width, of uniform tint, and in which cannot be observed any distinct vessels. This zone is called the *dyscrasic circle*. In the commencement of the disease the iris becomes duller, and presents a grayish appearance, the radii being more or less effaced; the small circle of this membrane is livid or copper-colored; its tissue is tumefied, and forms an elevated ring composed of thick downy flakes. The pupil is more or less contracted, and assumes an irregular or angular shape; the cornea is somewhat dimmed, and on its inner surface, careful examination detects small fasciculi of congested vessels; the tunica albuginea is of a rose-color, which at its juncture with the cornea is converted into a dark-red hue. As the disease advances the iris becomes more discolored, its surface is covered with exudation, its free margin is tumefied, and upon its anterior surface there are elevations of a yellowish or gray tinge. The pupil at length becomes perfectly immovable; pedunculated excrescences, termed *condylomata of the iris*, sprout from the membrane, and adhesion takes place between the iris and the lenticular capsule. In such cases, the pupil still remains open, and presents a gray, instead of its usual black appearance. At the bottom of the anterior chamber, through the dim cornea, a more or less elevated layer of pus, sometimes mixed with extravasated blood, can be perceived. The patient experiences in the suborbital region of the affected side, violent constrictive boring pains, which radiate sometimes to the neighboring regions of the head, are increased towards evening, most violent at midnight, and abate towards morning. The visual faculty is more or less altered, by reason of the intensity of the inflammation, and of the plastic exudations formed in the pupillary opening. Photophobia is rarely present in true syphilitic ophthalmia, and when the symptom is noticed other complications are often the cause of its appearance.

The terminations of the disease are—resolution, condylomata of the iris, exudation within the pupil, or obliteration of this aperture.

This variety of ophthalmia, although it is sometimes met with alone, is generally accompanied with other symptoms of secondary syphilis, such as eruptions of the skin, ulceration of the fauces, or pains in the periosteum.

In the **treatment** of this form of iritis, the object is to allay inflammatory action, as well as the eradication of the virus, to arrest further extension of its effects. As the disease is most frequently met with when the inflammation has threatened to close or obliterate the pupil, a resort must be had to artificial means to dilate the pupil, which is best accomplished by dropping into the eye, three or four times a day, or even more frequently if there is high degree of inflammatory action, a few drops of the following:

℞. Atropin, ... grs. viij.
Aquæ font, ... ℥ij.
M., ft. collyrium.

This dilates the pupil and allows perfect rest to the muscular fibre.

A resort to the external application of either atropin, belladonna, or hyoscyamus in a concentrated form to dilate the pupil, is equivalent to a mechanical force, the object being to irritate muscular fibre into unnatural contraction—very different from exhibiting an infinitesimal dose to produce *curative* action.

Rhus tox. is adapted to the earlier stages, when there is profuse lachrymation. Petroleum for pain, heat, and throbbing in the occiput, with heat in the eyes. Cinnabar for pain in the supraorbital region. The latter is the best mercurial in this form of disease.

When *abscess* forms in the iris, hepar, merc., silic., and sulph. are valuable medicines.

For the chancrous ulceration that sometimes attacks the cornea, besides mercurius, arsen. and calc. should not be forgotten.

In those cases in which mercury has been abused, nit. ac., hepar, sulph., mez., and dulc. will prove useful.

Colchicum will be of service when there is an exudation of lymph, or the inflammation is of a very chronic character.

Syphilis of the larynx is another manifestation of the presence of the virus, which generally appears late after the primary infection. It is not, however, a very uncommon affection, and is easily recognized. The patient has but slight difficulty in deglutition, and the erosions on the mucous membrane may remain stationary for a time, or be subject to periods of extension, and to quietude. There is a dry hacking cough, hoarseness, and expectoration of a sticky and tenacious mucus. Finally, however, the ulceration spreads to the cartilages of the larynx, and, in some cases, destroys them either in part or entire; the voice, from being husky, disappears in toto; the cough becomes worse, the patient emaciates, deglutition is accompanied by fits of suffocation, hectic fever and debilitating sweats supervene, and the patient finally dies a miserable death. The prognosis is in most cases bad.

Treatment.—I have had under treatment at different times, some very difficult cases of syphilitic laryngitis, and have found that the ordinary medicines, as laid down in the books, are not at all satisfactory in their action—I mean phosphorus, hepar, sulphur, etc. The medicines which have produced decidedly beneficial action, are the *bichromate of potash*, the second trituration given twice or thrice a day, and continued for a length of time; also, the *kali hydriodicum*, in substance, given thrice a day; or if the indications for mercury be present, the *bichloride* acting better than others. Arsenic, iodine, macrotys, and podophyllum, have been given from time to time with benefit. I have used also the atomizer, containing a weak solution of iodine, with excellent results, but, in its application, care must be taken that the solution is not too strong, as very disastrous effects have followed such inhalation. Ten drops of the first decimal dilution of iodine placed in a gill of water, will be found of sufficient strength for most cases, and need not be repeated more than twice during the week.

Syphilization for the cure of syphilis has been practiced from time to time and has had some warm advocates, while many are very much opposed to the practice. It consists in inserting under the skin the syphilitic virus. "The inoculations are performed first on the sides of the thorax, then on the arms, and lastly on the thighs. Six such punctures are made every three days in symmetrical positions, the matter for each inoculation being always taken from its predecessor as long as it takes effect, a fresh supply being only used when the former has entirely lost its force." Dr. Boeck, of Norway, is a great advocate for this method of cure, but is particular not to have recourse to it, until the general symptoms manifest themselves. With this method I have had no experience, but find that it has been practiced in this country by Professor Boeck. At a meeting of the New York Academy of Medicine on June 6th, 1872, Dr. Hutchinson, of Brooklyn, read a paper on this most interesting subject. He related cases in which Professor Boeck, while on a visit to this country in 1869, practiced syphilization. The cases were three in number, and, as the reports read, "went from bad to worse under the various treatments adopted, and were regarded as utterly hopeless." The first of these cases died. The detail of the second*

* *Vide* Medical Record, July 15th, 1872, p. 306.

is given here in full, not only to show the method, but to observe the time occupied and the symptoms manifested, and because the operation was conducted by Professor Boeck himself.

Case 2. James C——, æt. twenty-one; sailor; admitted August 16th, 1869. Patient stated that his health had been good. Five months previously, ten days after an exposure, a small sore appeared near the meatus urinarius, followed soon after by other sores upon the glans. These healed rapidly, to be followed by another in April, without fresh exposure; this also healed speedily. Early in May he began to have sore throat, and the cervical glands became enlarged.

June 8th. An eruption made its appearance on the forehead, and since that time it has spread to the face, trunk, and limbs.

Examination, on admission, discovered patches of ulceration in fauces and pharynx; the epitrochlear and inguinal glands were enlarged and indurated. A very extensive rupial eruption was noticed in various parts of the body; was emaciated and very feeble. Treatment by means of mercurials (internally and by fumigation), iodide of potassium, sarsaparilla, etc., was instituted.

Sept. 2d. No improvement having taken place under the usual treatment, syphilization was, with the consent of the patient, inaugurated.

Nov. 30th. Inoculations with matter from a soft chancre, on chest, were systematically practiced every third day, and were invariably successful.

Dec. 14th. No further effect was produced by inoculation on chest, by matter from whatever source. Large crusts formed on the sites of inoculations; they increased in size and became confluent. Rupial crusts on face diminished in size. General condition was somewhat improved.

Feb. 1st. Reinoculations had been practiced successfully on arms and thighs, which were covered with extensive crusts, while the chest was comparatively free from them. Large ulcers continued in the throat, and there was a constant fetid discharge from the nose. Although the patient appeared to be in better physical condition, he was yet too feeble to leave his bed.

Feb. 21st. Inoculations were seldom effectual; they were accordingly discontinued, and the iodide of potassium, with a vegetable bitter, was prescribed.

March 8th. Recommenced inoculations, but the patient was no longer susceptible to virus taken from any source.

March 28th. The general physical condition was improved; the patient left his bed for the first time in five months; ate and slept well. The ulcerations in throat and pharynx had healed.

May 3d. The crusts following inoculations had nearly all disappeared. The patient weighed one hundred and eighty pounds—more than at any previous period. Said he was a "well man."

July 9th, 1870. Had continued to improve in health and strength, and was discharged cured.

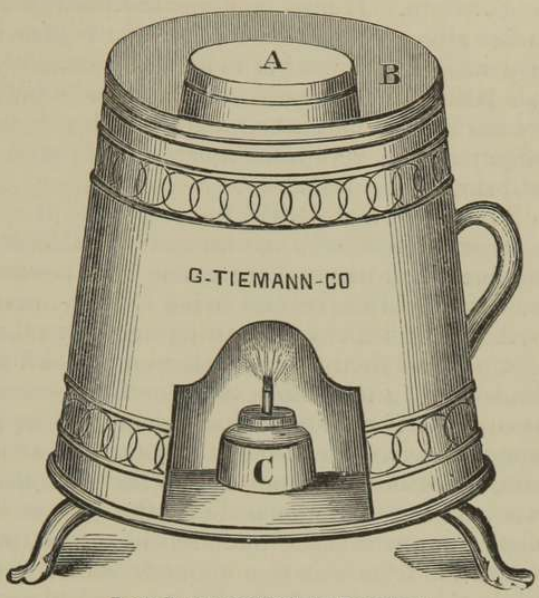
Mercurial fumigation has also been employed, and I have in a few instances tried it myself, but have not found it equal my expectations.

This method of treatment is highly recommended by Mr. Langston Parker, and can be made easily by filling a shallow vessel with boiling water, thoroughly heating a brick and placing it in the water, which must not be of sufficient depth to overflow the top surface, on which is sprinkled from thirty to sixty grains of the mild chloride of mercury. This vessel is then placed on the floor underneath a cane-bottomed chair, upon which the patient, having been previously rubbed off with a towel, is seated. He is

then covered closely with a blanket, which is secured around the neck, and its folds allowed to reach the floor on all sides. The bath may last a quarter of an hour, when the patient must retire to bed.

Mr. Lee has constructed a lamp for this purpose, which has been modified by Bumstead, of New York, and which I have used and found convenient for the purpose. It is represented in the adjoining cut (Fig. 38). Upon the small saucer, A, is placed a scruple or thereabouts of calomel, or of the black oxide of mercury. The groove surrounding the saucer, B, is filled with boiling water, and the alcohol lamp, C, lighted. The patient arranged, is seated upon the chair, and the bath conducted as already described. In a short time perspiration is produced.

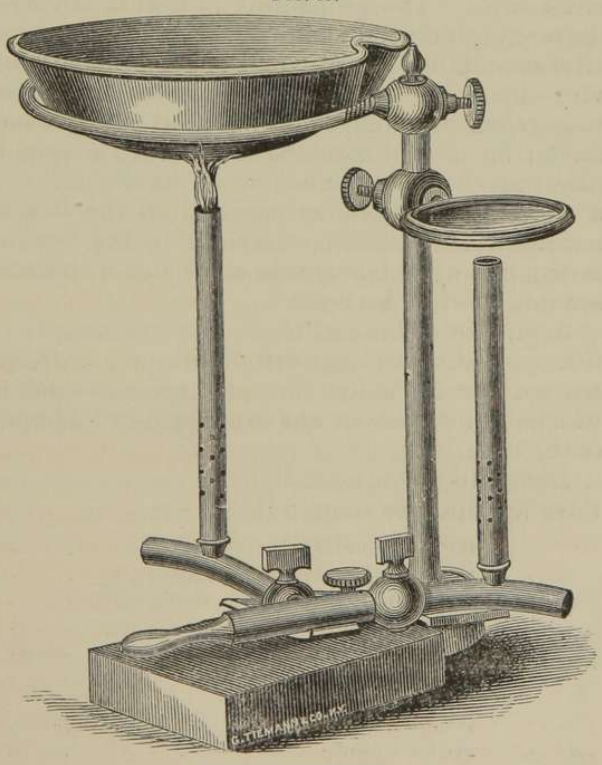
Fig. 38.



Lee's Lamp modified by Bumstead.

Dr. Maury has invented a very complete fumigating apparatus, which is represented in Fig. 39. It is arranged in such manner that it can be used with gas, and the burners are those known as Bunsen's.

Fig. 39.



Maury's Fumigator.

With regard to the *inunction treatment* of Sigmund, of Vienna, consisting of rubbing the gray ointment of mercury successively on the arms, forearms, thorax, abdomen, thighs, and legs each night, and using a tepid water-bath every morning, keeping the patient perfectly quiet and upon strict diet, I may say that I have known of its good effects in the hands of Dr. Comstock, of St. Louis, in a case of rupia syphilitica which had been under my care, and had resisted all other treatment. The doctor, I believe, employed in this case the citrine ointment.

Infantile Syphilis.—Nothing is more pitiable to the humane surgeon than the sight of an infant developing symptoms

of syphilis. Nothing more forcibly illustrates the words of holy writ,—a child ushered into this world, bearing at birth the marks of serious disease contracted by its parent or parents.

Congenital syphilis presents the most remarkable phenomena in regard to its origin. It may be communicated from the mother alone, or from the father alone, or from both parents. It may be contracted from the paternal side without the mother being infected, and what is still more remarkable, the father having been infected years before marriage, may have every reason to believe himself cured, and yet may transmit the disorder to his offspring. It may also be present, though latent in the mother, and yet will develop in the child.

From this fact, it will be seen that it is not at all necessary that the mother should have contracted the disorder during her pregnancy, for a woman being married twice may have contracted syphilis even from her first husband, and the second being healthy, may yet have syphilitic children.

Again, a healthy woman having nursed a syphilitic child, contracts the disease, and then transmits it to other children gotten by a husband who is healthy. In both cases the blood, the source of life, growth, and nutrition, is completely empoisoned, and hence all its products, whether solid or fluid, must necessarily participate in the evil effects to which such a state gives rise. But in the female these effects are still greater than in the male; the whole function of the male in the process of reproduction consists in the deposition of a certain amount of semen, perhaps a solitary spermatozoon, while the female is also obliged, not only to furnish a fluid, but after conception has occurred, she is compelled to nourish the new being, the most intimate connection being established between them by means of the placenta.

With regard to the time at which a woman suffering with general syphilis may communicate the disease to the child, there is no certainty. Professor Gross says: "The probability is that it is very short. This is proven by the circumstance that such a woman frequently aborts within a few months after conception, evidently in consequence of the deleterious effects of the virus upon the fœtus. I suppose that the contamination is coeval with conception, occurring at the moment of the commingling of the two seminal fluids; for if it be assumed, as we have a right to do from the facts of the case, that the male can communicate the poison in this manner, why should a similar faculty not be ascribed to the female? She, too, furnishes an impregnable substance, a seminal liquor, which can no more escape contamination when her system is affected with secondary syphilis through the seminal fluid of the male."

A syphilitic child at birth does not usually present symptoms of infection, but after the first few months an eruption upon the face or scalp, mucous patches about the arms, spots of dark reddish hue over the body, which are all more or less inveterate in their nature, indicate the presence of the disorder.

Diday, to throw more light on the subject, has tabulated 158 cases. In these the disorder showed itself—

Before the end of one month in	86
Before the end of two months in	45
Before the end of three months in	15
At four months in	7
At five months in	1
At six months in	1
At eight months in	1
At one year in	1
At two years in	1
Total,	158

Treatment.—The first step in the treatment, if the child is nursed by the mother, is to remove it from the infected parent and substitute a healthy wet-nurse; great attention being paid to bathing and fresh air. Then the administration of such medicines as are indicated, must be carefully attended to. Of these, the preparations of mercury will generally be found most advantageous, and of these preparations, according to my own experience, the corrosive sublimate or bichloride is decidedly preferable. Whether it be that this compound has a more searching action, and permeates the system more deeply than others, I am not prepared to say, but certain I am, that when other mercurials have failed in obstinate cases, this has been of decided benefit. Next to this we have kali hydriodicum, which may be given during alternate weeks. The preparation of the bichloride which I use is the third, that of the potash, the first. I am aware that these drugs are considered antidotal to each other, and are considered "incompatible," according to pharmacologists; but in the treatment of the varieties of syphilis many distinguished surgeons have found from experience that the two agents may be combined with excellent results. It is a common practice nowadays (I cannot say whether it be entirely scientific or not) to mix a few grains either of the protoiodide or the deutoiodide of mercury with iodide of potash and sarsaparilla, and use the same in syphilitic affections.

The iodide of iron (ferri iodidum) is a valuable medicine in the syphilitic cachexia of children, and is particularly adapted to those forms of the disease where there is a constant tendency to indigestion and diarrhœa; it may be given in alternation with other medicines.

Hepar is better suited in these affections whenever mercury is not called for, especially for induration of the glands and eruptions about the scalp.

Lachesis.—Where there is much sore throat and dark ulcerated patches about the mouth, and when the infant "sniffles" or has constant coryza, with redness and excoriation of the Schneiderian membrane.

Mezereum is adapted to children who have a tendency to syphilitic exostoses, when the bones are large and the joints swollen. This medicine is closely allied to *asafœtida*, and has been of service to me in several severe cases.

Nitric acid, phytolacca, sanguinaria, thuja, iris versicolor, and other medicines are called for. In the majority of instances, however, it will be found that when the symptoms can be traced to hereditary syphilis the preparations of mercury and potash are best adapted to the cases.

CHAPTER XI.

WOUNDS: DEFINITION—CLASSIFICATION—DANGER OF—DRESSINGS FOR—SUTURES—STRAPS—ANTISEPTIC TREATMENT—METHODS OF HEALING—INCISED—PUNCTURED—CONTUSED—LACERATED—POISONED—GUNSHOT.

WOUNDS are solutions of continuity in any texture of the body, or divisions of the tissues caused by mechanical violence, and weapons of every variety, and are produced in innumerable ways. For convenience of description, however, they are divided into six general classes, this classification being based upon the appearance or general characteristics of the wound, and upon the agent or material which produced it. We have, 1st: *Incised;* 2d, *Punctured;* 3d, *Contused;* 4th, *Lacerated;* 5th, *Poisoned;*

6th, *Gunshot wounds.* There are also *superficial* and *deep* wounds; these terms explaining themselves. Wounds are also named according to the part of the body in which they occur, as wounds of the *head, face, chest, abdomen, and extremities.* Wounds in the direction of the long axis of a muscle or limb are called *longitudinal,* those passing directly across *diagonal* or *transverse* wounds; the latter class generally gape much more than the former, which fact should be remembered in making incisions in surgical operations. Wounds are also divided into *penetrating* and *non-penetrating,* or those entering joints or the cavities of the body, and those which enter but a short distance from the surface; the former are again subdivided into wounds with injury of the organs—or viscera contained in the cavity—and those without injury to the viscera. There are also *flap* wounds, found most frequently about the scalp, or made by sharp cutting instruments in other parts of the body. The flap is connected to the body by a neck of tissue, called "*the bridge;*" if the bridge be very narrow, and the flap very large, the probabilities are it will perish, because the only means of nourishment is through this pedicle. After a time, however, adhesions form other connections with the main surface of the body, and the circulation is thus re-established. By *wounds with loss of substance,* we understand those in which masses of tissue are entirely cut away. These are the general definitions, and will answer sufficiently for the purposes of this work.

The healing of wounds depends not only upon their proper treatment, but also upon the constitution or condition of the person at the time the injury is received. The more depraved or broken down the constitution the longer will it take to repair the wound, and *vice versa.* These solutions of continuity occurring in persons who are ill-fed, who are improperly clothed, or are uncleanly in their habits, who live in crowded and badly-ventilated apartments, heal with much difficulty, as do also those found in scrofulous or syphilitic individuals.

The *danger* attendant upon a wound depends upon its extent, and the physiological importance of the organs involved. Wounds of the heart, aorta, or medulla oblongata, produce almost instantaneous death, while quite severe lacerations of the extremities often recover rapidly. *Penetrating* wounds are critical, their danger being increased by injury inflicted on the lung, liver, stomach, intestines, kidneys, or bladder, in which case they are often rapidly fatal. Wounds of the brain or spinal cord rarely heal. Division of large nervous trunks produce paralysis of the parts supplied by them, and punctured wounds of the hands and feet frequently produce tetanus. The danger of poisoned wounds depends principally upon the virulence and amount of poison introduced into the system; in very many instances their prognosis is bad.

Dressings.—There are various appliances to facilitate the healing of wounds. These consist mainly in *sutures,* various kinds of *adhesive plaster,* and *bandages,* the object of all being to maintain the parts as nearly as possible in apposition, and to give support to the mutilated structures.

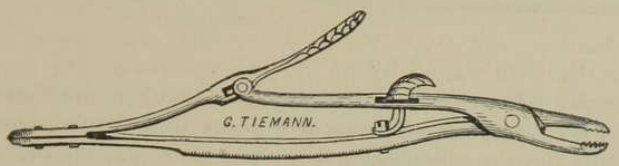
There are several varieties of suture, viz., the *continued,* the *interrupted,* the *twisted,* the *quilled,* and the *india-rubber;* these are most constantly in use. The "clamp suture" of Sims, the "button suture" of Bozeman, and the "plastic suture" of Professor Pancoast are sometimes employed by those who are adepts in the use of the varied instruments with which they are made.

The substances employed for sutures are either the ordinary saddler's silk, or a more costly article manufactured in England for surgeons' use, and coming to the market either in skeins or wound upon spools; it is a

most excellent fabric, and is called "patent ligature silk;" it does not kink or curl, and is remarkably strong and pliant.

The antiseptic ligatures of catgut or silk are fully described by Dr. Thompson in the next chapter.

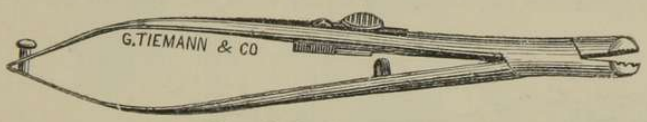
Fig. 40.



Sand's Needle-holder.

To facilitate the introduction of the needle, especially if the parts be tough and unyielding, several needle-holders have been introduced, as above; Fig. 40 represents Sand's needle-holder, and Fig. 41 shows the instrument of Prout.

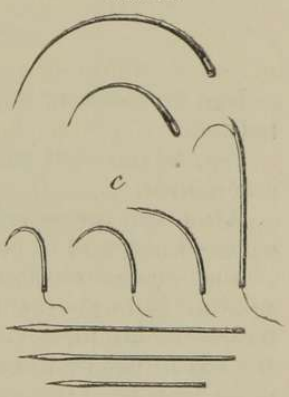
Fig. 41.



Prout's Needle-holder.

The needles are of various sizes, and may be straight, curved, or semi-curved (Fig. 42). They are either round-pointed, bayonet-pointed, or have cutting edges. Sometimes they are set in handles, and have the eye at the point (Fig. 43, next page).

Fig. 42.

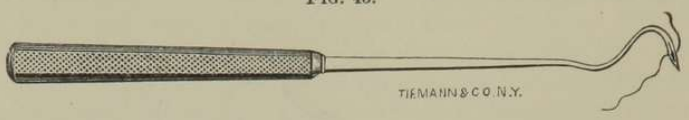


In wounds of considerable extent we may employ both suture and adhesive plaster. In making an interrupted suture, the stitches should be placed not more than half an inch apart, and in some particular cases at a less distance; they should be inserted at regular intervals, and great care should be taken to have the edges of the wound so adapted that there shall be no puckering. One lip of the wound should be seized with the fingers of the left hand, or a pair of forceps, whichever the operator finds the more convenient; the needle, threaded with silk or silver wire, is then passed from without inwards through the centre of the tissue; the other lip is then seized, and the needle passed from within outwards, inserting it at the same depth, and passing it out at the same distance from the edge or lip of the wound as it was passed *in* on the opposite side. A space of two to six lines from the margin of the cut will generally be found sufficient to hold the suture.

In threading a needle with wire, care should be taken to have the wire lodge in the grooves running back from the eye; the end should be pressed tightly down behind the end of the needle, and twisted about the long end of the ligature. This may appear a trivial matter, but the accomplished surgeon does not so regard these apparent trifles. Many surgeons of the

present day make the metallic stitches in the following manner, which was, I believe, first introduced by T. Addis Emmett, of New York: An ordi-

Fig. 43.



nary-sized needle is threaded by passing the two free ends of a loop of silk through the eye. The extremities are then tied firmly, leaving the loop free; upon this loop is placed the wire, which is simply bent over it. By introducing the needle, thus armed, it will be readily seen that the flexibility of the silk will allow a considerable degree of manipulation with the needle, which could not otherwise be accomplished without twisting or knotting the wire. After the metallic threads have been introduced, they may be seized with a pair of strong straight pliers and twisted, and the extremities cut off. To make a neat and satisfactory twist, several instruments have been introduced by Dr. Sims.

Fig. 44 represents the needle-holder, with the needle threaded.

Fig. 44.

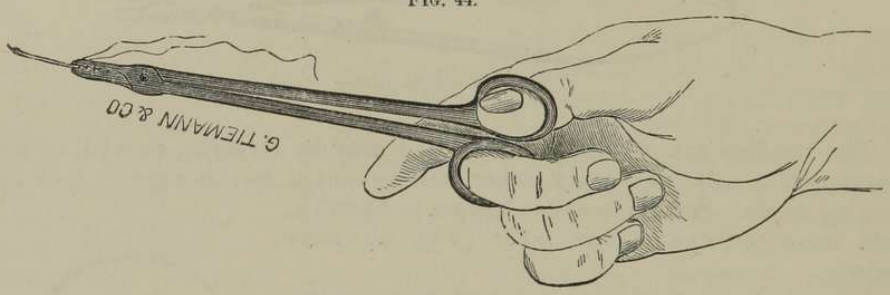


Fig. 45 (on next page) shows the wire supported and in process of being twisted.

Fig. 46 (on next page) is a silver wire carrier, which works with a spring and a slide.

After the introduction of the wire some surgeons prefer to tie it in a square knot, and to cut the ends short off.

The *twisted or figure-of-eight suture*, is made by introducing pins or needles through the lips of the wound, and twisting over them in the figure-of-eight form, silken thread or cotton. The pin should be placed in the pin or needle forceps, and introduced about one-eighth to one-quarter of an inch from the margin of the wound; care must be taken to pierce the tissue at least to the middle of its thickness. When the point is seen emerging from the raw surface, it is made to enter the opposite lip of the wound, and brought out on the surface at the same distance from the margin as it was entered on the opposite side. After the introduction of several pins, the silk is to be applied by placing its centre part over the first pin, and making two or three turns in the shape of a figure-of-eight; the ligature is then carried to the next pin, and the same process gone through. The cut (Fig. 47) gives a good idea of the interrupted and (Fig. 48) the twisted suture.

In tying either the silk, the thread, or the wire, the knot should never be placed over the line of approximation, but to one or the other side. The ends of the pins are then cut off with the pliers, and if there is a tendency

to laceration from pressure, small pieces of wax may be placed upon the extremities of the pins, or a small strip of adhesive plaster be laid under

FIG. 45.

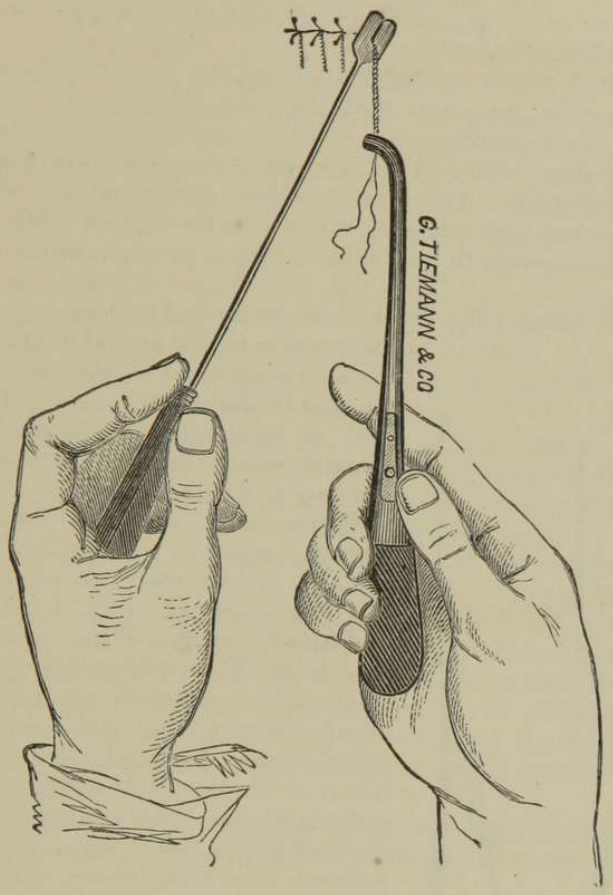


FIG. 46.

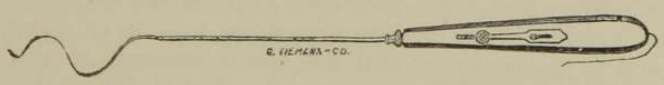


FIG. 47.

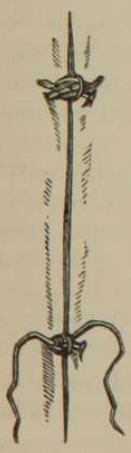


FIG. 48.

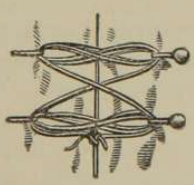
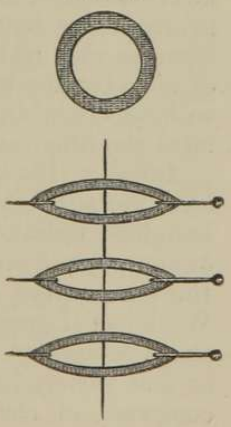


FIG. 49.



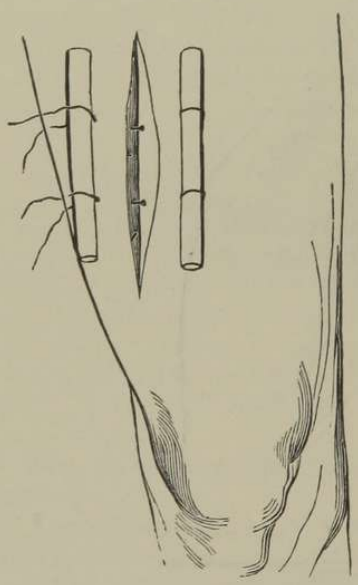
them. The latter is the plan which I usually adopt. As a rule, the pins should not be allowed to remain more than three days, as sufficient adhesion has generally taken place in that period of time. To remove the suture the thread must be carefully snipped on both sides of the pins, and lifted away; one extremity of the pin is then grasped by a forceps, rotated slightly, and withdrawn.

The *continued suture*, or that known as the *glover's suture*, is made by passing the needle, properly threaded, diagonally from one lip of the wound to the other, making, as it is called, the over and under stitch.

The *india-rubber suture* (Fig. 49) was introduced by Washington L. Atlee, of Philadelphia. It consists of small sections of gum elastic tubing, which are stretched over the pins, as seen in the figure. This suture may answer well in some cases, but is liable from its elasticity to cut into the tissues.

The *quilled suture* (Fig. 50) is merely an interrupted suture, with the extremities of the thread tied over pieces of quill or bougie, which are laid parallel with the lips of the wound.

FIG. 50.



It is especially applicable to lacerated wounds, where the parts will not bear the traction of single threads.

Gauze and Collodion.—This method of drawing together the lips of wounds, especially where there is much laceration, was first suggested by Dr. Paul B. Goddard, of Philadelphia, and has been extensively used in the Pennsylvania Hospital. I have employed it with good results. The method of application is as follows: Having prepared strips of gauze, or tarlatan, or bobbinet, of the requisite width, one end of the strap is placed upon one side of the wound on healthy texture. Over this collodion is painted, care being taken that none of this substance touches the wounded part. By the rapid evaporation of the ether the solution soon dries, and in so doing fixes itself and the fabric securely to the integument. The surgeon then draws the gauze over the wound, the edges of which are nicely adapted, and fastens the other end of the gauze on the opposite side in the same manner. This method of securing wounds has, besides the firmness with which it brings the parts together, the additional advantage of allowing the free application of any medicated substance to the wound without disturbing the dressings, and the surgeon can observe at any moment the progress of the case.

Adhesive Plaster.—There are several kinds of adhesive plaster. We have the old-fashioned adhesive, composed of resin, lead, and a little soap; Isinglass, Robbins's, Behrle's, Surgeon's, etc. When there is not much discharge, and where there is no water-dressing employed, the plaster of Robbins, or the surgeon's adhesive plaster, made at the Novelty Plaster Works of Lowell, answers exceedingly well; but where watery solutions are to be applied, the old-fashioned adhesive plaster is decidedly preferable, or that variety known as India-rubber Plaster. There are other varieties, composed of resin, lead, litharge, and turpentine, in various proportions,

said to possess advantages, but they are generally rather irritating to sensitive skins.

Cutting the Plaster.—The plaster, whichever kind is used, should be cut into strips sufficiently wide for the purpose, generally from one-quarter to half an inch in width, and in the direction of the long fibres of the cloth; if it be divided transversely it is very liable to stretch and allow the wound to gape. To apply adhesive straps, that is if the old-fashioned plaster is used, the free or unspread surface of the cloth must be laid on the outside of a smooth tin vessel, filled with hot water, until the adhesive surface is sufficiently sticky; it should then be carefully and evenly laid upon the part, sufficient traction being used to bring the cut surfaces in apposition. The traction or tenseness of each strap must be graduated in such a manner that an even support is given to the part, and to do this properly requires considerable experience. In the *removal of straps*, or even in changing them, there should be no haste; so long as they are fulfilling the purpose for which they were applied they should be allowed to remain, and when taken off, considerable care is necessary to prevent tearing the edges of the wound apart. One extremity of the strap should be carefully raised and drawn towards the edges of the wound. So soon as it has been raised to this point, the other extremity must be dealt with in like manner. In wounds of the scalp or parts covered with hair, the razor should be used, and the surface rendered perfectly smooth.

Collodion.—This substance is also used with advantage in small wounds, or it may even be applied after the use of sutures or straps. When there is a tendency to hæmorrhage the *styptic colloid* of Richardson is of good service, the tannin acting as a styptic, while the collodion forms an impervious covering to the wound. It is necessary to mention here, that some surgeons have objected to the use of these preparations of ether, on the ground that they cause too great contraction or shrinkage of the tissues. For my own part, however, I have not observed that untoward results have followed their application.

Healing of Wounds.—For a more accurate description of this process the student may refer to Chapter I, a brief recapitulation being only necessary here.

There are several methods which nature adopts in healing wounds: the first of these is what is termed *immediate union*, or that method in which the parts are brought into immediate contact and the continuity of the vessels restored, there being no inflammatory action or no deposit of lymph. This, however, is rarely the case, although there may be instances in which it can occur.

The *scabbing process* may be called nature's mode of healing wounds. We often see the process in animals when they receive slight wounds: the blood, dirt and other materials which collect on the outside form a thick scab, excluding the air; when the scab falls off the wound beneath is healed. This process takes place, however, only in slight wounds, where there is little or no suppuration. Dr. Hewson imitates this process in his earth treatment, and I must confess I have seen wonderful results from this application in recent wounds and burns.

Healing by *first intention*, as it is called, is the desideratum to be obtained in all varieties of recent wounds. This is the manner in which incised wounds generally heal, and takes place by the adhesive inflammatory process, if the edges are well coaptated, and there are no constitutional causes to operate against the healing process. The changes that occur are chiefly in the so-called connective tissue, composed of cells and intercellular substance. The cells multiply and form themselves in numbers about the divided tissues. These gradually form themselves into "*scar tissue*," by first

becoming spindle-shaped, then infiltrating the intercellular substance, and finally, the cells become changed into connective-tissue corpuscles. These latter are flattened and in a measure disappear, leaving the nucleus. This tissue gradually contracts until the scar is compact. There is a considerable difference of opinion regarding the action of the capillaries in this process, Billroth assuming that these minute elements occupy a secondary importance, and act through the cells themselves, while Cohnheim regards the capillaries as the main cause, and that they are exuded from the white corpuscles.

However this may be, we find after a time that circulation through the tissue is again re-established. In the present state of pathology it is quite impossible to state with any degree of certainty, what power the nerves of the part play in the reparative process. Wounds with loss of substance, such as contused and lacerated wounds, cannot be expected to heal by *primum intentionem*, because the vitality of the bruised tissue is destroyed to such a degree that it can never regain the normal standard. It dies and must be thrown off, and replaced by granulation-tissue, which constitutes the process adopted by nature to restore lost substance. All wounds in which there is loss of substance, or contusion sufficient to destroy the vitality of a part, must result in sloughing, and therefore that tissue must be supplied or replaced, which is accomplished by the *process of granulation*. It is as follows:

Small red granules or points are seen at the bottom and sides of the wound, and increase rapidly in number, inosculate with one another, and fill up the cavity from the bottom and sides towards the surface.

Healthy granulations are not very sensitive; are of a bright-red color, and ordinarily do not bleed easily; sometimes, however, they become sensitive, and bleed from the slightest touch, or they may become flabby, pale in color, and very luxuriant in growth; these are, of course, deviations from the normal or healthy process, and require treatment.

In a healthy granulation there is a single vessel and within each are arranged nuclei parallel to the sides of the vessel, or in some cases transversely. The granulations must be well supplied with blood, by means of which their many transformations are accomplished. When the granulations have reached the surface, around the margins of the wound or sore, the epidermis grows toward the centre, exhibiting a white line around the border of the cavity to be repaired. In this manner the reproductive material will partake of the nature of the part to be reproduced; bone in bone, muscle in muscle, nerve in nerve. (*Vide* Chapter I.)

Incised wounds are inflicted with sharp cutting instruments, and are generally considered the simplest of all the varieties previously mentioned, but the latter feature must depend to a certain extent on the parts that are injured. The most troublesome symptom is hæmorrhage, and this aside, there is but slight danger connected with them,—fibres have been simply divided, they have suffered no contusion or laceration, and consequently they are less likely to inflame severely, or to suppurate or slough.

Simple incised wounds pour out more blood than the contused or lacerated, although in the latter, much more important bloodvessels may be injured, but their coats not being divided entirely or fairly, they recede, owing to the size of the instrument by which the wound is produced, or to their inherent elasticity or contractility.

If the hæmorrhage be arterial, the blood has a florid, bright-red color, and if vessels of any magnitude are severed, it spouts in jets; if the blood be venous, it is a dark-red or purplish, and flows gradually.

This variety of injury may heal by the first intention, but there are fre-

quently causes that operate to prevent such desirable results. Among these may be the inability to coaptate the wound, or the effusion of blood between the margins of the cut, which may interfere with the healing process in several ways: first, by acting as a foreign body; secondly, by decomposing and furnishing a further source of irritation. Again, contusions of the wound-flaps may produce death of certain parts of the wound, or foreign bodies, as sand and dirt, etc., remaining in the cut may prevent the process of healing. Thus we see that there are a number of causes besides constitutional ones, which may operate against the speedy closure of incised wounds. It may not be amiss here to ask the question, how do wounds heal by first intention? What is the *modus operandi* of the process? When a wound is first united, either by the interrupted suture or otherwise, its edges may at first appear pale from the pressure produced by pins or sutures, or they often assume a purplish hue, owing to an obstruction to the return of the venous blood. Sometimes within a few hours, or at most within a day, local reaction is established, the edges of the wound become red, it pains slightly, swells to a certain extent, and feels warmer to the touch, though in reality the temperature is but little increased. These symptoms indicate the presence of inflammation, which may be termed *traumatic inflammation*, or the adhesive inflammatory process. So long as this inflammation remains, so to speak, normal, it does not extend far from the wound, does not increase in severity after the first twenty-four hours, and begins to subside from the third to the fifth day. If all goes well, at the end of the fifth or sixth day the infiltrated or exuded plasma will have become totally firm, the edges of the wound will be found quite solid, even firmer than the surrounding tissues. This induration, sooner or later, disappears. If the wound be now cleansed, the new cicatrix will be seen as a red stripe along the track of the original wound; indeed it is slightly elevated. In course of time it loses its redness and hardness, and finally becomes white and soft, even whiter than the surrounding skin.

Treatment.—In the treatment of incised wounds, the surgeon should endeavor to accomplish three objects, viz.: 1st. Arrest the hæmorrhage. 2d. Remove all extraneous matter from the wound. 3d. Coaptate the edges in the manner most favorable for their union.

Arterial hæmorrhage is most effectually checked by the application of a ligature to the ends of the vessels (it is frequently necessary in the treatment of incised wounds to ligate both extremities); when the bleeding is slight, it may be arrested either by compression or twisting the divided ends of the artery.*

After the first and most important object has been effected, attention must be directed to the second consideration—"removal of all extraneous matter." The wound should be carefully examined, and all such substances, which, by their presence, would prove a source of irritation (glass, dirt, clots, etc., etc.), should be gently removed, as it is impossible for the wound to heal by the first intention, if such be allowed to remain.

Hæmorrhage having been stanched, and the wound cleansed, the third consideration, *coaptation*, is to be thought of. In former days it was deemed advisable to effect the union immediately and completely, but the experience of modern surgery teaches the expediency of *moderate delay* and *incompleteness*.

If the external wound be put together while oozing blood continues, even though slightly, especially if the part be covered with lint and bandages, adhesion is necessarily thwarted on account of the oozing blood,

* See Chapter on arresting hæmorrhage.

which, being unable to escape, accumulating, forms a coagulum between the lips of the wound, and this, acting as any other extraneous body, prevents the union.

All attempts at closure should, therefore, be delayed for a time, in wounds of moderate extent, and in those of large dimensions the approximation of the edges should be incomplete. In cases where the wound is not extensive, a few moments' delay suffices; and when the cut surfaces present a glazed appearance, they should be nicely adapted, and retained either by straps or sutures.

If the oozing from the lips of the wound continue for some time, and if a considerable amount of blood is thus discharged, the local application of a saturated solution of tannin and alum, of the *liquor ferri persulph.*, or the dry Monsel's powder, or the perchloride of iron, or the ether spray, or the xylostyptic ether of Richardson, will generally arrest it; the best dressing, however, I have found to be the prepared styptic cotton of Ehrle, as mentioned in the chapter on hæmorrhage. In connection with this, arnica, crocus, diadema, creasote, or phosphorus, should be internally administered. If the patient's strength appears to be failing very rapidly, the countenance becomes deadly pale, or assumes a livid appearance, china off. should be prescribed, and the dose repeated every ten or fifteen minutes, until the symptoms commence to disappear.

After the bleeding has entirely ceased, adhesive plaster and position are frequently sufficient to complete the cure; this method, if practicable, is much preferable to any other for promoting union; but there are cases in which the wound is so situated, or so extensive, as not to admit of the application of adhesive straps, and when such is the case, recourse must be had to sutures. Those most commonly employed are the interrupted, or twisted, as already noted in the prefatory remarks on wounds.

For wounds that are slight, a French surgeon, M. Vidal, introduced small spring forceps, which at their extremities are provided with hooks, sufficiently sharp to hold the integument, without transfixing or laceration (Fig. 51, serrafines); when they have been allowed to remain from ten to fourteen hours, the wound may have sufficiently healed to permit their removal, after which all other means required for retention are unnecessary.

Fig. 51.

Serrafines.

When strapping is deemed sufficient to produce adhesion, the part should be placed in the position that relaxes the fibres of those muscles, which, if remaining tense, would tend to retard union. The surrounding skin should then be perfectly freed from moisture, and if there be any hair upon the part it should be carefully shaved. If we expect to use the water-dressings, such as solutions of calendula, or arnica, the old-fashioned adhesive plaster is to be preferred; if not, the Isinglass plaster, or Robbins's adhesive, or the Surgeon's adhesive plaster should be used. The straps should be long, and extend some distance from the wound, in order that they may supply the place of the bandage, in supporting the surrounding parts. Spaces should be left between the straps to allow the escape of the serous discharge that passes off during the process of adhesion.

Alcohol has been highly recommended by Dr. Dolbeau as a dressing for wounds. He applies to the surfaces and fills the cavities with charpie saturated with alcohol, and covers the dressing with a gutta-percha envelope. This application at first gives considerable pain, but in time the parts appear to become insensible to the action of the spirit. I have never had occasion to use the dressing, and, therefore, can say nothing in its favor.

The application of dry earth is also a good dressing to wounds, and may be used advantageously either to the recently cut surfaces as well as to suppurating wounds.

If sutures have been employed together with the plaster, they should be allowed to remain uncovered, in order that they may be easily removed, when their aid is no longer essential. The sooner they can be dispensed with, the more rapid will be the adhesion.

After the wound has been dressed, the patient should be placed in bed, all stimulating diet should be prohibited, and all causes of excitement be, if possible, removed; arnica should then be administered internally. If the patient be robust, and there is a tendency to fever or delirium, acon. or bell. may be employed. Staphis. has been recommended for incised wounds.

After surgical operations, acon. has been very highly recommended. Dr. Wurtzler writes: "After amputations, extirpations, and other surgical operations, I have invariably derived the most important service from the employment of aconitum. In most instances a complete cessation of pain took place three hours after its administration; traumatic fever never supervened, and the patients almost always fell into a placid and refreshing slumber; but rarely was it found necessary to have recourse to opium, and that only when startings from sleep took place from local or general convulsive jerkings or twitchings."

Punctured wounds are inflicted by sharp and narrow instruments, as needles, pins, thorns, nails, splinters, etc., which bruise and tear as well as cut. They are, when slight, attended with little danger, but when of any considerable extent the injury is always serious. Much also depends upon the constitution of the patient and the situation of the wounded part. A superficial wound along the integument, and not involving the textures beneath, is of trivial importance; but when the direction is from the surface internally, there is always some danger to be apprehended, either from the injury inflicted upon some internal organ, or from inflammation occurring in the deep part of the wound, inducing the formation of matter, which being confined, infiltration of the surrounding textures is likely o supervene, giving rise to much constitutional and local disturbance. Large collections of matter have formed beneath the fasciæ, giving rise to excessive pain, and even permanent contraction or extension of the limbs, by uniting the muscles or their cellular texture together.

Dr. Gibson mentions a case of a young man whose forearm was covered with sinuses, from which matter could be pressed in every direction. The fingers were permanently contracted, and consequently useless. The disease arose from a very trivial wound inflicted by a needle fixed in the end of an arrow.

The lymphatics often swell from punctured wounds. A wound in the foot may produce a sympathetic bubo, or a wound in the hand may give rise to inflammation and swelling of the axillary glands.

Treatment.—It was formerly the custom among surgeons to endeavor, by immediately dilating punctured wounds, to convert them into incised, and treat them as that variety of injury, but this cruel practice is fast becoming exploded, although dilatation may be necessary under peculiar circumstances, viz.: If a portion of the weapon that inflicted the wound be imbedded in the injured textures, its removal requires that incisions be made to permit the introduction of instruments used in extraction. If an artery be punctured, it must be ligated, and this requires a certain degree of dilatation. Or, again, when by the formation of matter, infiltration of the surrounding tissues is threatened, free incisions must be employed.

But in many cases of punctured wounds, after ascertaining that there is

no extraneous substance present, by the use of isinglass plaster, and by placing the part at rest and in the proper position, union by the first intention takes place, and the wound in a short time heals. If, however, inflammation appear and suppuration threaten, hepar, mercurius, or silicea should be administered. If the local inflammation is excessive, cham., bell., or rhus will prove serviceable; but by the judicious and early exhibition of arnica or aconite the above symptoms may be prevented. Nit. acid and cicuta vir. have been recommended in the treatment of this variety of wounds.

Ledum is said to be one of the most serviceable medicines in punctured wounds and affections attendant upon them. The characteristic symptom for its exhibition is *coldness* during the fever. M. Teste remarks: "*Ledum* is for wounds inflicted with sharp instruments, what arnica is for contusions."

The above writer mentions instances in which this medicine was productive of most beneficial results.

"1st. In several whitlows caused by the pricks of a needle.

"2d. Violent bite of a water rat.

"3d. In a serious wound inflicted upon a young lady who fell with an embroidery needle in her hand, which pierced through and through. No hæmorrhage occurred, but I observed the intense cold which accompanies and characterizes ledum fever."*

If, as a consequence of punctured wounds, tetanus supervene, acon., arn., angust., and cicuta may be employed.†

Contused Wounds.—In every contusion there must be a certain degree of injury inflicted upon the parts beneath, though the integument from its elasticity may remain unbroken.

Ecchymosis, in the generality of instances, occurs from the rupture of smaller bloodvessels, their contents being poured into the surrounding cellular tissue. If larger vessels have been torn, danger is to be apprehended from the extensive infiltration of blood, giving rise to inflammation, suppuration, and gangrene.

If, together with the contusion, the integument is broken, the injury is then termed a *lacerated wound*. Such wounds, when first inflicted, give rise to little pain, because the nerves of the part have suffered from the concussion; but after a time, when the part has to a certain extent recovered its nervous power, the pain increases in proportion to the inflammation that is established.

The degree of violence of contused wounds is in proportion to the velocity with which the contusing weapon is carried against the parts, and the resistance of the textures to which it is applied. If the parts yield, the shock is diminished, and consequently the injury is less considerable.

Treatment.—In simple bruises, or in the most violent contusions, provided there is no abrasion of the integument, the remedy is arnica, administered internally, applied as a lotion externally, or both.

The extraordinary virtues of this "*panacea lapsorum*" is not only appreciated by the whole medical profession, but as a domestic medicine its excellent qualities are fully understood, and the frequency with which it is employed with success; bears testimony to its usefulness in all manner of *bruises*.

As an external application, the tincture should be diluted according to the sensitiveness of the skin of the patient, but in the generality of cases one part of the pure tincture to ten or twelve parts of water will be suffi-

* Teste, Mat. Med., p. 77.

† See Chapter on Tetanus.

cient. If ecchymosis be present to any extent, the internal administration of arnica or sulph. ac. will generally suffice.

If, however, by the use of the diluted arnica there be any aggravation of pain, or if any of the pathogenetic effects of the drug are manifested, calendula officinalis must be employed. Helianthus and symphytum have also been recommended.

If contused wounds be slight, and the vitality of the affected part not much impaired, union by the first intention should at least be attempted, inasmuch as partial agglutination may prevent deformity and other ill consequences; but if the injury be of any considerable extent, adhesion is impossible, for the bruising is such that the texture is immediately deprived of life, or its vitality is so much diminished that death is inevitable.

In all cases sutures should be dispensed with, and isinglass adhesive straps employed to retain the edges of the wound as nearly *in situ* as possible. Rest and perfect relaxation of the muscles of the part are indispensable.

When the ligaments or tendons are implicated, rhus tox., as adapted particularly to contusions of such tissues, is preferable to arnica as an external application, and should also be administered internally.

If gangrene threaten, china off. should be immediately prescribed, but if the wounded part assume a bluish tinge, and the patient's strength sink rapidly, arsen. or carb. veg. must be administered.

When there has been considerable loss of substance in contused wounds, the parts can only heal by granulation, and if there be present any dead or dying tissue, it must first slough away. When such is the case, the patient must be kept at rest, and hepar or mercurius sol. be administered to aid nature in her efforts to cast off the slough, and when this has been effected, calendula, silicea, or sulphur may be administered to forward the granulations and complete the cure. If the bones or periosteum has been affected by the injury, mez., phos. ac., or ruta should be employed; the latter is especially serviceable when the wound has involved the tarsal or metacarpal joints.

In all injuries when there is great contusion, arnica should be immediately administered internally, and if high fever and delirium supervene, it may be alternated with acon., bell., hyos., or stram., according to the indications for each medicine. If the fever assume a lower grade, and typhoid symptoms are present, rhus, ars., or carb. veg. must be employed agreeably to the presenting symptoms.

Lacerated Wounds.—A wound is said to be lacerated when its edges present a torn and ragged appearance.

In this variety of injury there is generally but little hæmorrhage, and it is this circumstance that frequently leads inexperienced practitioners to establish a false prognosis regarding the termination of the case, but the experienced surgeon does not allow himself to be deceived by the absence of hæmorrhage; on the contrary, in proportion as there is little bleeding, the violence that the fibres and vessels have received is estimated. Whole limbs have frequently been torn from the body without the occurrence of profuse hæmorrhage.

In La Mott's *Traite des Accouchements* can be found an interesting account of an injury of this kind that happened to a lad, who, while playing near the wheel of a mill, entangled his arm and forearm in the machinery. The limb was violently torn away from the shoulder-joint, but the hæmorrhage was so trivial that it was stopped with a little lint, and the boy very soon recovered.

The indisposition to hæmorrhage manifested by lacerated wounds is owing to the following circumstances: The orifices of the bleeding vessels, from

the laceration, become drawn together, or, as it were, puckered, consequently the stream of blood is diminished in volume; they also retract to a greater degree than when they have been evenly divided; the sheaths of the vessels are drawn, at the lacerated extremity, to a point, which also tends to retard the flow of blood, and the arterial coats being divided at different times contract separately, the internal and middle being the first that are separated. These circumstances, as will be perceived, tend greatly to arrest the hæmorrhage, which otherwise would necessarily occur.

Any irregular body, driven with violence, may produce a lacerated wound. They may also be caused by falling from a height upon uneven surfaces; but machinery, when in full motion, produces, perhaps, the most fearful and disastrous lacerations.

There are cases of this description recorded by Carmichael, Morand, Cheselden, and also in many of the medical and surgical journals, that are highly interesting, as denoting from what frightful laceration the system may ultimately recover.

Complete union by the first intention is impossible in lacerated wounds; inflammation and suppuration are certain, and the dead tissues must be thrown off in the form of a slough, and if this be large, severe constitutional symptoms are likely to supervene; but this is not the only difficulty which has to be encountered: gangrene often spreads rapidly in the surrounding textures, thus increasing the danger to both life and limb; or tetanus may threaten with its alarming symptoms.

Treatment.—The first attention of the surgeon when called upon to treat a lacerated wound, must be directed to the removal of all extraneous bodies, and if it be present, arresting hæmorrhage. It sometimes happens that dirt or sand are begrimed in the wound, and this is particularly the case when the injury has been occasioned by the patient falling from a height upon uneven ground and loose stones. After all such foreign matter has been extracted and the wound cleansed carefully, the most important bloodvessels that have been implicated must be searched for and ligated, and a dose of arnica administered internally.

It is advisable never immediately to cut away any of the lacerated soft parts, because it frequently happens that some portion of them may heal by adhesion, thus leaving a less amount of surface to be repaired by the reproductive process (granulation and cicatrization).

Adhesive straps should then be loosely applied, and in such a manner that a free exit be allowed for the matter. Calendula officinalis, prepared as before directed, should be applied to the part, and also administered internally in the usual form, as it is known to prevent, in many instances, that prolonged suppuration that so frequently occurs in extensive lacerations, and also exercises a powerful influence over granulation and cicatrization. If, however, the expectation of the practitioner be disappointed and suppuration is excessive, hepar, silic., or sulph. should be substituted.

If the patient is restless, uneasy, and excited by the least emotion, and the local pain is severe, cham. will prove serviceable; or, if together with the pain there is high fever and delirium, acon. or bell. should be resorted to, the latter, particularly, if the patient is of a robust habit of body. Either of the above may be alternated with arnica or calendula.

If the patient becomes extremely weak, with thirst, hot dry skin, and gangrene threatens, ars. must be substituted; or, if the symptoms correspond, carbo veg., china, or lach. are to be employed.

While the ulceration and sloughing are progressing, the wound must be narrowly watched, as there is danger of hæmorrhage ensuing. Tetanus

may also be present, the proper medicines for which will be found in another portion of this work. (See Tetanus.)

In some cases, however, notwithstanding the best-directed efforts in both constitutional and local treatment, gangrene appears to be spreading rapidly; in such, the question of amputation must be seriously considered.

Poisoned wounds are characterized by the presence of some poisonous material, which is itself the principal source of danger, the wound being generally a mere puncture or scratch. The prognosis in such injuries must depend upon the extent of the wound and the virulence of the poison introduced into the system.

The nervous system is reacted upon by the virus which is received into the blood; and the great nervous centres suffer in proportion as the poison is introduced either remote or near them. In some instances it would seem that the nervous system is immediately affected, as death has been known to follow the bites of the more venomous serpents in a very short period of time. In the majority of instances, however, in poisoned wounds, some time intervenes between the introduction of the poison and the symptoms indicating its presence in the system.

By the term *zymosis*, is understood a process of fermentation, which is supposed to take place in the circulating fluid after the introduction of virus, whereby the whole system becomes contaminated, and most alarming symptoms present themselves.

Some poisons after being introduced into the system have a period of incubation, then develop their characteristic mark in the shape of pustule or ulcer, and from this the entire system becomes inoculated. This process is called the double zymotic process.

Insect Wounds.—Among insects, the bee, wasp, hornet, and yellow jacket, inflict a slight wound, and infuse into it poison contained in a bladder situated at the base of the sting. The virus flows from the vesicle through the sting at the instant this passes into the flesh. Such wounds are, in this country,* generally trivial, and their effects pass off in a short time; but sometimes they are productive of intense pain and violent inflammation. The virus of the hornet or of the yellow jacket is more highly acrimonious than that of the common bee, and there are instances on record in which both human beings and inferior animals have lost their lives from wounds inflicted by these insects. Dr. Gibson records a case of a female who died in fifteen minutes after having been stung by a yellow wasp. Another case is also mentioned by the same author, of a young woman who lost her life from swallowing a bee inclosed in a piece of honeycomb.

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* Insects are the curse of tropical climates. The *bete rouge* lays the foundation of a tremendous ulcer. In a moment you are covered with ticks. Chigoes bury themselves in your flesh, and hatch a large colony of young chigoes in a few hours (p. 404). They will not live together, but every chigo sets up a separate ulcer, and has his own private portion of pus. Flies get entry into your mouth, into your eyes, into your nose; you eat flies, drink flies, and breathe flies. Lizards, cockroaches, and snakes get into the bed; ants eat up the books; scorpions sting you on the foot. Everything bites, stings, or bruises. Every second of your existence you are wounded by some piece of animal life that nobody has ever seen before, except Swammerdam and Meriam. An insect with eleven legs is swimming in your tea-cup, a nondescript with nine wings is struggling in the small beer, or a caterpillar with several dozen eyes in his belly is hastening over bread and butter. All nature is alive, and seems to be getting all her entomological hosts to eat you up as you are standing, out of your coat, waistcoat, and breeches. Such are the tropics. All this reconciles us to our dews, fogs, vapors, and drizzle, to our apothecaries rushing about with gargles and tinctures, to our old British constitutional coughs and swelled faces.—*Sid. Smith's Works*, vol. ii, p. 147.

The mosquito, certain varieties of spider, and some species of fly, inflict severe and oftentimes dangerous wounds. In unhealthy constitutions, or in individuals whose skin is very susceptible to inflammation, the sting of the mosquito will degenerate into a troublesome sore. Dr. Dorsey* mentions a case where gangrene and death supervened from a bite of this insect. The patient was previously enjoying good health. There is also recorded by Dr. Mease, in the *Domestic Encyclopedia*, an instance in which the sting inflicted by a spider was productive of fatal results.

The tarantula, a species of spider that is found in South America, Mexico, and in Europe, particularly in the neighborhood of Naples, inflicts a bite which has been pronounced by some authors to be exceedingly severe, while others deny that ill consequences of any severity result from the virus injected into the system.

The scorpion is an insect whose sting in warm climates is so severe that death frequently ensues. It attains its largest growth in Persia, India, and Africa, where it is termed the *scorpio afer*. The reservoir that contains the poison is situated near its tail, and is ejected from two small orifices on each side of the tip of the sting. The symptoms produced in animals after they had been bitten, were swelling, convulsions, retching, vomiting, and death soon supervened.

The appearances presented when individuals have been bitten by the scorpion, are related by Mr. Allan to be similar to those produced by the stings of bees, but much more aggravated.†

Wounds of Venomous Snakes.—The two species of American serpents that are the most venomous, are the copperhead and rattlesnake. Of the latter there are ten species. The oldest naturalists mention but eight, but the two others, *crotalus cumanesis* and the *crotalus læflingii*, were discovered by Humboldt and Bonpland. All are poisonous, but those whose virus is most malignant are the *crotalus horridus*, *miliarias*, and *durissus*. The poison of the rattlesnake is of a yellow color, tinged slightly with green; during the extreme heat, particularly in the procreating season, it becomes of much darker hue.‡

Mr. Catesby§ informs us that the Indians, who in their constant wanderings in the woods are liable to be bitten by snakes, know immediately if the wound will prove fatal. If it be on any part at a distance from the large bloodvessels, or where circulation is not vigorous, they at once apply their remedies; but if any artery or vein of considerable magnitude is involved, they quietly resign themselves to their fate.

Sir Everard Home, in some observations on the poisons of the black-spotted snake of St. Lucia, the *cobra di capella*, and the rattlesnake, remarks:

"The effects of the bite of a snake vary according to the intensity of the poison. When the poison is very active, the local irritation is so sudden and so violent, and its effects on the general system are so great, that death soon takes place. When the body is afterward inspected, the only alteration of structure met with, is in the parts close to the bite, where the cellular membrane is completely destroyed, and the neighboring muscles very considerably inflamed. When the poison is less intense, the shock to the general system does not prove fatal. It brings on a slight degree of

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* Elements of Surgery, vol. i, p. 68.

† Allan's System of Pathological and Operative Surgery, vol. i, p. 370.

‡ Gibson's Practice of Surgery, vol. i, p. 108.

§ Preface to Natural History of Carolina.

delirium, and the pain in the part bitten is very severe. In about half an hour swelling takes place from an effusion of serum in the cellular membrane, which continues to increase, with greater or less rapidity, for about twelve hours, extending, during that period, into the neighborhood of the bite. The blood ceases to flow in the small vessels of the swollen parts; the skin over them becomes quite cold; the action of the heart is so weak that the pulse is scarcely perceptible, and the stomach is so irritable that nothing is retained by it. In about sixty hours these symptoms go off; inflammation and suppuration take place in the injured parts; and when the abscess formed is very great it proves fatal. When the bite has been in the finger, that part has immediately mortified. When death has taken place, under such circumstances, the absorbent vessels and their glands have undergone no change similar to the effects of morbid poison, nor has any part lost its natural appearance, except those immediately connected with the abscess. In those patients who recover with difficulty from the bite, the symptoms produced by it, go off more readily and more completely than those produced by a morbid poison which has been received into the system."*

The viper is a serpent whose bite is exceedingly venomous. It is the virus of the lance-headed viper (*trigonocephalus lachesis*), with which the members of our school are so familiar, by the labor, research and the self-sacrificing investigations of Dr. Hering.

This poison has somewhat the appearance of saliva, but it is less tenacious. It readily forms into drops, and falls without threading. It is slightly greenish in color, and when exposed to the air concretes into a dry yellow mass.†

Wounds by Rabid Animals.—The bite of rabid animals produces, in many instances, that disease termed *rabies canina*, or *hydrophobia*, although this affection does not necessarily follow; for it has certainly been ascertained that out of numerous persons bitten by dogs, undoubtedly mad, few have sustained material injury.

The first symptoms of hydrophobia generally manifest themselves between the seventh and fortieth day; but there are cases recorded of the virus remaining latent in the system for months and years. The wound is often slight, and heals readily and may never again re-open but sometimes at the onset of the disease it inflames, becomes painful, breaks open afresh, assuming a livid and spongy appearance, and secreting an ichorous humor. The patient complains of pain extending from the wound or cicatrix along the nerves. The part bitten feels numb, becomes stiff and immovable, or it may be convulsively moved.

The patient is troubled with excessive apprehension, the countenance indicates great anxiety, or the features may assume a melancholy expression. The sleep is restless and uneasy, interrupted by frequent startings, or there is complete sleeplessness. There are also present drawing pains in the nape of the neck, burning in the fauces and stomach, sensitiveness to draughts of air, with vertigo, nausea, and vomiting of green bile. Constant urging to urinate, the urine passing in drops, or an irresistible desire for copulation, are symptoms that are not unfrequently encountered. In some cases vesicles appear under the tongue, which are said by some to be pathognomonic of the disease.

When the convulsive stage sets in there is that frightful aversion to

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* Case of a man who died in consequence of the bite of a rattlesnake.

† Jahr's Pharmacopœia and Posology, p. 221.

liquids which characterizes this disease, and from which it derives its name.* Although the patient is tormented with violent thirst, even the thought of fluid at once excites most painful and distressing symptoms. If the attempt be made to swallow a few drops of water the throat and chest become constricted, and the most violent suffocative convulsions of the facial, thoracic, and abdominal muscles ensue. The convulsions are excited by the most trivial incidents. The movement of a curtain, contact, etc., give rise to spasm. There is also often present another very distressing symptom,—the collection of thick, ropy, viscid phlegm, adhering with such tenacity to the throat that it is extremely difficult and often impossible to eject it. Dr. Marcet, in the *Medico-Chirurgical Transactions*, records a case of this disease in which the phlegm was thrown off with such extreme torture that the patient exclaimed, "O! do something for me! I would suffer myself to be cut to pieces! I cannot raise the phlegm; it sticks to me like birdlime!"

Finally, tetanic or epileptic convulsions take place, and the appearance presented by the sufferer during these spasms is most horrible and appalling. The face expresses intense anguish and despair; the eyes are protruded, bloodshot, and roll wildly in their sockets; the delirium is furious, during which muscular strength increases to such a degree that the patient is with difficulty controlled. He howls, bites, and spits, or endeavors to tear himself to pieces. This attack continues about fifteen minutes, and subsides for a short period, leaving a state of complete exhaustion. It is during such intervals that consciousness is sometimes present, and often it happens when a slight gleam of reason returns, that the patient warns his attendants to what danger his rage may expose them, or prays them in earnest tones to terminate his sufferings.

Sometimes vomiting occurs. Men may be attacked with priapism, and women with *furor uterinus*. The beats of the pulse are small, irregular, and very frequent—about 130 to 150 per minute.

As the disease progresses, the paroxysms increase in frequency and violence, and death ensues in two, to eight days, generally from exhaustion (*apoplexia nervosa*), or the patient may die, suffocated, in convulsions. These are the symptoms that occur in most cases of hydrophobia; but there are modifications in this as well as in other diseases. In some instances, the patient may be able to swallow some liquids, and not water; or the symptoms may only appear during a paroxysm; or they may be purely nervous.

This disease is said to originate and develop itself spontaneously among the canine or feline race. The virus can be transmitted to men and to all warm-blooded animals. Youatt has noticed the disease in the horse.

Several severe cases of this horrible disease have been brought to my notice, one in particular deserving some attention. A man had a pet dog which regularly slept in the same bed with his master. The dog was seized with rabies and died; shortly after the man was also attacked with hydrophobia, and died also, no wound being detected upon his person. This is a singular but undoubted case. In another instance, a mad dog had been killed upon the steps of a public institution; shortly after a man, in a state

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* In a letter published in the Lancet the following remarks occur: "*Drinking* water is now no criterion by which we can judge of the existence or not of rabies. The name of hydrophobia is now universally allowed to be incorrect, there being no dread of water itself, but of the horrible spasms which the attempt to swallow liquids induces. Even this is not so constant an attendant on the disease as it was formerly supposed to be. There are many well-marked cases of rabies *without either a horror of fluids or difficulty of swallowing.*"

of intoxication, fell upon the same step, striking his head violently on the spot where the dog had been killed. In a short time symptoms of hydrophobia manifested themselves, and the patient died in all the agonies of the disease.

Rabies in the dog is said to be of two varieties. "The first is characterized by augmented activity of the sensorial and locomotive functions, continued and peculiar barking, and a strong disposition to bite. The affection commences with some alteration in the peculiar habits and disposition of the animal, who, as the case may be, is more tractable, more irritable, more lively, or more sluggish than usual; or these several conditions may alternate in one and the same animal. An early symptom consists in an inclination to lick,or carry in the mouth, various inedible substances, especially such as are cold. The animal after a time gets restless; snaps in the air, as if at flies; frequently leaves the house, but soon returns; and is obedient, and seems attached to its master. According to Blaine, constipation constantly exists. There is usually complete loss of appetite; but the animal seems to suffer from thirst, drinking eagerly, until, as indeed usually occurs, the mouth and tongue become swollen. The eyes are red, and become dull, haggard, and half-closed, the skin of the forehead being also wrinkled, which gives the animal a peculiar aspect. The nose, tongue, and throat now usually become swollen, and the coat becomes rough and staring. According to Hertwig, the mouth is generally very dry; but Blaine has constantly observed a flow of thin saliva. After some time, the gait becomes unsteady and staggering, and finally the extremities are paralyzed. The tail, in this form of the disease, is not drawn between the legs; and the head is carried erect, the nose being pointed upwards. A disposition to bite, sooner or later, invariably occurs. It is not, however, permanent, but recurs periodically. It is directed against both inanimate and animate objects—most especially against the cat—less so towards other animals, and least of all towards man. When the animal bites, he does not previously bark, or fly at the object of his attack, but approaches in a quiet or even friendly manner, and makes a sudden snap.

"The second form of the disease is distinguished by inactivity and depression. There is no disposition to bite—probably from the lower jaw being paralyzed—nor is there any indication for change of place manifested. The first symptoms are unusual quietness and apparent depression of spirits. The voice is peculiarly altered, as it is in the foregoing variety; but there is much less disposition to bark. The mouth is open, the lower jaw hangs as if paralyzed, and is raised only under the influence of strong excitement. There is a constant flow of saliva from the mouth. The animal either does not drink at all, or does so with difficulty, but manifests no fear of water; and, on the contrary, willingly immerses the nose in that fluid. The tongue is almost constantly protruded from the mouth."*

The anatomical changes that are noticed in the bodies of those persons who have died from hydrophobia are as follows: The subject decays rapidly; the blood is dark, fluid, and quickly imbibed by the system. The veins are engorged, air is frequently found in the larger vessels, and emphysema develops itself rapidly. The whole surface of the body is blue-red; the epidermis is very dry; all the muscles are dark red, and, like the tendons, they are rigid and tight.

The *introduction of morbific matter* into the system is sometimes productive

* British and Foreign Medical Review, No. XXV, p. 50.

of the worst results. One of the most deleterious poisons seems to be engendered in the body during the puerperal disease, and when by any accident there has been inoculation with this virus, results the most fatal have followed. Anatomists, or those engaged in macerating or making preparations, have suffered severely from accidental wounds inflicted by the instruments they were using. Violent inflammation frequently follows such casualties; the axillary glands inflame and suppurate; the whole limb is painful; abscesses form, and gangrene and death may result. Many examples of such cases are on record.

Treatment of Poisoned Wounds.—The bites of the mosquito and other insects, which are common in our climate, are often quite painful, and cause considerable annoyance. However, a lotion composed of a weak solution of arnica tincture, if applied to the bitten part, eases almost immediately the pain and itching. Camphor and lemon-juice,* as external applications, are also highly recommended for this purpose. Dr. Gibson writes:† "The aqua ammoniæ applied to a part stung by bees, I have known to act like a charm." The internal administration of ledum is also recommended by M. Teste.‡ He says: "Against mosquito bites, a single teaspoonful of a tumblerful of water, in which a few globules of the 15th dilution of ledum had been dissolved, quieted completely in a few minutes—I might even say a few seconds—the itching caused by the bite, without any application being necessary. Also, the stings of bees and wasps have been treated with ledum in a most satisfactory manner."

If, after the sting of any insect, the part becomes swollen, tense, hot, with erysipelatous blush, bella. should be administered, and if fever supervene, acon. may be used in alternation. Arnica is also an important remedy, and should be used, both internally and as an outward application, when the swelling assumes a bluish cast, and there is a bruised sensation around the part. If the pain is stinging, and there is itching, and a thin discharge from the wound, creas. should be administered. This medicine has also been recommended as a lotion, of about ten drops of the tincture to a pint of water.

The following medicines have also been found very serviceable; the indications for their use will generally be shown in the constitutional symptoms that present themselves: Ant. crud., calad., lach., merc., seneg., sep.

In Morocco, where the scorpion is very common, most families keep *a bottle of olive oil*, in which the bodies of several of these reptiles have been infused, and when bitten, apply it to the wound, and with reputed success. A ligature is also generally placed above the wounded part, to interrupt the progress of the poison, and the wound is afterwards scarified. "In Tunis, when any person is stung by a scorpion," says Mr. Jackson,§ "or bit by any venomous reptile, they immediately scarify the part with a knife, and rub in olive oil as quick as possible, which arrests the progress of the venom. If oil is not applied in a few minutes, death is inevitable, particularly from the sting of a scorpion. Those in the kingdom of Tunis are the most venomous in the world." According to the same author, the *coolies*, or porters, who work in the oil stores, have their bodies constantly saturated with oil, and on this account, not only never suffer in the slightest

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* Laurie's Homœopathic Practice of Physic, p. 541.
† Institutes and Practice of Surgery, p. 119.
‡ Materia Medica, p. 77.
§ Jackson's Reflections on the Commerce of the Mediterranean.

degree from the bites of scorpions, and other reptiles which creep over them at night, as they sleep on the ground, but there is not a single instance known of one of these people ever having taken the plague, although the disease frequently rages in Tunis in the most frightful manner.

Dr. Hammond, of New York, has called the attention of the profession to Bibron's solution in antidoting the poison of the rattlesnake. The formula for its production is:

℞.—Bromine, ... ℥v.
Hydrarg. bichlor, ... grs. ij.
Potass. iodidi, ... grs. iv.
M. ft. sol.

S.—Ten drops every twenty to sixty minutes, in accordance with the violence of the symptoms.

Dr. Hammond has used this preparation with success.

The use of olive oil has been highly extolled by many writers as a remedy for the bites of poisonous serpents. Dr. Miller,* of South Carolina, relates the case of a man who was bitten in the sole of the foot by a very large rattlesnake. Although very little time elapsed before he reached the patient, his head and face were prodigiously swelled, and the latter black. "His tongue was enlarged and out of his mouth; his eyes as if starting from their sockets; his senses gone, and every appearance of immediate suffocation." Two tablespoonfuls of olive oil were immediately got down, but with great difficulty. The effect was almost instantaneous; in thirty minutes it operated freely by the mouth and bowels, and in two hours the patient could articulate, and soon after recovered. The quantity of oil taken internally and applied to the wound did not exceed eight spoonfuls. In the course of twelve years Dr. Miller has met with several similar cases in which the oil has proved equally successful.

The *application of dry heat* has also been highly lauded for the neutralization of the virus inflicted by serpents.

In the western parts of our country, where rattlesnakes abound, and persons frequently are bitten, the treatment consists in forcing the patient to swallow from a pint to a quart of some alcoholic stimulant—generally common whisky. Although this method of treatment may appear novel and strange, still the effects produced are recorded as most wonderful. In the iron regions of Missouri, among the mountains, the rattlesnake is frequently found, and the inhabitants, although they fear the reptile, are destitute of that *dread* which generally connects itself in our minds regarding the crotalus; this probably arises from the belief that their remedy is infallible.

Case.—A boy was chasing a squirrel in the locality above mentioned, when the animal, as the child supposed, ran into a hollow tree. The boy immediately thrust his arm into the opening, and was bitten by a large rattlesnake. The hand and arm soon after commenced swelling, and the glands in the axilla had become somewhat enlarged, when medical assistance was procured. Common whisky was immediately administered by the half-tumblerful, until the child must have swallowed nearly a pint and a half. The stimulus did not appear to produce any exhilarating effect, but drowsiness came on and the patient slept for some time; on awaking,

* New York Medical Repository, vol. ii, p. 242.

though the arm was still considerably swollen and painful it was more natural in color. From this time improvement continued, and the patient ultimately recovered. The author witnessed this case.

The late Professor Brainerd, of Chicago, extolled very highly the following treatment in snakebites: Saturate the parts with a solution composed of five grains of iodine and fifteen grains of iodide of potassium in a fluid ounce of distilled water, and paint the limb with the tincture of iodine, at the same time administering five grains of the iodide of potash every five hours.

Dr. Perkins, in the *Galveston* (Texas) *Medical Journal*, states that the immediate application of a coal of fire is a specific treatment for the bite of the rattlesnake.

In the western parts of Missouri a very popular remedy for the bites of all venomous serpents is a plant vulgarly called "the snake weed," the "snake infallible," or "rattlesnake master." In the *Western Homœopathic Observer* an interesting account of it can be found. It belongs to the class Pedicularis Canadense, or lousewort.

Professor Halfour, in the *Pacific Medical and Surgical Journal*, gives some very interesting cases treated by the injection of liquor ammoniæ into the veins. Two drachms of a solution of this medicine were employed. He gives some remarkable cases, from which we select the following:

A robust man, aged twenty-three years, was bitten in the palm of the right hand. The part was immediately excised. Arriving at Dr. Rae's soon after, he employed suction and cauterization, and no symptoms of poisoning appearing sent the man home. In three hours, drowsiness, nausea, numbness of right arm, intolerance of light, and oppression in the chest came on, and increased so rapidly that it became difficult for the man to ride alone. Upon arriving again at Dr. Rae's the stupor was so great that shouting would scarcely elicit monosyllables in answer. The surface was cold and clammy, breathing quiet and slow, pulse feeble and intermittent, pupils widely dilated and scarcely responding to the stimulus of light. Twelve minims of liquor ammoniæ fortior with two drachms of warm water were injected into the median cephalic vein. Within a minute the man moved himself in his chair, and in ten minutes had so recovered, as to walk out in the open air unassisted. He resumed work the next day. Dr. Rae wrote that he had had no faith in the treatment, but adopted it because there was nothing else to do. He could scarcely believe his eyes in regard to the result, which seemed incredible, though nevertheless true.

In some concluding remarks Professor Halfour speaks of the great value of ammonia injections in the depression resulting from the inhalation of large quantities of chloroform, also in opium poisoning and in cholera.

It appears, however, from some further experiments that the treatment by injection of ammonia is not always free from danger, and has to be very carefully conducted.

The best method of practice, however, if the surgeon is present when the bite is inflicted, or is called immediately after, is the free excision of the part. The indications for treatment are to prevent absorption of the virus, and obtain its expulsion from the body. Therefore a ligature must be thrown immediately around the limb, in order to obstruct return of venous blood, and if the part be favorably situated free excision be instantly practiced; if the latter is impracticable, incision should be made and the flow of blood caused by every means. Suction by the mouth is also exceedingly beneficial after either operation, and should never be neglected. The suction must be continued long and repeated often. It is of the greatest importance to ascertain whether the *snake* that has inflicted the wound is

venomous or not. Dr. Hering writes, "All *venomous* snakes have in the upper jaw but *two teeth*, very long and large. All snakes that have two rows of teeth above and below are not venomous. After the bite of a venomous snake, a cutting and sometimes a burning pain is experienced. Immediately after sucking the wound, rub into it fine kitchen salt until the part is saturated with it; or, if that cannot be obtained, gunpowder, ashes of tobacco, or wood-ashes may be used as a substitute. The patient should be kept as quiet as possible; the greater the motion or the anxiety, the worse will be the consequences."

If there is vomiting, giddiness, or fainting, and blue spots make their appearance, ars. or carbo veg. should be administered. The former of these medicines has been used with considerable success by the old-school physicians. Dr. Gibson* writes, "As an internal medicine arsenic has been lately found more decidedly beneficial than any other."

Mr. Ireland† has recorded five cases, in all of which the most violent symptoms produced by the bite of the *coluber carinatus*, a poisonous serpent very common at the island of St. Lucia, were speedily arrested, and cures finally effected, by the use of this medicine. The supposed efficacy of the Tanjore pill, a medicine very commonly employed in India against the bites of serpents, the chief ingredient of which is arsenic, first led Mr. Ireland to employ Fowler's mineral solution. He gave it to the extent of two drops every half hour, and repeated for four hours, with the best effects. Severe vomiting and purging followed the exhibition of the medicine, and the patients were soon after relieved.

The administration of the above-mentioned medicine, in smaller doses, would prove more serviceable, and save the patient an immense amount of additional suffering.

A person bitten by a dog, under suspicious circumstances, writes Mr. Miller, "is usually much alarmed, and applies for relief without delay. The first business of the surgeon is to inquire into the history of the accident; the disposition of the dog; its apparent condition at the time; whether loose or chained; whether provoked or not. For it may happen that the animal was not to blame, having either been provoked to assault, or having inflicted the bite with the idea of discharging a supposed duty on an aggressor. Such a wound is not supposed to contain any virus."

If there be any reasonable grounds for doubt concerning the state of the animal at the time when the bite was inflicted, the treatment should be conducted as though the person had been inoculated by the virus. The best method is immediate and free excision of the parts, and at the same time, if there be any presenting symptoms, those medicines best adapted to them should be administered. If there was unquestionable and undeniable authority concerning the efficacy of homœopathic treatment of hydrophobia, it would undoubtedly be wrong to subject the patient to an operation, and although the cases recorded, particularly those by Mr. Leadam and Mr. Ramsbotham, have the appearance of *genuine* hydrophobia, and are evidences of the powerful action of several drugs in this affection; still the disease is so terrible in its nature, that the surgeon has indeed necessity for being doubly armed against it, for if excision fail, he has medicines at his command, the symptoms of which are very nearly allied to those manifested by hydrophobic patients, as will be hereafter shown. Moreover, the poison is an extraneous matter introduced into the system, and surely the

* Loc. cit., vol. i, p. 123.

† Medico-Chirurgical Transactions, vol. ii, p. 394.

homœopathic surgeon may be justified in using mechanical means for its removal. My friend, Dr. T. G. Comstock, of St. Louis, has reported a case of undoubted hydrophobia, which was permanently cured.* He was called on May 14th, 1852, and the patient was discharged at the end of the month. The medicines were chiefly rhus tox., bella., hyoscyamus, and lachesis. But let it be remembered, that if some time has elapsed between the infliction of the bite and the application of the patient for relief, excision of the part will prove of no avail, and immediate recourse must be had to medicines, the chief of which are belladonna, hyoscyamus, lachesis, stramonium, and cantharides.

The following indications for the first three of these medicines are quoted from Mr. Leadam, M. R. C. S. L.,† whose valuable paper on a "Case of Supposed Hydrophobia," every student should peruse.

Belladonna.—Hydrophobic symptoms. The symptoms are descriptive of various forms of headache. Violent throbbing in the brain from before backward and towards both sides; externally this throbbing terminates in the shape of painful stitches. Stitching ache in the temples from within outwards. Cutting ache in the temples from within outwards; this pain becomes more and more violent, and spreads through the brain, where it is felt as a violent throbbing. The whole of the head is affected with a stitching ache, especially the forehead. Sharp stitches through both frontal eminences from within outwards. Excessive headache; dull stitches dart through the brain in all directions. Stabbings in the brain. A few lancinations traverse the occiput, immediately behind the ear, as fast as lightning; they almost made him scream in the evening. Pain externally over the whole head, such as is felt in the integuments after violently pulling the hair. Distracted features. Paleness of face, with thirst. An extreme paleness of the face is instantaneously changed to redness of the face, with cold cheeks and hot forehead. Sweat only in the face. Increased sensitiveness of the meatus auditorius. Spasmodic movements of the lips; the right corner of the mouth drawn outwards. Risus sardonicus; spasmodic distortion of the mouth. Bloody foam at the mouth; vacillation and gnashing of the teeth. The head is drawn backwards; burying of the head into the pillow. Grinding of the teeth, with copious saliva running from the mouth. Impeded deglutition. Painless inability to swallow. Short-lasting, but frequently-recurring contraction of the œsophagus, the more during than between the acts of deglutition. Painful contraction of the fauces; when preparing the parts for the act of deglutition, a tension and stretching is experienced by them, although deglutition is not accomplished. He has the greatest trouble in swallowing water, and can only get down very little of it. Aversion to every kind of liquid; she demeans herself frightfully when seeing it. Pouring drinks down her throat makes her mad. Inability to swallow. Desire for drinks without caring about drinking; he approached the cup to his lips, and then set it down again immediately. Difficult respiration. Violent, small, frequent, anxious respirations. Pressure in the præcordial region; this arrests the breathing, and causes a feeling of anguish. Convulsive concussion of the upper limbs, as if caused by an excess of shuddering. Convulsive movements of the limbs. Twitching of the limbs. The most violent spasm after a slight vexation. Lassitude and anxiousness accompany the spasms of the limbs. Convulsions. Convulsive momentary extension of the limbs when waking from sleep. Spasmodic extension of the limbs, with distortion of the eyes. Trembling, with convulsive concussions of the body. Frightful dreams, which one recollects very vividly. Anguish prevents one from falling asleep. Starting in a dream; this wakes him up, his forehead and the scrobiculus cordis being covered with sweat. He is tormented by a burning thirst and by heat, and desires to drink from time to time, but when offered a drink he repels it. Extreme sensibility to the cold air. A convulsive shuddering lifts him up in his bed; in two hours heat

* Philadelphia Journal of Homœopathy, 1852–53, p. 315; also Medical News Letters, St. Louis.

† British Journal of Homœopathy, vol. vii, p. 145. This paper was also reprinted in this country in the Quarterly Homœopathic Journal, vol. i, p. 308, Boston, 1849. See also Mr. Ramsbotham's case of Hydrophobia, B. J. H., vol. viii.

and general sweat come on, without thirst either during the shuddering or heat. Great anguish about the heart. Anxious and fearful. Complains about an intolerable anguish in the moments which are free from rage; this makes her feel desirous of dying. He talks about wolves; full pulse. Delirious prattle about dogs that swarm about him. He is beside himself; rages; talks much about dogs. Paroxysms of delirium. Violent shaking of the head, foam at the mouth, and loss of consciousness. Horrible contortions of the muscles of the face. Great irritability and sensibility of the senses; taste, smell, tact, sight, and hearing, are more refined and keener than usual; his feelings are more easily stirred up. He becomes angry easily, even at trifles. Rage; the boy did not know his parents. He tosses about in his bed in a perfect rage; he tears his shirt and clothes. Frenzy, with attempts at violence. Instead of eating that which he had called for, he bit the wooden spoon in two, gnawed at the dish, and grumbled and barked like a dog. Rage; the patient being sometimes very cunning, and alternately singing and screaming, or spitting and biting. He wants to bite those around him. He bites everything in his way. Inclination to bite and tear everything around him. Bites and spits. Attempts to jump out of bed. Apprehends death. Is afraid of an imaginary black dog.

Lachesis offers the following symptoms: Dartings in the head. Deep stinging throughout the whole head. Sticking with pressure in the right side of the head. Tearing lancinations in the forehead, above the eyebrows. Distortion of the face. Distortion of the mouth to the left side during a fit. Hurried talking, with headache and redness of the face, or with mental derangement and constrictive sensation in the throat. Difficulty of swallowing food, or drink, or saliva. Dryness of the pharynx and œsophagus, preventing deglutition. Jerking and twitching of the hands. Twitching of the left lower limb while sitting. Tingling in the toes, also with heat and numbness, or prickling. Constant sopor after cessation of pains. Convulsions and other spasms, with violent shrieks, etc. Sensation of internal trembling, as from anguish. Violent convulsions of the limbs and face, with rigid stretching of the body.

Hyoscyamus.—Hahnemann gives among the symptoms: Impeded deglutition. The posterior part of the throat is affected. Frequent hawking up of mucus. Burning heat in the throat. Dryness and subsequent fine stinging in the region of the larynx. Parching dryness of the fauces. Great dryness in the throat and thirst. Dryness in the throat. Thirst and dryness in the throat. Thirst occasioned by stinging dryness in the throat. His throat feels so dry and constricted that a little tea came near choking him. Constriction of the throat. Inability to swallow. He twice spat out a liquid which had been introduced into his mouth. Hydrophobia. Intolerable thirst. Unquenchable thirst. Dread of drinks. Violent sweat after thirst. After drinking he was now attacked with convulsions, now he did not recognize those present. He asks for drink, and is, nevertheless, unable to swallow. Frequent spitting of saliva. Mental derangement with occasional muttering. Alternations of ease and rage. Mania, he can scarce be governed. He is extremely strong in his rage. Peevish, sad. Went from place to place. Anguish. Fits of anxiety. Horrid anguish. Concussive startings, alternating with trembling and convulsions. Strange fear that he will be bit by animals. Excessive sweat.

Stramonium.—The following symptoms are recorded in Jahr's new manual: Endeavors to escape, imagines he is all alone all the time, and is afraid. He endeavors to beat those around him, with a terrible cry and rage. He bites a person's hand. Great desire to bite and to tear himself with his teeth, even his own limbs. Alternations of convulsions and rage. Hydrophobia. Delirious, he had no memory or consciousness. With his eyes staring and his pupils dilated, he saw nothing, did not recognize any of his family, carried his hands about as if he would grasp at something, and stamped with his feet. Frightful fancies; his features show fright and terror. Convulsions of the head. Swollen face, turgid with blood. Dilatation of pupils; staring eyes. His tongue is paralyzed, it trembles when he attempts to put it out. Bloody froth at the mouth. Hydrophobia; restlessness, violent convulsions, the patient being so violent that he had to be tied; he rolled about in his bed sleepless, and uttering crowing screams; he was delirious without memory or consciousness; his pupils were extremely dilated; violent desire to bite and to tear everything with his teeth; extreme dryness of the inner mouth and fauces: the sight of a light, a mirror, or water, excited horrible convulsions, irresistible aversion to water, with constrictions and convulsions of the œsophagus; froth at the mouth and frequent spitting. Dread of, or aversion to, water or any other liquid, with spasmodic motion. Aversion to watery liquids; he became enraged when his

lips were moistened. Frequent spitting; slaver hanging out of the mouth. Tenacious mucus in the mouth. Stiffness of the whole body.

The following symptoms of hydrophobia are taken from the proving of the virus, **Hydrophobin**, by J. Redman Coxe, Jr., M.D., assisted by other members of the profession:*

Slight dizziness and nausea. Violent pressing outward in the forehead, the patient put the head to the wall. A very intolerable, snappish, irritable headache, with stiffness of the jaws and numb hands. (Nearly all the symptoms relating to the head are such as might be present in the incipient stage of hydrophobia.) Twitchings of the face and hands. Rending and tearing pain in the malar bones. Face pale, yellow, nearly brown. Both jaws feel stiff, with tingling in the cheek-bones. Jaws stiff and sore. Jaws feel stiff, and a disposition to gape. Rending pain in right upper jaw, towards the ear. Mouth full of saliva, and total disinclination to drink. Saliva more viscid, constant spitting; feeling of general malaise all over, without pain. Increase of saliva. A large quantity of viscid saliva in the mouth. Saliva more plentiful, but thin and of a yellow color. A desire to swallow, and spittle more viscid than usual. Difficulty in swallowing liquids. Sensation as of inability to swallow, but can do so when trying. Difficulty in swallowing liquids; epiglottis appeared partially paralyzed. Burning down the œsophagus. Constant desire to swallow. Violent spasm of the throat with sense of suffocation. Strange constrictive sensation, with inability to swallow without great pain. Constrictive sensation in the throat, much worse when swallowing liquids.

Drs. Hartlaub and Trinks recommend **cantharides** as a preventive of hydrophobia. It should be prescribed for the following symptoms:†

Alternate paroxysms of rage and convulsions, which may be excited by touching the larynx, by making pressure on the abdomen, and by the sight of water; the eyes look fiery and roll about in their sockets in the wildest manner. The patient is scarcely able to swallow, especially liquids, on account of a burning and dryness of the mouth. There is an excessive desire for sexual intercourse, with constant painful erections, and continual itching and burning of the internal sexual parts. The oppression of breathing and anguish are less striking than in cases for which bella. and hyos. are indicated; the convulsions, however, sometimes being frightful. In general, cantharides appears to be more indicated when the inflammatory symptoms are the most prominent, and when the impeded deglutition does not proceed from a spasmodic constriction of the fauces, but from the inflammation of those parts, or from pains caused by swallowing.

Although much reliance cannot be placed on the many popular remedies for this dreaded malady, it would seem proper to mention one which has a very great reputation in certain localities, which is the *elecampane*. Many persons are said to have been cured by it. The directions for its use are as follows, as given by Mr. Fry:

The patient is to be kept free from excitement of every sort, especially from that caused by the visits of sympathizing friends. The medicine is to be prepared by taking one ounce of elecampane root, powdered; one tablespoonful of madder, and one quart of new milk, and boiling them all together, slowly (in a water-bath, if possible), until reduced to a pint. The dose is one wineglassful once a day for three days, then intermit three days, then repeat and intermit again, and again repeat. That is, nine wineglassfuls are taken in all, and there are three intermissions.

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* See Philadelphia Journal of Homœopathy, vol. iii, p. 262.

† Hartmann's Chronic Diseases, vol. ii, p. 164.

In support of the efficacy of this treatment it is stated that thirty years ago Mr. Reed and Daniel Mershon were bitten at Germantown by a rabid dog; that Mr. Reed was treated by an eminent physician and died of hydrophobia, while Mershon, under this treatment, never suffered at all. A young man and a young woman, under similar treatment, recovered from the dreadful disease about twenty years since. In 1858, a policeman, so far gone with hydrophobia as to have to be held in the carriage, in which he was driven through Germantown to Mr. Fry's residence, was also treated with entire success. A number of additional cases are quoted, in all of which the remedy described is claimed to have effected complete cures.

There is a species of hydrophobia, not arising from the inoculation of virus, but proceeding from some violent mental emotion; the disease is termed *symptomatic hydrophobia*. Fear and imagination, after a bite from a perfectly healthy animal, may give rise to symptoms that very nearly resemble those of the genuine affection. Sometimes very serious trouble is occasioned by large doses of bella., canth., or mercury, the drug disease assuming as it were the form of a medicinal hydrophobia. The treatment of these affections is generally simple, when their cause is correctly ascertained.

When putrid animal matter has been received into the system by means of wounds, as in dissection, there should be a ligature worn for a time, and suction by the mouth be immediately resorted to, after which, collodion should be applied over the wounded surface; if the wound after a time present rather a bluish appearance with swelling, china off. or arsenicum should be given; if mortification or abscess ensue, the treatment has already been mentioned.

Gunshot Wounds.—Before entering into the consideration of the wounds occasioned by firearms, it will be necessary to make a few remarks upon the *general principles of firing* and *the motion of projectiles*, for it may often be of service to the surgeon, in his endeavors to discover the course of a ball or a bullet, and to determine other questions of import in gunshot injuries.

There are three imaginary lines upon which the general principles of firing are grounded. These are:

1st. *The line of fire or projection.*

2d. *The line of metal or aim.*

3d. *The line of trajectory, or flight of the bullet.*

By the first is understood the primary direction of the centre of the bullet, or the axis of the barrel, indefinitely prolonged, indicating the course the ball would take if it were subject alone to the explosive force of the powder.

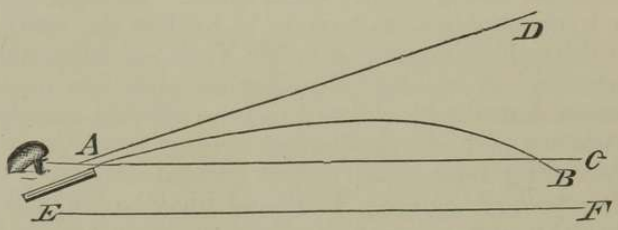
The line of aim, or the line of metal, is an imaginary line drawn from the centre of the back sight and the top of the front one, directly to the object of aim.

By the third, *or line of trajectory*, is meant the flight of the bullet, and is the curve described by the missile from the barrel of the gun to the object of aim. It must be obvious that so long as the bullet is passing along the barrel of the gun, that the line of fire and that of trajectory are the same, but the moment the bullet leaves the muzzle, the trajectory leaves the line of fire, the divergence becomes greater and greater as the bullet passes through the air.

This may be illustrated by the cut, Fig. 52. *A* to *D* is the line of fire; *A* to *C* is the line of aim; *A* to *B* is the line of trajectory. The course of a bullet is urged downwards by several forces, as inertia, friction, gravity, and its rotation, the latter being occasioned by the grooves or the twists in the barrel of the gun. These points are useful in ascertaining the velocity and revolution of balls. In order to find the velocity and rotation of a

bullet, divide the velocity in feet by the number of feet in which one complete turn is made by the bullet. Thus: "The initial velocity (that of the bullet as it leaves the muzzle) of the Enfield rifle, being twelve hundred

FIG. 52.



and sixty-five and one-tenth feet per second, and the turn (rotation) one in six and a half feet, the initial velocity of rotation of the bullet fired from the Enfield, is one hundred and ninety-four and six-tenths revolutions per second."

The bullet, therefore, as it leaves the gun, must be under the action of three separate and distinct forces—that of the gunpowder exploding; that of gravity, and that of resistance of the atmosphere—and it is discovered that in the first second it falls sixteen feet; at the end of the second second it will have fallen sixty-four feet; and at the end of the third second, one hundred and forty-four feet. It is from a knowledge of these facts, and many more, that the science of gunnery teaches accuracy of aiming. Robins says "he found that when a twenty-four-pound shot was impelled by its usual charge of powder, the opposition of the air was equivalent to at *least four hundred pounds weight*, which retarded the motion of the bullet so powerfully, that it did not range one-fifth part of what it would have done if the resistance of the air had been prevented." With a knowledge of the power obtained by rotation given to bullets by the shape of the barrel, and the uncertainty of smooth-bore guns, very many remarkable improvements in the construction of firearms and cartridges have been adopted; certain grooves have been constructed, and certain twists made in the barrels, which make the guns of to-day a marvel of ingenuity, accuracy, and execution. Among many of these American guns we have "Wesson's improved American rifle;" "Colt's," which is in high favor in the service; "Sharp's," the "Maynard," the "Burnside," the "Spencer," the "Ballard," the "Peabody," "Remington's," "Cochran's," and many others, which are mostly breech-loaders, and using conical balls. And among the European the "Needle-gun," invented by Herr Von Dreyse, the "Chassepot breech-loader," the "Snider-Enfield rifle," the "Cornish breech-loader," and the "Grenade rifle;" in the latter the ball is hollow, and is filled with two and a half grains of powder; it explodes when it strikes with great certainty, and sends its fragments three feet in every direction. It is reputed to do as much damage as three or four ordinary balls, and to create the utmost dismay.

Some experiments have been made to show the relative number of shots that may be made by some of these remarkable guns.

Spencer—A little less than twelve shots per minute.

Peabody—Fourteen and two hundredths per minute.

Ballard—Fifteen per minute.

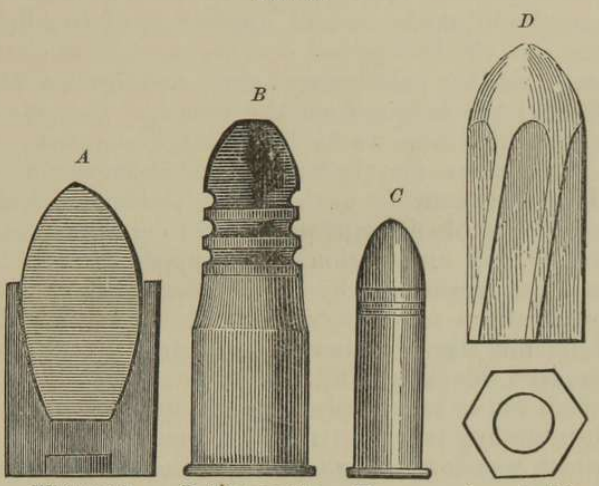
Berdan—Sixteen and four hundredths per minute.

The "Mitrailleuse" is another most powerful weapon, which produces most serious devastation and dismay.

The "Chassepot rifle" can be fired, the men taking aim, about eight or ten shots per minute, and fourteen without shouldering the gun.

Great improvements have also been introduced in the manufacture of the ball, most of which are conical in shape, with hollow bases. Fig. 53 shows the shape of the different missiles of various guns; and Fig. 54, taken from the Surgeon-General's Circular, shows the round and conical bullets now much used in the army of the United States.

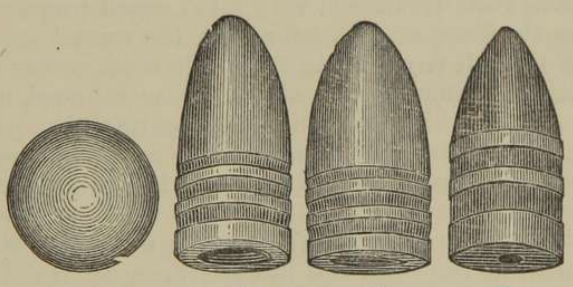
FIG. 53.



Whitworth bullet. Ball for needle-gun, 451 grs. Wesson slug, 28 to pound. Large ball for Spencer breech-loader.

Of the varieties of gunshot wounds, none are more terrible in their effects than those that are produced by the peculiar bullet invented by M. Etienne Minie, of Paris. These terrible implements of war are cylindro-conical in shape, with a hollow base, and they cover every requisition, viz.: 1st. When the explosion of the powder takes place, they fill exactly the bore of the gun. 2d. When projected they proceed with a rotary motion. 3d. They are so formed as to present as little resistance as possible to the air. 4th. The forward portion of the ball is solid, to cut through whatever opposes its progress. The Minie bullet is for rifles, and is made of lead; the base of the ball is nearly the diameter of the rifle, and is hollowed out. The effect of the powder when firing is to expand the thin portion of lead around the recess at the base of the ball, making it fit tightly the grooves of the rifle. With these advantages the missile may be projected to immense distances with unerring precision, and the effects are truly terrible; bones are ground almost to powder, muscles, ligaments, and tendons torn away, and the parts otherwise so mutilated, that loss of life, certainly of limb, is almost an inevitable consequence. None but those who have had occasion to witness the effects produced upon the body by these missiles, projected from the appropriate gun, can have any idea of the horrible lacer-

FIG. 54.



A, U. S. round musket-ball, calibre 69, weight 387 grs.; *B*, Springfield rifled musket-ball, calibre 58, weight 500 grs.; *C*, Enfield rifled musket-ball, weight 450 grs.; *D*, Austrian rifle-ball, weight 460 grs.

ation that ensues. The wound is often from four to eight times as large as the diameter of the base of the ball, and the laceration so terrible that mortification almost inevitably results.

Quite a number of men wounded at the Camp Jackson affray were brought to the Good Samaritan Hospital at St. Louis immediately after the skirmish. It was during the service of Dr. Fellerer. I watched these cases, and made careful dissections of the limbs after amputation. In one case the ball passed directly through the inferior maxillary bone, cutting loose the palatine and glossi muscles, fearfully smashing the bone and forcing the tongue from the mouth. This man could neither speak nor swallow for some weeks, but finally recovered.

In another case, the ball entered about the middle of the forearm, coursed down on the surface of the radius, and emerged at the wrist-joint. Although every possible attempt was made to save the arm, untoward symptoms presented, and amputation at the upper third of the forearm was necessary, and was performed by the surgeon to the hospital. The muscles on the anterior face of the forearm were soft, but not much out of place or tumefied; but those (particularly the deep layer) on the posterior aspect were decayed, black, and filled with extravasation; the radius was shivered into about ten or twenty pieces, the medullary matter being thrown out into the surrounding textures; the ulna was not broken, except the styloid process, which was torn away; the semilunar bone of the carpus was divided, the os pisiforme separated from the joint, and the head of the os magnum driven forward and split open. With such a wound as this, mortification was a result to be expected.

In the third case amputation was resorted to above the knee-joint. In this instance, the extravasation was very remarkable, the fluid being extremely dark and very offensive. Here the fibula was only slightly touched; but the tibia was broken near the knee-joint, and split longitudinally for two-thirds its length, very many small fragments of bone being imbedded in the tissues. The fetor from the wound was intense, and the laceration of the soft parts, along the whole track of the ball, severe and remarkable.

In the fourth case, a wound was inflicted immediately below the knee-joint, smashing the fibula, and tearing the structures to a considerable degree. The course of the ball was under the gastrocnemius and through the soleus. Every effort was resorted to to save the leg of this man, a captain in the service. An attempt was made to resect the fibula; upon cutting down, however, upon the bone, it was found that the external lateral ligament of the joint had literally been destroyed, that the head of the fibula was gone, and that in its place there existed a black, gritty mass of decayed muscle, bone, and ligament. All hope of saving the limb was therefore abandoned, the patient still kept on the table and under the influence of chloroform, and the limb amputated above the knee-joint at about the middle third of the femur. It is worthy of observation, that on the morning of the operation pain was complained of in the popliteal space. On examining the limb after amputation, the tibio-fibular articulation was found to be involved; and upon inserting the scalpel through the transverse ligaments, a large amount of fetid fluid, containing flocculi of a cheesy character, issued from the joint. Upon inspection, marks of disease were found upon the left condyle of the femur, sufficient evidence that a serious, if not fatal disease of that most complicated joint, the knee, was about being established, and that amputation was necessarily the only resource left to preserve life.

Such is a brief account of effects produced by the Minie ball upon the organism.

The preceding cuts will give an idea of the different shapes of the balls and cartridges. Fig. *A*, the Whitworth bullet. Fig. *B*, the ball of the needle-gun, weighing 451 grains. Fig. *C*, the slug of the Wesson cavalry carbine, twenty-eight to the pound. Fig. *D* represents the cartridge (full size) for Spencer's army and navy rifles.

Cannon-balls inflict sometimes the most severe injuries, carrying away an entire limb, or severely bruising the parts without breaking the integument.

The total number of gunshot injuries in times of war is appalling to the civilian. In the British army during the Crimean war there were 12,094 wounded and 2755 killed, making a total of 14,849. In the French army in the Crimea there were 39,868 wounded, 8250 killed, or a total of 48,118. In our own war the reports from about three-fourths of the regiments, for the year ending June 30th, 1863, were 55,974 gunshot wounds, and according to the circular No. 6, from which these figures are taken, "the battle-field list of wounded for the years 1864–65 include 114,000 names." Such is the sacrifice of life and limb in war.

The following figures, taken also from the Surgeon-General's circular, as corrected from the register on September 30th, 1865, shows the classification of wounds and injuries and results during the civil war in the United States:

Of gunshot fractures and injuries of the cranium there were 1108; of gunshot fractures of the bones of the face, 1579; gunshot fractures of spine, not involving chest or abdomen, 187; gunshot fractures of ribs, 180; of pelvis, 397; of scapula and clavicle, 389; of the humerus, 2408; of the radius and ulna, 785; of the carpus and metacarpus, 790; of the femur, 1957; patella and knee-joint, 1220; tibia and fibula, 1056; tarsus and metatarsus, 629; gunshot penetrating wounds of the chest, 2303; of abdominal viscera, 565; scalp wounds, 3942; flesh wounds of face, 2588; of the neck, 1329; of the thoracic parietes, 4759; of the back, 5195; of the abdominal parietes, 2181; of the genito-urinary organs, 468; of the upper extremities, 21,248; of the lower extremities, 25,152; wounds of arteries, 44; wounds of the veins, 3; of nerves, 76; sabre wounds, 106; bayonet wounds, 143.

Simple fractures and miscellaneous wounds and injuries, 2883; tetanus, 363; of secondary hæmorrhage, 1035; pyæmia, 754; making a total of 87,822.

The following is the *classification* of the *surgical operations:*

Amputation of finger,	1849
" of wrist-joint,	46
" of forearm,	992
" of elbow-joint,	19
" of arm,	2706
" of shoulder-joint,	437
" of toes,	802
" of foot (partial),	160
" of ankle-joint,	73
" of leg,	3014
" of knee-joint,	132
" of thigh,	2984
" of hip-joint,	21
Excision of head of humerus,	575
" of elbow,	315
" of wrist,	34
' of ankle,	22

Excision in continuity of upper extremity (shafts, humerus, radius ulna, radius and ulna),	695
" of shafts of tibia and fibula (tibia, fibula, tibia and fibula),	220
" of knee,	11
" of shaft of femur,	68
" of head of femur,	32
" of bones of face or wrist,	101
Trephining,	221
Ligation of arteries,	404
Extraction of foreign bodies,	726
Operations for surgical diseases,	443
Operations not classified,	23

Gunshot injuries partake more or less of the nature of contused and lacerated wounds, and are often accompanied with extreme danger, the patient being either immediately or remotely destroyed; or there may exist extensive mutilations, giving rise to abscesses, sinuses, or diseased bones, which are frequently extremely tedious and difficult to heal. Indeed, the after-life of the patient may be fraught with such intense suffering that the approach of death is hailed with joy as the only relief. The kind and extent of the injury must depend upon the *form and size of the instrument inflicting the wound*, upon the *velocity* with which it is carried, and a variety of other circumstances.

A ball moving with great rapidity and striking the body enters readily, and pursues its course generally in a straight line, either passing through the part or lodging at a greater or less depth. On the contrary, a ball which moves slowly enters with difficulty, and instead of following a direct line, is diverted by the slightest obstacle, always taking an angular course. Owing to this circumstance, it often happens that a bullet strikes some part of the body and apparently passes through, but upon examination it will be found that it has taken a circuitous route, or traversed the head between the bone and the scalp, or passed entirely around the abdomen or neck. When such is the case the superficial track is marked by a discolored line, sometimes slighty emphysematous. Other instances there are in which the ball strikes an extremity, runs beneath the integument or among the muscles, and is lodged many inches—or even two or three feet—beyond the point at which it entered.*

The aperture made by the bullet's entrance is small, and with margins inverted: often it appears of much less dimensions than the foreign body which has passed through it, and sometimes it may even assimilate the incised character. In such cases, the ball has come from some distance, and has struck with considerable force and velocity; the aperture, consequently, is made with comparatively little bruising or tearing, and the elastic textures close upon its track.

The aperture of exit, on the contrary, has its margins ragged and everted; and is of larger dimensions than that which marks the entrance. There has lately been some discussion concerning the size of the wound of entrance and that of exit. The French surgeons, and particularly M.

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* In one instance, which occurred in a soldier, with his arm extended, in the act of endeavoring to climb up a scaling ladder, a ball, which entered about the centre of the humerus, passed along the limb, and over the posterior part of the thorax, coursed among the abdominal muscles, dipped deep through the glutei, and presented in the forepart of the opposite thigh, about midway down.—*Hennen's Principles of Military Surgery*, p. 34.

Roux, of Paris, contend, that, in gunshot wounds, it frequently happens that the aperture of entrance is larger than the opening made by the ball as it passes from the body. When the injury has been inflicted at a short distance, the aperture of entrance is comparatively large, has no smoothness in its edges, and is obviously of a lacerated character; then, too, portions of the wadding are usually impacted in some part of the track, and the surface may be marked by the grains of powder.* There are many instances in which there are not two openings. In such cases the ball, after having entered, lodges under the integument, in the muscle, or in a bone.

Extraneous substances may be carried before a bullet—such as buttons, coins, keys, etc. These always produce irritation in proportion to the irregular shape of the foreign matter.

In other cases, portions of clothing may be driven before the ball, and be imbedded deeply in the wound. When such is the case, it frequently happens that when the cloth is removed, the bullet is discharged with it.

Balls have been buried and never been found. They become, in such instances, inclosed in a cyst, or surrounded by bony formation, the patient experiencing little or no inconvenience from them; or they may change their position and traverse the body, giving rise to pain, long suppuration, hæmorrhage, convulsions, or paralysis.

Dr. Franklin records a very interesting case, "in which a bullet was driven into the upper part of the thigh; all efforts for its removal were unavailing. The wound healed, and the patient attended to his ordinary duties as if nothing had happened, when suddenly (four years after the injury) he was attacked with loss of motion in the leg. Having placed himself under the care of a surgeon, and getting no better at the end of five weeks, the case was submitted to my care. Upon examination I discovered the cause of the difficulty, and learning the position when struck, examined carefully the inner and upper part of the thigh, where I felt the ball lying in contact with the crural nerve. The ball was removed, the patient improved in strength, and in a short time fully recovered the use of his limb, and up to this time enjoys uninterrupted health."†

Again, balls by striking forcibly the edge of a sharp bone, may be divided, each portion of the bullet taking for itself a separate route.

"It is no uncommon thing," writes Mr. Thompson,‡ "for a ball in striking against the sharp edge of a bone, to be split into two pieces, each of which takes a separate direction. Sometimes it happens that one of the pieces remains in the place which it struck, while the other continues its course through the body. Of a ball split by the edge of the patella, I have known one-half pass through at the moment of the injury, and the other remain in the joint for months, without its presence there being suspected. In the same manner I have known a ball divided by striking against the spine of the scapula, and one portion of it pass directly through the chest, from the point of impulse, while the other moved along the integuments till it reached the elbow-joint. But the most frequent examples of the division of bullets, which we had occasion to see, were those which were produced by balls striking against the spherical surface of the cranium. It sometimes happens that one portion of the ball enters the cranium, while the other either remains without, or passes over its external surface.

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* See Miller's Principles of Surgery.

† Science and Art of Surgery, vol. i, p. 676.

‡ See Thompson's Reports of Obs. in Military Hospitals in Belgium.

Not unfrequently, in injuries of the cranium, the balls are lodged between its two tables, in some instances much flattened and altered in their shape, and in other instances without their form being changed."

The course which bullets take is at all times uncertain, "for very slight obstacles cause a retroversion from the rectilinear direction." A shot may rebound from the water, and a button or a handkerchief has been the means of preserving life. "Although," says M. Chevalier, "in many cases a mathematical explanation of the course of a ball cannot be given, this arises entirely from the want of data, the laws of matter being fixed and immutable. But when the data are known, as, for instance, the *velocity* and *direction* of the shot, the *position* of the patient, or of the wounded part at *the time of the accident*, and the structure of the parts penetrated, a much more probable conjecture of the course of the ball may generally be formed than if these circumstances had not been regarded."

Dr. Franklin, during his service in the army, saw many remarkable "evidences of the strange and anomalous course of balls in various parts of the body. In one case the bullet passed over *more than two-thirds* of the circuit of the neck, and was cut out just beneath the skin.

"In another, a ball entered at the crest of the ilium, passed downward parallel with the thigh, and emerged just above the knee-joint."*

The opening by which the ball has made its exit is frequently very near the aperture of its entrance. Indeed, there are cases on record in which the aperture of exit and that of entrance were the same. Dr. Hennen mentions an instance in which a ball entered the *pomum Adami*, and, after running completely around the neck, was found in the very orifice at which it entered.

Gunshot wounds partaking of the nature of contused and lacerated wounds, seldom bleed profusely externally, and for the same reason; but often, though the bleeding is not manifest, a fatal hæmorrhage may be taking place internally. Secondary hæmorrhage is also of frequent occurrence in this variety of wound, from the detachment of the slough, etc. But it must also be remembered, that though immediately after the injury the bleeding may be but slight, in a short time the hæmorrhage may become profuse, and particularly if the wound be inflicted in vascular parts, like the face and neck; and this may occur even though the larger branches of the artery may not be opened.

When a large artery is only partially divided, the bleeding is more profuse and dangerous than when the vessel is completely severed; and in such cases the hæmorrhage often continues until the patient expires.

Mr. Guthrie† mentions three cases in which life was lost from wounds of the carotid, femoral, and humeral arteries, no means having been adopted to arrest the hæmorrhage.

There is a peculiar shock which attends upon gunshot wounds—an extraordinary perturbation, or agitation, which the bravest are not able to resist. This, however, is not invariably present; for, says Dr. Hennen,‡ "the effects of a gunshot wound differ so materially in different men, and the appearances are so various, according to the nature of the part wounded, and the greater or lesser force with which it has been struck, that no invariable train of symptoms can be laid down as its *necessary* concomitants. If a musket or pistol ball has struck a fleshy part, without injuring any

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* Science and Art of Surgery, p. 675.
† On Gunshot Wounds, p. 8.
‡ Principles of Military Surgery, p. 33.

material bloodvessel, we see a hole about the size of, or smaller, than the bullet itself, with a more or less discolored lip, forced inwards; and if it has passed through the parts, we find an everted edge, and a more ragged and larger orifice at the point of its exit. The hæmorrhage is in this case very slight and the pain inconsiderable, insomuch that, in many instances, the wounded man is not aware of his having received any injury. If, however, the ball has torn a large vessel or nerve, the hæmorrhage will generally be profuse, or the pain of the wound severe, and the power of the part lost. Some men will have a limb carried off, or shattered to pieces by a cannon-ball, without exhibiting the slightest symptoms of mental or corporeal agitation; nay, even without being conscious of the occurrence; and when they are, they will coolly argue on the probable result of the injury; while a deadly paleness, instant vomiting, profuse perspiration, and universal tremor, will seize another on the receipt of a slight flesh wound. This tremor, which has been so much talked of, and which, to an inexperienced eye, is really terrifying, is soon relieved by a mouthful of wine or spirits; but, above all, by the tenderness and sympathizing manner of the surgeon, and his assurance of the patient's safety."

A rather peculiar case representing the fatality of shock present in gunshot wounds was related to me at the time of its occurrence by Dr. Comstock. The gentleman, a patient of Dr. C., was at the encampment of Secessionists, near St. Louis, when the United States troops demanded surrender. A slight skirmish ensued, and the gentleman received a wound on the anterior face of the inferior third of the thigh, shattering the bone. Dr. Comstock not being at hand, a physician was called who prescribed a large dose of morphine, and sent for a surgeon to amputate the limb. In the meantime Dr. Comstock arrived and found the patient just expiring, no reaction having followed the shock.

Surgeons at the present day deny the existence of the so-termed *wind contusion*, or the effects produced by the wind of a ball; and explain the injuries heretofore attributed to it, as produced by spent balls, which have really struck, yet with so little quickness of force as to merely bruise, without inflicting an open wound.

The nerves also suffer to a great extent in gunshot wounds, especially those of the extremities. Even after the wound has healed, there may be very distressing sensations around and in the cicatrix, which pains are generally aggravated in damp cloudy weather, or from cool moist easterly winds.

The progress of cure in gunshot wounds is often extremely tedious from the numerous accidents that are likely to ensue. Excess of inflammation, erysipelas, abscess after abscess, excessive suppuration, sloughing, gangrene, non-union of fracture, caries, necrosis, hectic, and tetanus, are some of the untoward events that may occur to prevent the healing of a gunshot wound.

As "deduced conclusions," from considerable experience in gunshot wounds, I have condensed from the most concise and practical work of P. L. Appia some most pointed observations on gunshot wounds. They are a *résumé* of what I have written in the preceding pages, and are inserted here chiefly for the use of the student and young practitioners:

Delusions.—I. It is wrong, *as a precautionary measure*, to lay open a wound under the impression that it changes the gunshot wound into one of a simple character.

II. There are no such things as *wind contusions*. Heavy projectiles, especially balls, can produce deep and serious injuries of the soft parts, and even to bones, without necessarily breaking the skin, and these undeniable

facts were accounted for by the extreme pressure which the air in front of the projectile underwent. But one need not be a natural philosopher to see that air is too delicate and elastic a medium not to separate on either side of a convex and limited surface, like that of a bullet, rather than undergo extreme compression from it.

III. Internal injuries, in former times, would have been attributed to the wind of the ball.

Dr. Quesnoy saw an engineer officer who had his forearm broken without any external symptoms of injury. At Alma they took into the ambulance a soldier whose forearm was in its interior a mere mass of pulp, though his skin was unhurt.

Shock.—I. The general shock to the system is not a *constant* symptom in gunshot wounds.

II. In general, pain is a *late* symptom of a gunshot wound.

Illustrations.—In the Crimean war, men with their upper and lower jaws crushed, were known to walk from the trench to the ambulance. One of these men, from whose pharynx some fragments of bone were removed, although unable to speak, could write what he wished with a steady hand. At Alma, men whose limbs hung by a mere shred of skin, were in full enjoyment of all their senses.

Varieties of Gunshot Wounds.—I. Wounds from firearms are of infinite variety, according to the velocity of the projectile, its bulk, shape, and direction, with regard to the body, and also the numberless changes of posture which the latter may assume at the very moment when the accident occurs.

II. The relative frequency with which the different parts of the body are struck by the bullet may be seen by the following table:

	Cases.		Cases.
Legs,	100	Knee-joint,	54
Thigh,	97	Foot,	29
Face,	61	Elbow-joint,	22
Arm,	60	Neck,	22
Hand,	57	Genitals,	18
Chest,	53	Ankle-joint,	15
Abdomen,	52	Shoulder,	13
Shoulder,	42	Hip,	6
Skull,	37	Vertebra,	10
Forearm,	36	Wrist,	2
		Total,	784

III. It has generally been remarked that the orifice of entrance is smaller than that of exit, its margins more sharply cut than the latter, which is usually smaller and with everted edges. In the Parisian hospital, where in 1848 hundreds of wounded were collected, I sought often to establish this difference, but *I did not find it so well marked as has been usually described.*

IV. According to the velocity of the projectile, a wound presents either: *a.* A simple bruise without laceration of the skin. *b.* A wound with a single orifice. *c.* A wound with a double orifice. *d.* When it has carried off a limb.

V. A cylindro-conical ball produces a terrible shock, and *splits* and *tears* the bone. This comminution of the bone has no parallel in former surgical annals.

VI. The most serious consequences of wounds from conical balls depend on *three* causes: 1. The conical ball is never turned by a hard or elastic body, but passes straight through it. 2. It may, nevertheless, in its course through the body change its longitudinal position, so that it strikes the organs with its long axis, causing very considerable damage. 3. It is probable, from the pointed shape of the conical ball, that it causes *less* actual loss of substance, but at the same time more *lateral separation of tissue from its wedgelike* form.

VII. The surgical experiences of the Crimean war have been rather *discouraging, as regards the resources of art for preserving limbs which have sustained comminuted fractures.*

Foreign Bodies—I. The foreign bodies which complicate and aggravate gunshot wounds are: 1. The destroyed tissues. 2. Bone splinters. 3. The ball itself. 4. Pieces of clothing, woollen, or other objects encountered by the ball.

II. External injury may be insignificant, compared to the internal destruction of parts, and from external examination one *might be led to underestimate the mischief* which has occurred *within*, and from a superficial view entertain hope of a cure, which turns out detrimental to the patient, and from which one is only warned by repeated disappointments.

III. The velocity of a ball influences the extent of its injuries to a bone, and it is generally thought that these effects are less in *inverse* proportion to its velocity.

IV. The character and shape of a ball are influenced by its encounter with hard substances.

Illustrations.—Laroche relates a curious case of one of his relations, who had twenty Napoleons in his pocket, which, struck by a ball, were driven into his belly. In the Crimea, fragments of a shell were found lodged in the abdominal parietes, in the thigh, in the leg.

The following is a list of some of the foreign bodies found in thirty-one cases in the revolution of 1848:

	Cases.
Small bits of ball,	5
Small shot,	2
Pieces of wadding,	3
Pieces of shoe,	3
Pieces of cloth and shirt,	6
Wadding and tow,	4
Worsted,	2
Bundle of hair,	1
Many hogs' bristles,	1
Pieces of cast iron,	1
Small piece of wood,	1
Copper ornament from shako,	1
Nail,	1

With reference to the alterations in the form of the bullet some very curious cases are mentioned.

1. A ball split on the edge of the petrous bone.
2. A ball split in two by the crest of the tibia, which broke the latter, and half remained in the periosteum.
3. A ball divided by the orbital arch into two parts, the larger of which lodged behind the eye at the bottom of the orbit.
4. A ball split in three parts by the orbital arch.
5. Division into three parts by the edge of the clavicle.

6. A ball shot into the skull of a subject, which spread out on the internal table of the skull like a piece of tin.

7. A ball divided into two parts upon the femur.

8. In another soldier, a bullet which had struck the great trochanter, was divided into three separate pieces.

9. The oddest example is related by M. Servier. In Algeria a ball broke into five fragments on a rock, five or six paces from a grenadier; the *first* fragment struck and broke the right ankle, *two* others pierced further down; the *fourth* wounded his right thigh, and the *fifth* lodged in the skin on the back of the hand.

Torrey relates the case of an artilleryman who was struck by a ball in the right thigh. The femur was broken; as for the ball, it pierced the thickness of flesh, turned around the bone, and ended near the anus, by dipping into the hollow of the thigh. When he was brought to the ambulance, neither he nor his surgeons suspected the presence of a foreign body; the patient was even of the opinion that the same ball had passed on and struck another bombardier. It was only when performing amputation that Torrey discovered a ball *five pounds in weight.*

Dupuytren relates, that a ball, *nine pounds in weight*, was so completely concealed in a patient's thigh, that the surgeon did not at first discover its presence.

On the morrow after the taking of the Mamelon Vert, a soldier applied at the ambulance, said to be wounded in his left thigh; about its middle was found a small circular aperture, like that of a round ball. Not a wound of exit. On examination they could feel an obscure swelling in the popliteal space, but otherwise there was no swelling, redness, or special amount of pain. A large incision enabled them to discover and extract an enormous shot, which had run around the limb *without breaking it.*

Twisting Course of the Ball.—I. A ball may enter at one part of the body, and pass out at another, leaving two apertures apparently quite independent of each other.

II. Two apertures may be found opposite to each other, including between them in the straight line, which must unite them, organs important to life, which, if the ball had touched, must have inevitably been followed by death. Whence one naturally concludes that the ball must have passed around these organs.

III. The wandering course of a ball cannot, in the majority of instances, be known by the condition of the wounds.

IV. Spitting of blood is *not* a pathognomonic sign of penetrating wounds of the lung, simple contusions and superficial wounds being complicated with it.

V. One is forced to admit very often, that there has been a deviation in the course of the ball, in cases when the patient's progress has been too favorable to allow the belief that the ball has traversed any vital organ, and so to suppose that it penetrated in a direct line, when the severity of the symptoms seem more in proportion to the importance of the organs injured.

Illustrations.—Roeng mentions a case of simple perforation of the right shoulder, with no trace of fracture, but, nevertheless, a line drawn between the two apertures passed *straight through* the head of the humerus. Hennen declared he saw a case, in which the ball entered near the thyroid cartilage, and which, after going around the neck, returned to the same point at which it had entered, and was extracted at that spot. A soldier was struck at the moment he extended his arm to mount a ladder. The ball

entered the middle of the humerus, passed along the limb above the posterior aspect of the thorax, opened for itself a passage in the abdominal muscles, pierced those of the buttock, and passed again upwards to the anterior aspect of the opposite thigh.

Diagnosis.—I. In order to determine the treatment of a wound, it is necessary to know its *depth* and *direction*. This cannot always be accomplished by drawing a *direct line* between the apertures.

II. It is necessary in such cases to assume that the wounded man was in a particular position, which he sometimes remembers, and can assist in diagnosis by telling the surgeon.

III. The inferior extremities being, during action, less frequently approximated to the trunk, never present the same complications as the arms. There are but few cases where the ball has broken both thighs, or even both legs.

IV. It is *useless* and *wrong* even to have an *inclination* to determine *with the probe* the depth of a wound of the splanchnic cavities. This practice, which some surgeons delight in, to *enhance the apparent importance of their own functions*, should be especially repudiated.

V. In examining wounded *limbs*, the *probe becomes an invaluable guide*, enabling us to ascertain the presence of splinters, etc., and should be used as early as possible.

VI. The introduction of the finger, or especially of the probe, is always a painful operation, so it is well to perform it when the limb is still numbed by the shock of injury.

Illustrations.—In one case, at St. Louis, the ball had traversed the left biceps muscle, then had penetrated the chest by the axilla, and had gone out again by the left lumbar region. To understand the course of the ball one must imagine the body much bent forward and the left arm extended to the utmost. A ball entered in the upper third of the right arm and went out just above the nipple. If the arm is hanging, the straight lines uniting these two wounds to the body would in a manner seem to indicate *four* skin wounds. But as there were only *two*, we must imagine that the arm was stretched out when struck.

Surgical Prognosis.—I. Wounds of the *heart*, of the *lung*, and the *brain*, will generally be fatal when they reach the *centre* of the organ, as the base of the brain, the root of the lung. As to the heart, however, although a wound of it appears incompatible with life, yet cases are upon record to the contrary.

II. The *spinal marrow* cannot be wounded without causing death, whether from its importance to life, or from the extensive osseous injuries which of necessity accompany it.

III. Penetrating wounds of the *abdomen* are almost always fatal, owing to the impossibility of retaining the edges of the wounded intestine in a suitable position for cicatrization.

IV. Wounds of the *liver* can recover with an hepatic fistula.

V. Lacerations of the *bladder* are almost always followed by fatal results from urinary infiltration.

VI. *Fracture of Bones.*—The prognosis depends upon several causes, upon the degree of splintering, the rapidity with which new bone is thrown out, and the extent of suppuration. *Fractures of the skull* owe their unfavorable prognosis, independently of the extent of injury, to the inflammation which they set up, often slowly and insidiously, from without inward, through the thickness of the cranium to the cerebral mass.

VII. Wounds of the *pelvis* admit a much more favorable prognosis than fractures of the long bones.

Treatment.—Gunshot wounds are, to a certain extent, amenable to the rules of treatment that have been mentioned as applicable to contused and lacerated wounds.

The symptoms of *shock* must be treated according to the indications laid down in the Chapter upon "The Nervous System after Operations and Injuries."

The suppression of hæmorrhage (vide chapter on that subject), and the removal of the foreign body, should be attended to immediately. If blood be poured out copiously the vessel must be ligated, even though incisions be necessary. As soon as the hæmorrhage has ceased it is of much importance to ascertain if foreign substances have lodged in the wound. If the opening be large enough to admit the finger, it may be inserted; or if the wound be small, or if the finger be too short to reach the bottom, a probe must be used. The best of the kind is the long gunshot probe (Fig. 55), which, from its length, is preferable to the ordinary instruments carried in the pocket case. It should be ten or twelve inches in length, and should be much thicker than usual.

FIG. 55.

Dr. Gross is a great advocate of this large probe, and I believe has one constructed which bears his name.

The probe with which the celebrated Nélaton discovered the ball in Garibaldi's wound was tipped with porcelain, in order to detect the presence of the metallic body.

The electric bullet probe consists of a steel probe connected at one extremity with an electric chain; when the other end comes in contact with the metallic substance the chain announces the fact. Staff surgeon Nemperdick, at Berlin, succeeded at the first trial of the instrument, in detecting a bullet lodged in the bones of the foot, which had eluded observation for six weeks.

It is well, however, before commencing any operation, to administer to the patient acon. and arnica in alternation; or if there is excessive prostration, china may be employed, as such treatment may tend to expedite the disappearance of the shock and relieve pain.

The patient should then be placed as nearly as possible in the position that he occupied at the time the wound was received, and the probe passed along the wound gently, but with determination. If from any circumstance the surgeon has reason to believe that extraneous matter is imbedded anywhere in the track of the ball, probing should be instituted as soon as practicable after the infliction of the injury. If this operation be delayed for a time, the lips of the wound close, the whole track becomes so swollen and painful that it is not only frequently impossible to ascertain the direction the foreign body has taken, but the operation, slight as it may appear, causes intense suffering. But immediately after the wound has been inflicted, the probe carried through the recently made passage, glides along with comparative ease to the bottom of the wound, where it may encounter the foreign body, which may, if practicable, be withdrawn by the forceps, or removed by a counter-opening made just over it. In every case, however, *in which the ball is not easily discoverable*, all examinations should be abandoned, and the extraneous body allowed to remain in its situation until its locality is better known. Mr. Hunter disapproved of making counter-openings, excepting

when the integuments under which the ball was lodged were so contused that sloughing was inevitable; in such cases the parts might be considered as already dead, and an opening might be made for extraction, but it is the more modern practice to cut down upon the foreign body and extract it, if it is not too deeply imbedded.

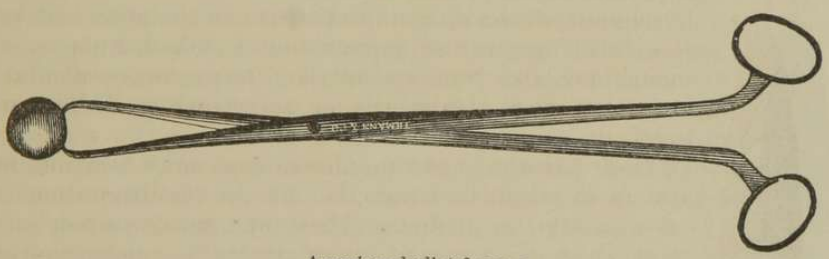
In wounds of the abdomen, probing should only be instituted to ascertain the track of the ball in the parietes; any further search *in the cavity* of the abdomen would be extremely dangerous, and productive of no good to the surgeon.

Guthrie mentions that he has cut out a number of bullets that were more than an inch below the surface. However, the surgeon should always be guided by the locality and texture of the wounded part; if the ball be deep and firmly impacted, it is preferable to wait for the relaxation of the textures that occurs during suppuration, before attempting its removal, as at this time the foreign body itself, in obedience to the general law, has begun to seek the surface. It should always be remembered, as has been before stated, that a ball may be inclosed in a cyst, or surrounded by bony formation, and remain for years in such a condition that the patient experiences little or no uneasiness from its presence.

For extracting the ball, many bullet forceps have been made, some of them very much more highly thought of than others.

The cut, Fig. 56, represents a most excellent one, made by Messrs. Tiemann & Co., of this city. It has been used abroad during the late French

Fig. 56.



American bullet forceps.

war, and has been much lauded, receiving the name of the "American bullet forceps." Sometimes a scoop (Fig. 57), is very useful in removing the ball.

When a bone has been struck, or even grazed, very careful examination is necessary—assisted by incision, if need be—in order to ascertain if splintering has occurred. For recent experience in Paris seems to have shown, that unless all bruised and splintered fragments are thoroughly removed at the time, these portions become necrosed, and serious consequences by inflammation and suppuration are likely to ensue.*

The remainder of the treatment should be conducted on the same plan as that noticed under contused and lacerated wounds.

If the wound has been inflicted in a vascular part, and there is considerable oozing of blood from the smaller vessels, the medicines that will frequently subdue such hæmorrhage, if arnica has not proved efficacious, are crocus, phosphorus, or diadema. The latter being recommended "for hæmorrhage from every orifice of the body; *for violent bleeding from wounds;*" or perhaps sabina may prove useful, provided the remaining symptoms correspond.

* Miller's Principles of Surgery, p. 677.

If there is a contusion caused by a spent ball, arnica is the specific. After the extraction of the foreign matter, not only to mitigate suffering, but also to prevent exhausting suppuration, calendula must be prescribed. Or if the patient complain during the suppurative process, of boring pain in the head, particularly in the forehead, whizzing and throbbing in the ears, chilliness, particularly of the extremities, hepar will be the best medicine.

FIG. 57.

Bullet scoop.

If the fever be high, with delirium, acon. and bell. in alternation; or one of the above with some other medicine, may be employed.

If the fever exacerbate at night, and also the other symptoms, and if suppuration proceed slowly, mercurius.

Creasote may be employed if the discharge from the wound is thin and sanious, or consists of decomposed blood, and the patient is debilitated. Nit. acid should also be administered in somewhat similar cases.

Silicea is also another predominant medicine, and should be exhibited, if the wound is very difficult to heal, and the suppuration very profuse; if the inflammation has a tendency to spread, and there are drawing pains in the limbs; also, when the patient is constantly chilly, with insufferable thirst and frequent flushes of heat in the head.

Sulph. must be employed when the patient complains of frequent internal chilliness, or there may be spasmodic jerkings through the limb; when the pains in the wound are aggravated by change of weather, and the patient sleepless and very restless; also for profuse suppuration and unhealthy pus. This medicine is also very well adapted to promote granulation and cicatrization, as is also silicea, or according to Thorer, calendula off.

There are also other medicines that may be valuable in the treatment of gunshot wounds, but the practitioner must in all cases select the medicine whose symptoms correspond to the most of those that are experienced by the patient, always, however, bearing in mind the pathological condition of the part, as it is an index, as it were, to the genus of the remedies, from which the appropriate medicine must be selected.

If gangrene threaten, or to prevent the spreading of such disease, the best medicines are ars., carb. veg., china off., lachesis or crotalus.

Very frequently, the first care of the surgeon is to determine whether to amputate the limb, or to endeavor to save the part. Of course, whenever there is a reasonable hope that the wound may be healed without the performance of a painful operation, it is the duty of the surgeon to endeavor to produce such favorable results. There are cases, however, when amputation is absolutely necessary.

Tooth Wounds.—The wounds that are inflicted by the teeth of men and of the inferior animals are always serious. The popular impression prevails that because the animal or man is not rabid from disease that wounds inflicted by the bite are not serious. This is a great error. I have seen many of these wounds, and have noticed that those inflicted by man are generally more troublesome to manage and produce more severe constitutional disturbance than those of dogs or cats. In every instance save one that came to my notice, where the wounds were on the fingers, amputation was necessary; and in the one exception the recovery was lingering. Parts of the

ear and nose are sometimes bitten off in those horrible encounters of man, when he becomes more beastly than the brute, and death has been known to result in some cases from the bites of these "*rabid*" human beings.

An accidental blow upon a tooth at times is followed by inflammation, erysipelas, and sloughing.

In the *treatment* of these wounds, the first object of attention is to thoroughly cleanse them. They should first be washed with soap and water, and then bathed with a solution of carbolic acid; if they should begin to inflame, and symptoms of erysipelas develop, acon., apis, bell., rhus, lachesis, cantharides, or crotalus, may be given. If there is a disposition to ulceration, the ointment of the carbonate or oxide of zinc will be productive of satisfactory results.

Sometimes a solution of the carbonate of potash tends much to relieve the pain and soothe the part.

Arsenicum and china and veratrum relieve; phytolacca and carbo veg. may also be called for according to the symptoms.

If there be evidences of the formation of pus, the sooner it is evacuated the better. Other symptoms may require treatment according to directions already pointed out in the management of the various kinds of wounds.

DISSECTION WOUNDS.

Under this head may be included those wounds which infect the body by the presence of poison received in the system (generally by accidental inoculation), while dissecting the cadaver, or operating for malignant tumors. Students of anatomy, in the dissecting-room, frequently scratch or cut their fingers, yet, considering the number thus engaged, unfortunate results are not frequent; occasionally, however, most melancholy, or, even fatal consequences occur.

In some individuals there is greater susceptibility to the action of virus from the dead body than in others, and, moreover, this susceptibility varies at different times in the same individuals. I have known a student who, during one winter, from careless handling of the scalpel, pricked and cut his fingers without being injured, while during the second session, he was made so severely ill by receiving a scratch in the dissecting-room, that he had to abandon his studies and return home, where he remained several months before recovering.

The poisonous virus of dead bodies has its period of incubation, which period varies in different individuals, from three to ten days. A vesicle first appears containing a limpid fluid, which gradually degenerates into a pustule, which opens, leaving an unhealthy sore beneath. At other times the hand inflames, the skin is hot, tense, and shining, the pain very severe, the axillary glands enlarged; the arm becomes stiff and painful during motion, and, if examined, streaks of a reddish hue are visible, extending upwards. There is a high degree of constitutional disturbance, fever, delirium, jactitations, and prostration; entire loss of appetite; coma may supervene, and death take place.

In other instances suppuration takes place beneath the thecæ and aponeuroses, giving rise to excruciating pain. If the matter is not evacuated caries of the bone may result. Again, the ulceration may become phlegmonous, and gangrene require speedy amputation. Erysipelas also may appear in some cases, thus complicating the case and increasing the sufferings of the patient.

My friend Dr. Jernigen during the winter, 1872, while demonstrating the triangles of the neck to the class, in a subject very much decayed,

became inoculated with the virus from the body, and for months suffered intensely from thecitis in the palm of his hand and the index and middle finger. He finally recovered with a stiffened joint. In this case the constitutional symptoms were well marked and of a typhoid nature, and the aspect of the hand so serious that at one time it was feared that amputation might be necessary.

Persons dying of puerperal fever, septicæmia, cancer, malignant pustule, and that class of ailments, at an autopsy, should always be carefully dissected, as the poison from such bodies is always more virulent than from other subjects. What the poison is which generates in the human body after death, is unknown; like the vaccine, the syphilitic, the hydrophobic, it eludes the search of the chemist and microscopist.

Most severe wounds and dangerous symptoms are also induced from the introduction into the body of matter from cancers, suppurating sores, and abscesses.

I recently attended a boy who died from septicæmia and synovitis, occasioned by poisoning of the rhus radicans, which I believe he ate. The bandages from his ankle were changed frequently by his mother, uncle, and other attendants. Shortly after his death his mother began to suffer from a small vesicle on the knuckle of the index finger of her left hand. This went through the usual stages of inflammation, the arm was much swollen, the axillary glands enlarged, fever and prostration followed, suppuration took place beneath the tendon of the extensor indicis, and the matter was evacuated. The uncle of the boy also suffered from several similar evidences of the poison. The person who washed the dressings, which were many and frequently changed, likewise had several pustules on the finger, and two others of the household, who had nursed the lad and handled the bandages, had several places on their fingers cauterized to prevent further extension of the poison.

The surgeon in operating for malignant carcinoma should always be on his guard, as instances are upon record where disastrous effects have speedily followed inoculation from such virus.

Treatment.—There are some prophylactic means which should be observed to prevent inoculation while dissecting or making *post-mortem* examinations, one of the best of which is to anoint the hands freely with olive oil, beef or mutton tallow. Olive oil is considered in many countries a preventive of the unpleasant symptoms arising from the stings of venomous insects, and that it has such power is well known. It is so readily obtained that it can always be employed.

The practice of using gloves during dissections or operations on the cadaver is both unseemly and absurd.

A favorite custom of students when they have either pricked or cut themselves, is immediately to wipe off the spot with a wet towel, suck out the poison, and then cauterize the injured place with the nitrate of silver, or some prefer to place upon the wound a piece of tobacco. These means are really productive of good result. Dr. Gross prefers the acid nitrate of mercury as a caustic, and Dr. Comstock speaks highly of the hamamelis as a local application.

I believe the best caustic is the actual cautery, which may be applied *secundum artem*, by the iron, or in a more homely manner with a lighted cigar, the latter being generally more easily attainable than the former. If, however, the patient is not seen until there is the formation of a vesicle or pustule, it may be immediately opened, and a poultice of linseed applied, and carbolic acid given in the second dilution, fifteen or twenty drops in half a glassful of water, of which a tablespoonful should be taken every two

hours. For the nervousness and sleeplessness which follow, the bromide of potash is the best medicine, not only as a sedative, but from its action in the various forms of toxæmia. Other medicines are those which are mentioned in the treatment of erysipelas, gangrene, and poisoned wounds. In the case of Dr. Jernigen, after the parts had been well opened, there was not the slightest disposition to heal, the hand remained swollen, and the tendons very rigid. Dr. Liebold, with whom I saw the patient in consultation, applied to the hand red precipitate ointment with the very best result.

EQUINA—GLANDERS—FARCY.

This horrible disease was formerly confounded with malignant pustule, but further researches have proved their distinctness. It received the name equina from Elliotson, on account of its being transmitted from the horse. It is denominated by some *farcy*.

It is occasioned in man by the introduction into his system of a specific animal poison derived from the horse, the ass, or mule.

Glanders has a period of incubation of from three to eight days, and is divided into the acute and chronic varieties. When the zymosis begins to be apparent a rigor generally announces the contamination of the system. There is severe aching in the bones, fever, and delirium, accompanied with profuse and offensive sweats and discharges. During this period the inoculated part becomes painful, red, and swollen, the lymphatics and glands are inflamed and enlarged, and abscesses form in the joints and cellular tissue. The face becomes shining and livid, and the very characteristic viscid and offensive discharge from the nostrils appears. Pustules form, or in some instances, blackish bullæ on the face and on the body, which soon assume a gangrenous appearance, coma and subsultus tendinum supervene, and the body sinks into death, overpowered by the poison. In the chronic variety of the disease the symptoms, though they do not follow with such alarming rapidity, yet are almost as fatal. The nasal discharge is profuse and accompanied with considerable tumefaction of the nose and eyes. The pustules, both on the integument and Schneiderian membrane, soon degenerate into foul and ill-conditioned ulcers, the ulcerative process extending along the mucous lining of the pharynx, larynx and lungs; these symptoms may not appear to progress rapidly, when an unexpected aggravation takes place and the patient is rapidly carried off, or great exhaustion with excessive perspiration may terminate life. The duration of the disease is from ten to twenty days.

Glanders in the horse can either arise spontaneously or be transmitted by inoculation. About forty years ago the fact of its transmission to man was undoubtedly proven. Though the disease *per se* requires for its development inoculation with the virus, yet the miasm arising from the disease may produce in man symptoms of malignant and fatal fever. The horse, the mule, and the ass, are all liable to the disease, and it is probable that the zebra, jaghatai, quagga, and other solipeds are also susceptible to the poison, while it is asserted that ruminating and carnivorous animals are not affected by it.

If a horse be inoculated with the virus either from man or other of the equine species, the symptoms of glanders will be produced in from three to four days.

Treatment.—The treatment of this malignant disease is not satisfactory. In some of the veterinary manuals, the only direction given is to destroy the animal at once, to prevent further infection. Mr. Moore, however, has suggested that *kali bichromicum* is a medicine of great power in the disease,

and I can see no reason why, if it is beneficial to the animal, it should not be so to man. Mercurius, lachesis, and arsenicum are adapted to certain symptoms of the affection. The sixth volume of the *North American Journal of Homœopathy* contains an article on *glanderine* and *farcine*, in which the writer strongly urges the use of these animal poisons in diseases of a peculiarly malignant type, and, perhaps, under certain circumstances, they may be serviceable in true glanders. In the treatment of glanders, great attention must be paid to cleanliness, diet, ventilation, and disinfection.

MAGGOTS IN WOUNDS.

In spite of the utmost cleanliness, maggots sometimes appear in wounds and among the dressings. They are especially found in wounds which have not received proper attention as to cleansing and changing of dressing, and in those where there is a large amount of suppuration combined with heat.

In some cases it appears impossible to assign a cause for them, while in others their presence may be readily accounted for. When they are once noticed they multiply with most singular rapidity and give considerable trouble. In cases of resection, especially of the knee-joint, where suppuration is profuse and the pus liable to gravitate around the limb and be subjected there to the heat of the body, maggots are often found. In compound and comminuted fractures we also sometimes find them.

In civil practice these maggots in wounds is the exception; indeed, of late years they are not even found in hospitals, excepting in occasional cases, the antiseptic treatment having completely abolished them.

The *treatment* is very simple and very effective. Remove entirely all the soiled dressings, that is, all that can be spared, and cut away others; with a good syringe or douche, send a stream of water into the wound and thoroughly cleanse the part. Wipe now all the wound and dry the parts well with "*marine lint*" (oakum). With a Richardson's local anæsthesia apparatus, spray on the parts a solution of carbolic acid and water in proportion of ten drops of C. A. to water one ounce. This having been done, apply clean dressings, and over these a cloth saturated with the carbolic acid. This treatment with me leaves nothing to be desired. The dressings should be changed twice a day for two days; after that period, once in twenty-four hours.

THE QUESTION OF AMPUTATION IN WOUNDS.

This is a subject of the greatest importance to the surgeon as well as to the patient, and one in which there are so many arguments *pro* and *con*, that a conscientious practitioner is often placed in the most unenviable position. I have experienced such feelings as these. Perhaps there is a severe lacerated wound occasioned by a railroad or steamboat accident, the bones are broken, and part of the flesh is pulpy and must die. It is impossible to ascertain the exact amount of injury done, although there is appearance of traumatic gangrene. Understanding the power of conservative surgery, and the action of medicine, the great desire of the surgeon, as well as of the patient, is to save the limb, and the preference should be given always for conservatism. Sometimes cases which appear desperate are cured, perhaps with a stiff joint and some deformity. If, however, gangrene threaten to extend, the medicines and treatment appear to be of no avail and the constitution suffers, the knife must be at once resorted to.

There are other cases in which the experienced surgeon can see in a moment that there is no hope to resuscitate the member; then amputation must be immediate.

When masses of substance are carried away, when large arteries and veins are implicated, when the cavities of large joints are opened, when tendons, ligaments, and bones are severely crushed, then a *primary* amputation should be resorted to. On the other hand, if the attempt be made to save the limb, and that effort appears unsuccessful, then, after a fair trial, not allowing the patient to suffer too greatly from the irritation produced upon his system, a *secondary* amputation must be performed.

In gunshot wounds there has been much discussion as to primary and secondary amputation. In military practice the majority of surgeons are in favor of *primary* or *immediate* operation. Dr. Franklin is of opinion that the operation should be performed during the shock. He says, "Whenever I could get access to the wounded during a battle, my judgment was always to operate immediately, using the time of shock, or nature's anæsthesia, as the most opportune period, without reference to the reaction upon which so much stress is laid in surgical works."* He says, farther, "that when he has waited for reaction, the patients have not gotten on nearly so well as those who were subject to the knife earlier."

Other surgeons prefer the period of systemic repose between the subsidence of shock and excessive reaction. These questions, however, should be settled in the mind of every military surgeon, and I have no doubt that many circumstances would influence the performance of amputation in either case. Primary amputation may then be considered to mean: amputation performed during the presence of shock, or between the subsidence of shock and establishment of reaction. What is now understood by secondary amputation? It means, in some instances, to defer the operation, though the surgeon may be convinced that it will have to be performed, in order to allow a better state of the constitution, to give greater hopes of success; or it may mean, when there is uncertainty in the mind of the surgeon, whether the loss of the limb is necessary, to wait and ascertain what conservative means may accomplish. In the one case the surgeon is certain amputation must be done, but hopes for a better state of the body for its performance. In the other, he is undecided whether he can save the limb or not, and awaits the development of symptoms. This has given rise to considerable confusion. We may, however, say that a secondary amputation is one in which, from any cause, the operation is delayed.

In 1689 cases of gunshot fractures of the humerus, the complete records of which have been obtained, amputation or excision was practiced in 996, and conservative treatment adopted in 693, with a rate of mortality of 21 per cent. in the former and 30 per cent. in the latter.

In gunshot fractures of the humerus, the tables of statistics in the late war were rather in favor of operation than against conservative measures.

The unsuccessful nature of the treatment of gunshot fractures of the femur has given rise to the opinion of some surgeons, that when the accident occurs, amputation should be immediately resorted to. This, however, is not the proper method to pursue in all cases, because instances are upon record wherein fractures of the femur from gunshot injuries have united, and the cure been complete.

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* Science and Art of Surgery, vol. ii, p. 719.

The following table, from page 31 *of the Surgeon-General's Circular, exhibits the results of* 2003 *terminated cases of Gunshot Fracture of the Femur, or of Gunshot Wounds of Knee-joint, out of* 3106 *cases that have been entered upon the record:*

	TOTAL TERMINATED.	AMPUTATION.				EXCISIONS.				CONSERVATIVE MEASURES.				AGGREGATE.
		Recovered.	Died.	Undetermined.	Mortality rate of determined cases.	Recovered.	Died.	Undetermined.	Mortality rate of determined cases.	Recovered.	Died.	Undetermined.	Mortality rate.	
Gunshot fractures of femur implicating hip-joint	82	0	2	0	100.	2	10	1	83.33	0	68	14	100.	97
Gunshot fractures of upper-third	387	8	24	11	75.	7	18	6	72.	93	237	199	71.81	603
Gunshot fractures of middle-third	346	42	51	47	54.83	2	13	10	86.66	106	132	148	55.46	551
Gunshot fractures of lower-third	418	131	112	117	46.09	1	1	0	50.	72	101	137	58.38	672
Gunshot wounds of knee-joint	770	121	331	266	73.23	1	9	1	90.	50	258	146	83.76	1183
	2003	302	520	441	63.26	13	51	18	79.68	321	796	644	71.26	3106

The primary operation so far gives the best results, and should be adopted when there is no hope of rescuing the limb. A secondary amputation should be performed when the hope of saving the limb, which dictated the delay, is deferred and weakened by the untoward progress of the case.

The surgeon, however, should bear in mind one fact, that no matter how decided the local injury may be in calling for amputation, the operation should not be performed unless there is a reasonable hope of success; and that secondary amputation is generally called for in cases of prolonged suppuration, hectic, non-union of broken bones, gangrene, sloughing, caries, and necrosis.

CHAPTER XII.*

THE VARIED METHODS OF DRESSING WOUNDS.†

As it becomes the daily duty of a surgeon to apply dressings to wounds and sores, it is also his duty to understand a variety of methods by which cicatrization may be attained, so that in case one method does not produce the desired results, some other may be resorted to. In many cases, however, the healing process will go on without hindrance under the use of almost any emollient application, therefore the principal object to have in view is to give the wound a covering, and so protect it from external influences; thus frequently the method adopted for this protection is unimportant.

In the case of superficial incised wounds, the tendency, in good constitutions, is to primary union. Still even in these cases foreign bodies should be looked for, as they often have forced into them either hairs, gravel, glass, or some portions of the clothing, or even some articles neither visible nor capable of detection by the touch. All of these should be carefully removed, either by washing, suction, or the forceps, before applying any dressing.

Unfortunately, however, wounds do not always present this simple character. It then becomes necessary to apply some method which will bring about the most favorable results; union by first intention, if possible, if not, to favor cicatrization by granulation.

In order that this most desirable result (primary union) may be attained, the wound should be clean, without having been severely contused, and without loss of much substance.

If only a short time has elapsed since its infliction, the edges may be brought together and maintained in proper apposition either by some kind of suture, or the application of strips of plaster, with the addition of a light bandage; the parts should always be placed in an unconstrained position and kept immovable; this latter is essential to primary union.

Should it be impossible to obtain union except by second intention or granulation, either on account of a severe contusion or suppuration having already become established, or in the case of gunshot wounds, which are

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* This chapter has been written by Dr. John H. Thompson, Lecturer on Minor Surgery in the New York Homœopathic Medical College.

† In the preparation of this chapter, I have availed myself of Prof Gosselin's lectures on the dressings for wounds, and the excellent articles on the subject of the antiseptic treatment of wounds, by A. C. Girard, M.D., and R. F. Weir, M D.—J. H. T.

quite certain to suppurate, it then becomes important to inquire which is the proper method to dress these different varieties of wounds. In all cases great attention must be given to the progress of the general symptoms, and those dressings selected which afford the best protection, and at the same time have a tendency to reduce the process of inflammation. Thus for local application, poultices, water-dressing, simple cerate, cold cream, etc., may be used.

Poultices, when required, should be used warm.

Water may be applied either warm or cold, and often the feelings of the patient will be the best guide, although water as hot as can be well borne will generally reduce an inflammation more effectually than cold. When cold water is applied, the compress which holds the water should be covered with a piece of oiled silk, or thin India rubber or impervious paper may be used, to prevent evaporation.

Another excellent method is that of irrigation, or the application of a continuous stream of water upon an inflamed part.

Thus in a few words are described some of the antiphlogistic methods which are of much benefit during the inflammatory period of those wounds which are destined to suppurate.

All dressings should fulfil two important indications,—not to produce pain and not convey subjects of contagion to the wound.

There are many salves and other articles for local application under the use of which, if the general constitution is good and the hygienic conditions favorable, the wound will heal. When, however, the granulations become too exuberant and rise above the surface, the application of nitrate of silver as a caustic, or powdered sulphate of copper, will generally reduce the sore to a more healthy condition. When, on the other hand, it becomes pale and anæmic, often with lardaceous spots, the pus transformed into a serous discharge, the reparative process has ceased, and stimulation becomes requisite. In addition to general treatment and hygienic measures, the application of an ointment of balsam of Peru may be made, or the sulphate of copper applied in solution, or the pure pulverized, and allowed to remain on until its caustic effect becomes apparent. An electric battery may be made of a thin plate of silver and another of zinc, connected with a copper wire, the silver being applied to the sore, and the zinc over a healthy part. Care must be taken to change the locality of the zinc frequently, or another sore will be produced.

Enough, perhaps, has been said concerning superficial wounds. Attention must now be given to a more important subject. I mean deep and more extensive wounds, and those which are connected with osseous structures, whether consequent upon an operation or traumatism. In the case of narrow deep wounds which compound a fracture, all the means at command should be resorted to in order to obtain primary union of the integument, and such an adjustment of the deeper parts that they may become united in the most speedy manner. This treatment would rarely be successful in the case of an amputation of a limb, or a gaping wound, the result of an operation for the removal of a large tumor; therefore it becomes necessary to be familiar with several methods of dressing, so that in the event of a failure in any stage of the method of dressing which may be adopted, some other may at once be substituted, for no matter how highly lauded each variety of dressing may be by its author or adherents, each may be followed by failure in some case or other, either on account of its being misunderstood by the surgeon, or a want of adaptability to the case.

Open Method.—The first method to which attention is called, is *the open treatment of wounds.* It was first introduced to notice in the early part of

this century by Kern, a Vienna surgeon, whose name is sometimes attached to this method. It was revived in 1856, in Germany, by Bartscher and Vezin. It consists simply in leaving the wound just as it is after the operation and the arrest of hæmorrhage, with a simple dressing of cloths wet with water, without sutures, strapping, or anything of the kind until granulation takes place; the sides of the wound are then adjusted and brought together with straps of plaster or bandages, so that the union is always that of second intention.

The advantages claimed for the open treatment are as follows:

1. The dressings do not cause undue pressure.
2. Danger of conveying contagion to the wound by impure applications is avoided.
3. As adhesion to primary union is abundant from the first, as many ligatures as are desirable may be applied to thoroughly avoid secondary hæmorrhage.
4. The wound may be inspected at any time by simply removing the cloth covering it.
5. There are no foul emanations from dressings to vitiate the surrounding atmosphere.
6. There is but slight danger of the retention of pus.
7. Irritation of the wound by changing the position, and making the external applications, is avoided.
8. Less material is required for the dressings.

These advantages should certainly be a recommendation for this method when frequent observation is to be made by the surgeons; also for the instruction of students in the wards of a hospital, and for practice in war when materials are scarce.

There are, however, two considerations against the open method; one is the renunciation of healing by primary union, and the somewhat more frequent occurrence of erysipelas. This may be somewhat avoided by due regard to sanitary protection. And if in a particular case the surgeon may expect union by first intention, some other method may be selected.

The second method of dressing wounds which will be mentioned is the **occlusive** and **compressive dressing** with wadding, originated in France by Dr. Alphonse Guérin, and used by him at St. Martin's hospital in 1870, where it became quite successful and gained excellent results. I will now explain the method of its application. Take for instance an amputation; the operation having been performed and the ligatures applied, the bleeding having ceased, and the wound thoroughly cleansed and dried; a large bundle of new wadding must then be prepared by having it heated in an oven to as high a temperature as possible. The wound should then be filled with this warm wadding, and secured in position by layers extending up on the limb several inches above the site of the operation. A sufficient quantity of the wadding should be applied to make the limb about three times as large as the other. The whole dressing is to be retained by an ordinary roller bandage, which should exert considerable pressure; this of course must be applied with great care.

The dressing should remain on from twenty to twenty-five days. At the end of this time it should be removed and a similar one put on. It is generally necessary to reapply it two or three times.

The inflammation which supervenes is but slight, and frequently the patient will sleep and rest as well as before the operation, as the pain is usually very slight.

Upon renewing the first dressing the cotton will be matted together, and as the wound is exposed a small amount of thick, creamlike, laudable pus

will be found. The wound itself is usually of a healthy reddish color, covered with granulations.

The principle upon which this dressing is applied is the complete exclusion of atmospheric germs. First the cotton is made as hot as possible to destroy any germs which it may have contained when procured; it is then applied in thick masses, and bound on tightly with a bandage. It might be supposed that this dressing would be impervious to germs, but vibriones have been found in the pus under this dressing on the twenty-fifth day; still they did not appear to interfere with a favorable result, as the wound afterward healed well.

Without either embracing or discarding the germ theory, this will often be found to be an excellent dressing, though like all others will sometimes fail, even under the most favorable circumstances.

Alcohol Dressings.—Professor Nélaton was the first to make recognition of this agent as a dressing for wounds, the discovery of which was the result of investigations for some method to obviate the dangers of pyæmia. Quite a number of distinguished surgeons have since used it, and some very favorable results have been obtained.

The wound should be dressed with a compress of lint, which is saturated with about ninety per cent. of alcohol. The effects are quite remarkable in many cases, though of course not absolutely certain in all. The period at which its inefficiency is most apparent is during suppuration, when it appears to delay the formation of a definite cicatrix.

The most markedly beneficial effects are that during its use it prevents the symptoms of inflammation; there is no redness, swelling, nor heat, and the pain is of a very moderate nature. The wound does not become putrid in any of its parts, and constitutionally the patient has but slight febrile reaction.

The **Bordeaux dressing**, so called by the professor of clinical surgery in that city, Dr. Azam, who in 1874 described his method for the reunion of wounds after amputation, which he claimed would cure the patient as certainly as the occlusive method just described, and in a much shorter space of time, the former taking from fifty to sixty days, while the method of Dr. Azam occupied for the same purpose only from ten to twenty-five days. This is certainly an important point, and worthy of our earnest attention.

After the operation has been performed, and all hæmorrhage controlled in the usual manner, a good-sized drainage-tube is laid in the deep portion of the wound and fastened to the limb. The bases of the flaps are then united with quilled sutures of fine silver wire, as many as are necessary to hold the wound firmly, each from one and a half to two inches from the edges of the flaps. The edges of the wound are then held together with the figure-of-8 suture or harelip pins, supported by strips of charpie dipped in collodion. The limb is then wrapped in wadding, except where the drainage-tubes emerge, the ends of which are covered with charpie to absorb the discharge.

The harelip pins may be removed on the second or third day, and the deep sutures may be loosened then, or a day or two later. The dressings should be renewed as in ordinary cases, and cicatrization will usually be perfect in from ten to twenty-five days. Under Dr. Azam's care an amputation of the leg healed in eleven days, and one of the thigh in ten days.

There are, therefore, three important points to be observed in the application of this method.

1st. A drainage-tube at the bottom of the wound, through which the blood and serum run out.

2d. The deep sutures which are to hold in contact that portion of the wound.

3d. The superficial sutures for the approximation of the margins of the wound.

These latter had been used by the English surgeons toward the end of the last century. Dr. Langier had proposed and applied the deep suture twenty years before for the same purpose. The drainage system had also been used by Drs. Broca, Fochier, and Courty previous to its adoption by Dr. Azam, but he is entitled to the credit of having united the three methods of drainage, deep, and superficial sutures, and originating a method which on account of its success is certainly entitled to much respect.

The manner in which a wound heals by this method is as follows: The margins and deeper parts unite by first intention. The inflammation, which is developed in the site occupied by the drainage-tube, is quite moderate, granulation becomes established upon the surface of the cavity, and unites the muscular to the osseous structures, generally after quite a limited amount of suppuration, and with a good chance of freedom from serious complications.

In 202 amputations, 63 of which were of the lower limbs, there were but 12 fatal cases.

Lister's Antiseptic Method.—This method was introduced by Prof. Joseph Lister, and first used by him in his hospital in Glasgow in 1868. Since that time he has made some alterations and improvements, and still further changes may be made in the course of time. It is only lately that attention has been given practically in this country to the teachings of Prof. Lister in regard to antiseptic surgery.

Much interest was elicited by his appearance at the International Medical Congress in Philadelphia in 1876, when he gave practical demonstration of his treatment. Also from the fact that highly satisfactory results have been obtained in the practice of many German surgeons with large hospital practice, it has come to be used by many of our surgeons.

There are some reasons, perhaps, why American surgeons, who have the credit of eagerly adopting all improvements, have not earlier tested this mode of treating wounds. One reason given is that it is "too much trouble," another that "other modes of treatment give good results."

To these two objections Prof. Lister answers, "that the trouble is more imaginary than real, and is one of the necessary results of a want of proper apparatus and appliances, together with inexperience as to their use, etc."* To the second objection he grants "that they give good results, but not the best attainable."†

Still another objection might be given, namely, that it was declaring one's self in favor of the germ theory.‡

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* Trans. International Medical Congress. † Ibid.

‡ The following is an excellent and concise explanation of the germ theory as given by R. F. Weir, M.D., in the N. Y. Jour. of Med., December, 1877. That in the dust of the atmosphere, and in matter with which it is in contact, there are germs of minute organisms, which under favorable circumstances induce putrefaction in fluids and solids capable of that change, in the same manner as the yeast plant occasions alcoholic fermentation in a saccharine solution; that putrefaction is not occasioned by the chemical action of oxygen or other gas, but by the fermentative agency of these organisms; that the vitality or potency of the germs can be destroyed by heat or by various chemical substances which in surgery are called "*antiseptics.*"

Thus Lister's definition of the antiseptic system is "the dealing with surgical cases in such a way as to prevent the introduction of putrefactive influences into wounds."*

However, "Thompson, Weitzelbaum, and others have stated that they found living bacteria in the carbolic solutions as used by Lister, and Linhart, Fischer, Ranke, Shüller, and Volkmann, who in several hundred observations have found bacteria in the discharges of wounds that had been most carefully and satisfactorily treated by the antiseptic method.

"It was noticed, however, that the presence or absence of these bacteria (and such were only considered as present when chain bacteria were found), did not influence the progress of the wounds, and Fischer gives the opinion, in which many of his countrymen join, that the object of the dressing is not so much to keep the germs away as to keep the secretions in such a condition as to be as unfavorable as possible to the development of bacteria, and thus prevent decomposition taking place."†

Mr. Lister says in reply to the observations above quoted: "The statement that cell-forms have been found beneath antiseptic dressings must be received with caution. I have recently met a gentleman who was with Ranke in Halle when he found, as he supposed, these organisms beneath antiseptic coverings, and when this gentleman pointed out to me the bacteria, which he called putrefactive, I at once recognized them as of the non-putrefactive variety, and the gentleman was forced to admit that they differed from those found in decomposing masses.

"The germ theory of putrefaction is the foundation of the whole system of antiseptic surgery, and if this theory is a fact it is a fact of facts that the antiseptic system means the exclusion of all putrefactive organisms."‡

It is desirable therefore that in the interests of science all possible knowledge may be brought to bear upon the pathological and physiological changes in connection with it. Be this as it may, we cannot afford to wait until it is fully explained, but must acknowledge that the antiseptic method is one full of marked success. On this point the voice of those who have successfully used it is unanimous.

"Hagedorn, of Magdeburg, says that in every failure the surgeon himself is to blame and not the method, and Lindpainter, representing the experience of Munich, with nearly a thousand cases treated antiseptically, states that it must be considered a precept that the minutest directions must be followed, and that he who does not get the results desired must certainly have made some mistake."§

We must constantly bear in mind that the principal object of this method is to prevent the entrance of germs into wounds, to destroy them if already there, and to guard against the accumulations of wound secretions. In order to accomplish this Mr. Lister has instituted a method of treatment, upon which he has on different occasions made some improvements, by which he proposes to prevent the injurious effect of these germs upon wounds.

The various articles and the manner in which they are to be used will now be taken carefully into consideration.

1st. A solution of carbolic acid crystals in water in the proportion of 1 to 20. This is used to carefully cleanse the surface before operations or neighborhood of wounds, to disinfect the hand of the surgeon and his

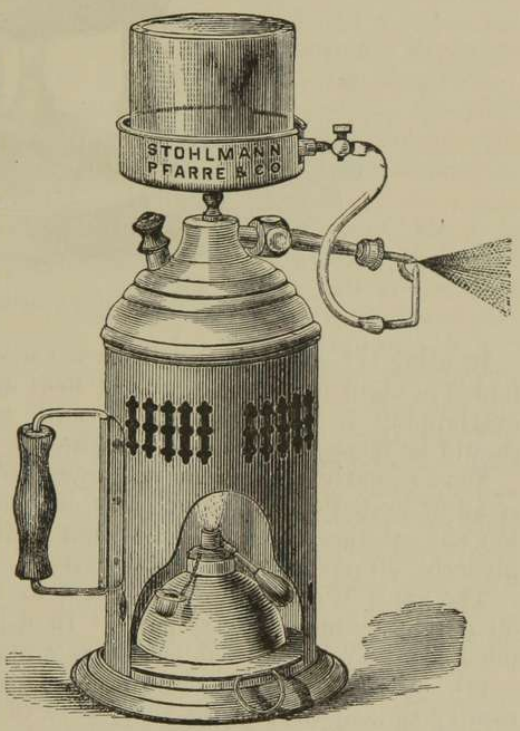
* Trans. International Medical Congress, Philadelphia, 1876, p. 536.
† Antiseptic Treatment of Wounds and its Results.—Weir.
‡ Lister, Trans. International Medical Congress, p. 538.
§ Weir.

assistants, to wash out septic wounds, inject into compound fractures, clean drainage-tubes. A basin of the solution of this strength should contain all the instruments which are to be used in the operation. "A solution of this strength is also required for the spray when a steam atomizer is used."*

2d. A solution of carbolic acid crystals in water in the proportion of 1 to 40 "for the sponges during the course of an operation,"* to wet the "loose layer of gauze, and for the lotion when changing the dressings."*

3d. *A Steam Spray Apparatus.*—In order to prevent the entrance of living germs during an operation or dressing, a spray of the solution of carbolic acid in water is used directly and constantly upon the parts. Some instrument which throws a large and finely divided spray should be used. A *steam* atomizer (Fig. 58) is indispensable on account of the necessity of keeping up an uninterrupted application of the spray, for one worked by hand would be too fatiguing. A boiler containing 20 to 24 ounces will give a spray for about two hours. It is said that atomizing the solution renders it weaker, so that some use a 1 to 30 solution, which, when in the form of a spray, will be about 1 to 40.

FIG. 58.



Hanks's Atomizer.

It is often necessary to be provided with two apparatuses, so that if for any reason one should cease working, the other will be at hand. Fig. 59 represents the atomizer of Dr. Weir.

4th. *The Protective* is ordinary oiled silk, coated with copal varnish to render it impermeable to carbolic acid, which gutta percha is not; it is then covered with a thin coating of dextrin, 1 part; starch, 2 parts; and carbolic acid solution, 1 to 20, 16 parts. After this last application the disinfecting solution will the better adhere to the protective. It should always be immersed in a 1 to 40 solution previous to being used after an operation. The object of the protective is to prevent the irritating effect of the carbolic acid contained in the antiseptic gauze to the part operated upon. The protective should slightly overlap the wound.

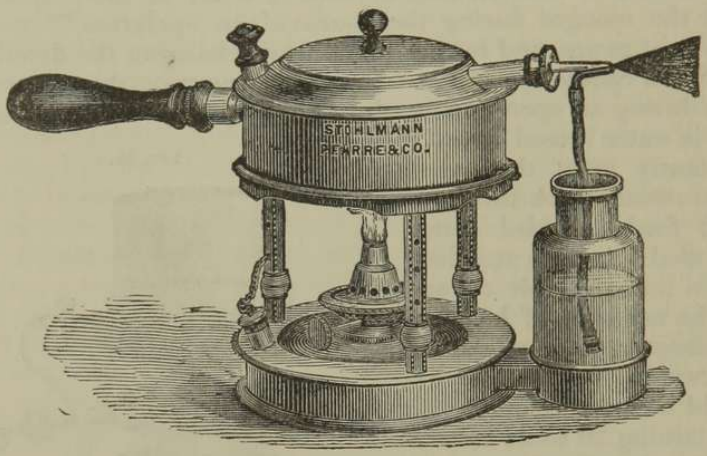
5th. *Antiseptic Gauze.*—This is made of a coarse-meshed, unstarched cotton cloth, which in Scotland is called "mull," but here is called dairy or cheese cloth. This was selected by Mr. Lister on account of the facility with which the secretions are absorbed by it. Mosquito netting has also been put to the same purpose after a careful preparation.

The mode of preparation is to heat the cloth for several hours beyond 212°, it is then sprinkled with a hot mixture, composed of carbolic acid,

* *Vide* letter from Prof. Lister to J. L. Little, M.D., of New York, in Hosp. Gaz., May 9th, 1878.

1 part; resin, 5 parts; paraffin, 7 parts. The cloth is then submitted to pressure so that the mixture will be equally distributed through it. The resin is excellent to hold the carbolic acid, and prevents its too speedy evaporation, and the paraffin prevents it from being sticky.

Fig. 59.



Weir's Atomizer.

In using the gauze, it should be wet with the carbolized solution, 1 to 40, folded in eight thicknesses, placed next above the protective, and slightly overlapping it. Between the seventh and eighth layers from the skin should be inserted a piece of mackintosh.

Very recently it has been recommended* that thymol should be used instead of carbolic acid, principally on account of its being less irritating; but one solution is required and that is, thymol, 1 part; alcohol, 10 parts; glycerin, 20 parts; water, 1000 parts.

The gauze is also prepared with it as follows: thymol, 16 parts; resin, 50 parts; spermaceti, 500 parts. In using this gauze "the protective" oiled silk may be omitted, the other minutiæ are the same.

6th. *Mackintosh* is common rubber cloth; this prevents the secretions from coming immediately to the surface, so that the whole dressing is saturated with the discharge, which is thus kept in contact with the antiseptic.

This should be cut an inch smaller than the gauze, so that when the secretions come to the outer layers of the gauze they may be detected while they are still in the antiseptic gauze.

It is not necessary to have a new piece of mackintosh at each dressing, but it may be washed off with carbolized water and used again, but it should be held up to the light each time, so as to detect any holes or imperfections.

7th. *Drainage-tubes* are small tubes of soft rubber, made of different sizes. They should have several openings on the sides to facilitate the egress of the secretions from the parts which they are intended to drain. Two small ones will be better to use than one large one, as they will not cause the wound to gape so much. Each pocket or angle of the wound should have its drainage-tube, and it should extend down to the bone; they should be cut off on a level with the skin, either square or bevelling, and sewed with a piece of silk drawn through the end, which should be fast-

* W. T. Bull, M D., in Med. Record, April 13th, 1878.

ened externally with a piece of plaster, so that the tubing may not be lost by slipping into the wound. Several strands of catgut may be used for drainage instead of a rubber tube; these can be withdrawn one or two at a time, if desirable, as the wound closes. A small bundle of horse-hairs is the latest article used for drainage by Prof. Lister.*

8th. *Catgut* as used for ligatures and deep sutures is one of the principal articles in antiseptic dressings. The edges of wounds approximated by this subtance heal readily; the catgut becomes absorbed without producing any irritation.

It is prepared by putting it in a mixture of carbolic acid made liquid by one-tenth its weight of water, to which is added five parts of olive oil. The catgut should be kept separate from the watery part of the mixture, and this is best done by placing some marbles or pebbles in the bottle and laying a piece of glass on them; this will raise the catgut above the water; they should remain in this manner two months without being disturbed.

At the meeting of the International Medical Congress, held in 1876, Mr. Lister announced that he had made more satisfactory ligatures by a mixture of carbolic acid, glycerin, chromic acid, spirits of wine, and water; the exact formula has not yet, however, been made known.

9th. *Antiseptic Silk.*—The catgut is used for ligatures and the deep sutures, but as it does not retain its firmness long enough for superficial sutures, silk antiseptically prepared is preferable. It may be prepared by immersing the silk for an hour in a mixture of hot beeswax, 10 parts; carbolic acid crystals, 1 part. It should then be drawn through a cloth to remove the superabundant wax. It may then be kept in a well-stoppered bottle.

10th. *The Sponges* used in Lister's dressings, whether during the operation or for the absorption of secretions, should be thoroughly beaten, then washed in warm distilled water, and kept covered in a jar filled with a carbolized solution, 1 to 20, until needed. After being used, they may be washed out in a solution and replaced in the vessel. In this manner they can be used repeatedly. In addition to small sponges used during the operation it is well to have some larger ones which may be applied to wounds the first day after the operation, to absorb the secretions, which are made copious by the application of the spray.

11th. *Carbolized Olive Oil*, 1 to 20, is used to oil catheters and other instruments, or the fingers when necessary to introduce them within the body.

It is also useful where a direct and continued application of the antiseptic is required to the wound, as for instance in a case of caries, or where it would not be possible to apply the gauze dressing; also in order to avoid some of the irritating and caustic effects of the spray upon the operator's hands.

12th. *Liq. Zinci Chlor.*, 1 part mixed with 12 parts of water, may be used in cases of compound fracture, or in any case where a wound has been exposed to atmospheric influences, or where a wound which has been dressed antiseptically has become septic, it may then be rendered aseptic by being washed out with this solution, but great care is necessary in its use, and it is generally a more successful way to scrape out sinuses or caries in bones before applying this article.

NOTE.—The writer has purposely omitted mentioning the varied preparations of boracic and salicylic acids as used by Prof. Lister, in order not to unnecessarily extend the limits of this chapter. J. H. T.

* Med. News and Library, February, 1878.

After all of the articles above described have been made ready, if there is any hair on the part to be operated upon it should be cleanly shaved off. The skin should then be washed with soap and warm water with a brush. The anæsthetic may then be administered, and when complete the spray should be directed upon the part. The surgeon's and assistants' hands are now to be thoroughly immersed in the 1 to 20 solution, and a final washing given to the skin. The instruments, having been immersed in a basin of the same solution, should be carefully wiped and returned to it after being used. The blood is wiped away with the prepared sponges, which are ready in another basin of the solution, and after being thoroughly squeezed, should be put in the basin again.

Care must be taken by the operator and the assistant who has charge of the spray apparatus not to allow any one's hands to come between the cone of spray and the wound.

The bleeding vessels are secured in the usual manner, and tied with the antiseptic catgut ligatures, and both ends cut off close.

A piece of gauze should be lying in carbolized water, so that in case the atomizer for any reason ceases to work, it would be ready to throw over the wound until the spray could be resumed, and for this reason it is always well to have two instruments at hand.

After the operation is completed the tourniquet or Esmarch's bandage, whichever has been used, may be removed. There is generally some hæmorrhage, owing to the fact that the spray prevents the formation of clots. All bleeding must be stopped, the wound carefully washed out with the 1 to 40 solution, the drainage-tubes may then be put in their places and secured as before directed, and the sutures introduced, the deep, with carbolized catgut, the superficial, with the antiseptic silk.

The wound is then to be covered with a piece of the protective which has been lying in the carbolic solution of 1 to 40, and this covered with a single layer of gauze wet in the same solution; this should be a little larger than the protective, so as to overlap it on all sides; if much depression exists, as after the removal of a tumor, one of the large sponges which has been prepared may be placed between the protective and loose layer of gauze. The spray may now be dispensed with. The eight layers of gauze are then to be applied either wet or dry, as may be desired, remembering to insert between the seventh and outer layers a piece of mackintosh, with the rubber side down, cut one inch smaller on all sides than the gauze. The whole of this dressing is to be retained with bandages made of strips of the gauze. When the wound is large, or the discharges are likely to be excessive, a thicker dressing may be put on.

The first dressing should generally be removed not later than twenty-four hours, sooner than that, if the discharge appears anywhere on the surface, but Mr. Lister says that when the oiled silk protective is used "a wound need not be opened for a week;" however, when there is an oozing at any part, undue pain, or an increase in the patient's temperature, the dressings should at once be removed, always under the spray, which should be carefully directed toward the parts until the wound is covered again. "If the protective is unchanged in color the wound is certainly aseptic; if it is not, it will show dark-brownish spots, the result of the action of the liberated sulphur upon the lead in the oiled silk. This only holds good of incised wounds. In contused wounds the changes of color are met with, even though the wound is doing well." (R. F. Weir, op. cit.) Whenever the protective is discolored the wound must be treated like a septic wound, either with the carbolized solution or the chloride of zinc.

If the wound has remained aseptic, washing it is to be carefully ab-

stained from, and the drainage-tubes not removed until the third or fourth day, unless one becomes choked up, when it should be carefully taken out and washed with the 1 to 20 solution, and replaced according to the granulation of the wound; the surrounding parts may be gently cleansed with a sponge. The feelings of the patient and the staining of the dressing are good indications of the necessity for making changes, but the best is the temperature of the body. When this is normal and the protective unspotted, we may be certain that our dressings are correctly applied, that the wound is doing well, and needs no interference.

When the patient shows an increase of temperature over the preceding examination, it becomes positively necessary to remove the dressings and examine the wound, when it will be found that the drainage-tubes have either become clogged, or else that they have not perfectly drained the wound, and the introduction of another tube, or washing the wound out with the carbolic solution, by means of a syringe, will correct the septic condition, and the relief will be shown by a fall in the temperature.

Prof. Lister keeps the drainage up until the wound is nearly if not quite healed, shortening them as often as is necessary. In reapplying the dressing everything had better be changed. The piece of Mackintosh may be used again, after having been thoroughly washed in a carbolic solution of 1 to 20.

For wounds to which this method is to be applied, and which have existed for some time before coming under observation, such as compound fractures and lacerated wounds, the procedure must be somewhat different from that already described. If it is a compound fracture, the external parts must be thoroughly cleansed, and the wound explored under the spray, the loose fragments of bone removed, and the cavity syringed out with the carbolized solution 1 to 20, or as Mr. Lister has lately used, carbolic acid, 1 part to 5 of alcohol, thrown into the wound with a syringe; drainage-tubes are then inserted to ends of the bone and the bottom of the wound; after this the protective and other dressings are to be applied as usual. In all cases the spray is to be continued until the parts have been covered by the protective. For wounds which have been brought to the surgeon in a suppurating condition, or those which "have failed to remain aseptic," it is necessary to resort to another procedure, and that is the application of the solution of chloride of zinc, as already described. However, when wounds treated from the first by this method have become septic, the experience of those who have used this method extensively, goes to show that there has been some error in making the dressing.

The presence of pus is not decisive of the failure of this method; but the odor that arises from it, also the brownish spots on the protective, indicate that a septic action has taken place, for dressings which remain aseptic are always without any odor. The antiseptic treatment does not always prevent the formation of pus, though it may be desired, and Mr. Lister himself does not regard putrefaction as the only cause of suppuration.

The results which have been obtained by this method of dressing wounds is a matter of the deepest interest to surgeons, and much has been written on the subject. The views of Prof. Lister are not confined to his pupils alone, but are embraced by men of high standing as surgeons, like Volkmann, Thiersch, Locin, Nusbaum, and many others.

Its advantages, therefore, are sufficiently vouched for, to render it the duty of every one having the charge of surgical cases to give it a careful trial, especially in hospital practice.

CHAPTER XIII.

HÆMORRHAGE.

THE MEANS AND INSTRUMENTS FOR ARRESTING HÆMORRHAGE—DEFINITION—DIATHESIS—HÆMOSTATICS, NATURAL AND ARTIFICIAL—INTERNAL MEDICATION—STYPTICS—FLEXION—COMPRESSION—PERCUTANEOUS LIGATION—ACUPRESSURE—VARIOUS INSTRUMENTS—LIGATURE—ESMARCH'S METHOD—DITTEL'S ELASTIC LIGATURE.

THE means and instruments with which to arrest hæmorrhage constitute a topic of grave import to the physician as well as the surgeon, because in the panic which generally accompanies every case of hæmorrhage, and of the uncertain and inopportune times at which bleeding may occur, the nearest medical man is summoned, whether he profess surgery as a specialty or otherwise.

The most fearless and bold operators have more or less dread of those great losses of blood which may either immediately or secondarily prove fatal to the patient; indeed, in the majority of operations it is "the bleeding" which is most feared. The fact that in a few moments the life of a human being may pass away with the crimson tide which bursts from an open vessel, causes such occurrence to be regarded with much apprehension, and, added to this, the heart-sickening scene presented by a person dying from loss of blood, the horror-stricken faces of bystanders, and the disorder and confusion which are often present on such occasions, have taught us to regard hæmorrhage always with certain feelings of anxiety. The appearances presented by a person "bleeding to death" are appalling. The ashy paleness of the face, the pinched nose, the blanched and drawn lips, the icy brow, the clammy skin, the intense nausea, and that hazy vacancy that gradually steals over the eye, together with the absolute depression of all those forces which render us cognizant of the great world without, indicate too plainly that vitality is giving place to death, that the wonderful life-giving current is rapidly being withdrawn from the organism which it nourished, and that light and life are soon to be extinct.

It is not therefore surprising that those men who are supposed to be familiar with the means which will save life when it is threatened from loss of blood, should be regarded with feelings almost akin to reverence, and it is in these times that all the self-possession, knowledge, skill, and mechanical tact of the operator will be called into requisition.

Such was the confidence placed in the skill of Ambrose Paré in arresting hæmorrhage, that he is said to have infused new life into the French army by his appearance in the midst of a sanguinary contest.

I have in my possession a treatise on surgery written a century and a half ago by Samuel Sharp, a pupil of the renowned Cheselden, and surgeon to Guy's Hospital.* On page 221 he has the following paragraph: "There are in armies a great many instances of gunshot wounds of the arm near the scapula, but the apprehension *of losing patients on the spot by*

* A Treatise on the Operations of Surgery, with a Description and Representation of the Instruments Used in Performing Them, etc., by Samuel Sharp, Surgeon to Guy's Hospital, London.

hæmorrhage has deterred *surgeons from undertaking it.*" Fabricius ad Aquapendente appears to have such horror of hæmorrhage that he recommended all incisions for amputation to be made in mortified, and, therefore, bloodless structures. O'Halloran, speaking of amputation of the leg, alludes to the "*bleeding*" as the most troublesome and alarming symptom, and that most reproachful to the surgeon, "the hæmorrhage often proving *fatal* to the patient." Professor Thompson, the preceptor of the distinguished Simpson, thus speaks: "The suppression of hæmorrhage and the reunion of divided surfaces are in every wound and in every operation the first and ultimate objects of the surgeon's attention." It is unnecessary to multiply quotations to establish *facts* that are so universally acknowledged, and although by some of the newer means for arresting hæmorrhage, the occurrence is deprived of some of its terrors, yet it still remains in every operation to demand the serious attention of the surgeon.

Definition.—By the term hæmorrhage is understood the escape of blood from bloodvessels. If this discharge takes place from open surfaces or from organs communicating with the atmosphere, the simple word "*hæmorrhage*" is used. When it occurs within the cavities of the body, we have "*internal hæmorrhage.*" When the discharge of blood is not very great and remains beneath the surface, "*extravasation*" is produced. When the blood flows freely and in streams, or is profuse in quantity, we use the term "*active hæmorrhage;*" "*passive*" being applied to slow and irregular discharges generally emanating from the capillary vessels. When the blood flows "*per saltum*" and is bright red, we recognize the characteristics of "*arterial hæmorrhage,*" and when it is of darker color and a more continuous flow, the hæmorrhage is said to be "*venous.*" Let me here, however, remark that an arterial hæmorrhage may occur, in which the blood does *not* flow "*in jets.*" I have seen this in amputations where a vessel—perhaps of the third calibre—has contracted behind muscular or tendinous substances, and in instances in which a longitudinal incision has been made in the coats of an artery; in the latter instance a portion of the blood passing through the tube, the remaining portion issuing through the opening in the coats. In such cases, which are always more or less embarrassing, the color of the blood, and a knowledge of the anatomical relations of the parts, must chiefly be our guide. Sometimes also there may be an apparent pulsation or "*jetting*" to the stream flowing from a good-sized vein, owing to its proximity to a large or pulsating tumor or arterial trunk.

Again, surgeons denominate "*primary hæmorrhage*" as that occurring during the performance of an operation; "*intermediary hæmorrhage,*" so I believe designated by Butcher, as that which takes place within a few hours after operative procedure, either from the relaxation of tissues, or the increased power of the circulation as reaction is taking place; and "*secondary hæmorrhage*" is that which results from the separation of ligatures, or removal of pins or dressings, which have been used to prevent the primary flow of blood.

Hæmorrhages, even extravasations, are always looked upon with apprehension. The gradual flow of blood into the meshes of a tissue is serious. If it take place within the globe of the eye, it may cause disorganization of the entire ball. If within the cardiac structures, imminent peril results; if within the brain, coma and death may supervene; while the dangers from active, arterial, or venous hæmorrhage are well known to every one.

Hæmorrhagic Diathesis. Hæmophilia.—It may be well here to remark that some persons are much more prone to hæmorrhage than others, and a circumstance still more peculiar is found in the fact that the so-termed "*hæmorrhagic diathesis*" appears in many instances to be hereditary or con-

genital. In the medical periodicals, and in our textbooks, many very interesting cases may be found, furnishing abundant testimony of the fact.

In those who are afflicted with this peculiar and distressing constitutional defect (whether it be a weakness of the capillary vessels, or a loss of their contractile power, or a diminished quantity of plastic material in the blood, or other unknown circumstance), a very slight and trivial cause, even a pin scratch, may give rise to a dangerous or fatal loss of blood. The diathesis generally is found among the male sex, and in the earlier years of life, the tendency disappearing toward adult age. When it is acquired it is usually among the poorer classes, who are ill fed, with lack of light, pure water, exercise, and pure air. There are in this affection, many symptoms that are analogous to scorbutus, the blood being thin and defibrinated, and the hæmorrhage taking place often without any assignable cause. Often it occurs beneath the integument, giving rise to dark purple spots, or those of a slightly reddish hue. I have known an almost fatal hæmorrhage occur from the gums of a patient without any assignable cause. Children have perished from loss of blood consequent upon lancing the gums, dividing the "*frœnum linguæ*," excising the tonsils, extracting a tooth, and other minor operations.

Some very remarkable cases in which several in one family have been afflicted with the hæmorrhagic diathesis* are upon record.

I have lately seen an interesting case in consultation with Dr. Swan, of New York, in which the infant bled profusely from the soles of the feet, the palms of the hand, the umbilicus, and the back. The complexion was very sallow, and though the child when born was apparently plump, it took no nourishment and died in a few days.

Hæmostatics.—Our object now is to ascertain the proper means and instruments for preventing or arresting hæmorrhage, occurring either during or after surgical operations; or that resulting from injury or accident or constitutional diathesis.

This we term hæmostatics, and we divide it into two departments, natural (A), and artificial (B).

(*A.*) *Natural Hœmostatics.*—To the student of physiology and pathology, the active part that nature, even unaided, takes upon herself to repair her temple and preserve vitality is well known. With a wonderful and silent power she keeps guard over her children in every emergency, driving out the innovator; healing broken bones; repairing tissue; manufacturing flesh; gluing together wounds; and in hæmorrhage working "*with all her might*" to save her own from death. On this last point, viz., the method in which natural hæmostatics arrests bleeding, experimental pathology has revealed much in the last few years. So long ago as 1731, Petit wrote and published several treatises on this subject, giving from actual experiment the manner in which "the two clots" are formed by nature to arrest hæmorrhage. The inside clot he called "*bouchon*," the outside "*couvercle*." In 1736, Morand, besides allowing the formation of clots as proposed by Petit, advanced the idea that besides this, very important changes took place in the coats of the artery itself. It is rather remarkable that some years afterwards Sir John Bell denied this proposition. In 1763 Kirkland made an additional step, by showing that besides the two clots and the arterial contractions, syncope or swooning lessened or arrested temporarily the discharge of blood, allowing time for clots to form and organize, or for mechanical in-

* Gross's Elements Path. Anat., p. 203, 204. Gross's Surgery, vol. i.—"Hæmorrhagic Diathesis." Braithwaite's Retrospect, No. 24, p. 199. Druitt's Modern Surgery, p. 305.

terference, and finally, Dr. I. F. D. Jones,* who has given us the best treatise on the subject, has informed the surgical world (which it is very important for us to bear in mind for the proper understanding of the *rationale* of certain methods now employed in arresting hæmorrhage) that for the permanent *arrest* of bleeding, "an effusion of coagulating lymph within its (the artery's) canal, between its tunics, and in the cellular substances surrounding it," is necessary, and does take place. Here are then *four* important means employed in natural hæmostatics, and if we call to mind the method pursued by nature in repairing fractures, the internal and external callus, "the temporary" and "permanent," and the removal thereafter of that which is unnecessary, a wonderful similarity in the two processes will be found to exist. Let us suppose that an artery of some magnitude is cut across; almost immediately both divided ends retract within the sheath, and by virtue of the elasticity of their coats, *contract* upon themselves, thus diminishing the calibre of the vessel and necessarily diminishing the stream. The sheath, however, not being nearly so elastic as the arterial tunics, retracts but little, thus leaving a species of cylinder around the vessel, to be filled with coagula, which takes place from filaments of fibrin being adherent to its walls; and this is increased by the increased plasticity of the blood as it flows. Vide Fig. 60, which shows the plan of natural hæmostatics in a cut artery; *a* is the divided extremity of the arterial tube rendered conical by contraction; *b*, the arterial sheath vacated by the retracted artery, and occupied by coagulated blood; *c*, the coagulum projecting from the orifice of the sheath. The more slowly the blood passes through the vessel, the

FIG. 60.

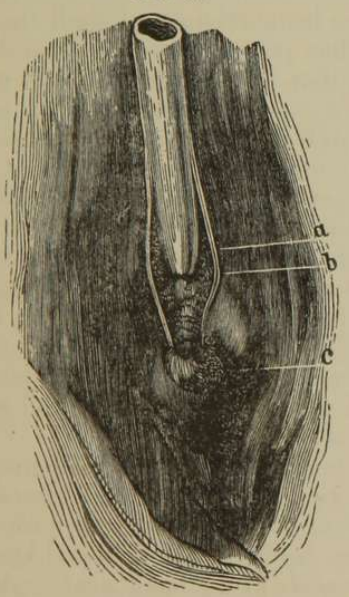
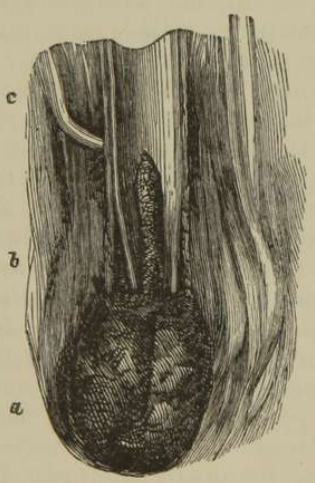


FIG. 61.

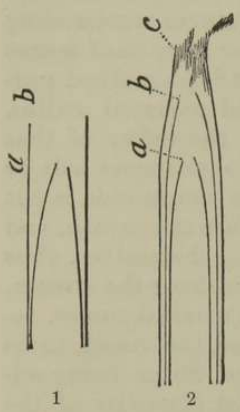


more opportunity is offered toward the formation of the *internal* coagulum which forms *within* the vessel in a long and thin clot, and if syncope have supervened, the conditions will be much more favorable to the "couvercle." "In the meantime," says Jones, "the cut surface of the artery inflames; the *vasa vasorum* pour out lymph, which is prevented from escaping by the

* A Treatise on the Process Employed by Nature on Suppressing the Hæmorrhage from Divided or Punctured Arteries, and on the Ligature, by I. F. D. Jones, M.D.

external coagulum." This lymph fills up the extremity of the artery; is situated *between* the external and internal coagula of blood; is somewhat intermingled with them, or adheres to them, or is firmly united all around to the internal coat of the artery. Fig. 61 (after Jones) shows also the plan of natural hæmostatics: *a* is the external coagulum, incorporated with the coagulum of the sheath *b*. The internal coagulum is also seen resting upon the external and extending to *c*, the first collateral branch. These are the processes which we find in natural hæmostatics, and the more we examine them, the more will the beauty of the process be appreciated. After hæmorrhage is suppressed, the artery at its extremity and sometimes up to its first anastomosing branch, becomes converted into a ligamentous cord, and the clots are removed by absorption. Fig. 62 shows: 1. Plan of retracted artery after section: *a*, the conical, contracted, and retracted arterial tube; *b*, the arterial sheath left vacant. 2. Plan of retracted artery after laceration: *a*, the retracted middle and internal coats of the artery; *b*, the external coat; *c*, the twisted sheath.

FIG. 62.



(*B.*) *Artificial Hæmostatics. Internal Medication.*—Among those hæmorrhages belonging to surgery, besides those occurring from accidental causes and the surgeon's knife, are epistaxis and bleedings from the bladder and the rectum, and even these, in the majority of instances, fall within the province of the physician, in the same manner as do hæmoptysis, metrorrhagia, hæmatemesis, and post partum hæmorrhage. I shall therefore speak of *internal medication*, so far as it has power to arrest hæmorrhage (surgically so called), and must confess, that it is a very difficult matter to lay especial stress on any medicinal means whatsoever, as in almost every case of hæmorrhage, some local application is made simultaneously with the internal treatment, or, indeed, if medicated substance is not laid over the bleeding surface, it is covered or bound up with bandages, or cloth, or lint, or cotton, or some other substance, to favor the formation of the clots. When vessels of any magnitude bleed, I would unhesitatingly regard it, not only the height of folly, but an unpardonable dereliction of duty, to rely exclusively on the internal administration of medicine, under the conviction that the bleeding would be arrested. Yet I have been told, though I scarcely credit the fact, that there are physicians who, having a case of such arterial hæmorrhage, would neither cover the wound with a bandage, nor ligate a vessel, nor apply a styptic.

In passive hæmorrhage there can be no doubt that our medicines are capable of exercising a beneficial effect. In oozings after large operations, I have frequently witnessed their excellent results. I do not propose to record in this place what is found in the manuals for hæmorrhage, or I would write that for hæmorrhage *in general* (*?*) we have asaf., cocc., copaiba, iod., and crocus. Hæmorrhages from "*various* parts," canth., and phosph. Hæmorrhages "from a newly opened wound," opium. Excessive hæmorrhage, antimonium crud., and much of the like. My object is merely to mention those remedies which, internally administered, have beneficial effects in certain forms of hæmorrhage coming under the care of the surgeon. For the record of medical and obstetrical hæmorrhages, this place is not the proper one.

Hamamelis will arrest a venous hæmorrhage, proceeding from varicose veins, and hæmorrhage from the mouth and gums, and from hæmorrhoids.

Dr. Cushing has seen it suppress hæmorrhage after extracting a tooth. Dr. Preston has with it cured hæmorrhage from the bowels.

Veratrum viride is one of the best medicines for hæmorrhages. A case is recorded of its successful use in secondary hæmorrhage after amputation.*

Nitric acid, given internally, will arrest a secondary hæmorrhage from the lower part of the rectum, after the removal of hemorrhoidal tumors.

Monsel's styptic, from 20 to 30 drops in half a glass of water, a tablespoonful every half hour, will arrest an oozing from the medullary canal after a resection of the humerus. I was led to its use in surgery by some remarks by Dr. Malcolm McFarland. Erigeron I have administered with success in hæmorrhage from the bladder, after operations for vesico-vaginal fistulæ, rupture of the perinæum, etc. For operations about the lower portions of the rectum, crocus and carbo veg. are excellent medicines. So far as my own knowledge goes, with the exception of *arsenicum* and *china*, in those cases where there is great prostration of the vital power, and the blood is thin and defibrinated, I can speak of no other internal medicines. The alnus rubra, apocynum cann., erechthites hieracifolius and iris, or diadema, are laid down as possessing power over hæmorrhage. This is a portion of the field of surgery that presents a wider scope to our school than others, and, no doubt, will in future be more thoroughly cultivated, but as I have before mentioned, the fact that many mechanical agents, from the simple roller bandage to the most complicated styptic compounds are generally employed, will always embarrass the attempt to assign the proper sphere to internal medication.

Styptics.—Before proceeding immediately to mention those articles which may be considered the most efficient as styptics, I would have the fact borne in mind that the *exposure of the bleeding surface to the atmosphere* will arrest quite a profuse hæmorrhage. Mr. Skey, years ago, taught this fact:† "A surgeon who has the least fear of hæmorrhage loses the least blood; a small wound may be tortured by styptics, and by compresses, and other unprofitable agents, until it becomes the fruitful source of protracted hæmorrhage. Masses of lint are piled up in heaps upon the wound, pressure is maintained until all the parties are exhausted, but still the hæmorrhage returns and continues by reason of the irritation caused by these very agents and nothing more. Under these circumstances, which I have frequently borne witness to, all dressings should be removed, and the wound should be opened and exposed to the air by its edges being drawn widely asunder and the bleeding apparently encouraged; its surface sponged freely with cold water, the coagula wiped away, and in this condition it may fearlessly be left to bleed; the cessation of the hæmorrhage by such means is often immediate." I have known quite a number of cases where such treatment has proved beneficial, and have laid down a rule, that in every operation where a bandage is not absolutely necessary to support the parts, it should be done away with. For the past five years, after amputation, or the removal of tumors, I have not permitted the application of the roller, the parts being merely covered by a light cloth, and thus many untoward symptoms have been prevented. A bandage often keeps up venous congestion, thereby producing troublesome oozing.

Cold.—The application of cold, either by means of ice water, or of ice pounded in bladders and applied to the part, or ice water used with a syringe upon the bleeding vessel, as employed by Agnew in ruptured perinæum, or the ether spray of Professor Richardson, or the Rhigolene of Dr.

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* Medical Record, Nov. 1st, 1872

† British and Foreign Medico-Chirurgical Review, 1851, p. 290.

Bigelow, all have excellent styptic effects, and with the exception of the latter are so devoid of all odor and so easily applied that they are always desirable except in those cases where the hæmorrhage is active.

Alum may be applied either in powder or in solution, and possesses powerful astringent properties. It is efficient in its action, and when combined with tannin exercises powerful control over the bleeding surfaces. Equal parts of sulphate of alumina and tannic acid I always keep ready for emergency. An excellent formula for a solution combining the two is that of Monsel:

℞.—Acidi tannici, ... grs. x.
Aluminæ sulph., ... ℈j.
Aquæ rosæ, ... ℥iss.
M. ft. sol.

A combination of tannin and the elixir of vitriol has been known to arrest a very profuse arterial hæmorrhage from the tonsils. This is easily obtained, and though I have never applied it, yet it must be a powerful astringent.

Rhatany.—By digesting rhatany in sulphuric acid a brown extract is obtained, which has been highly lauded by M. Tessier,* of Lyons, as one of the best hæmostatics.

Turpentine, Oil of.—The properties of this substance brought it into general use some seventy years ago, and it is occasionally used at the present, but there are so many other agents of superior efficacy, that it has fallen into very general disuse. It was highly lauded and recommended by Mr. Yonge.

Matico.—Dr. Jeffries, of Liverpool, is said to have introduced this substance as a hæmostatic to the profession, in 1843. It has been given internally, and applied locally. A decoction is made of one-half ounce of the matico to a pint of water, although Dr. Hunter Lane recommends that an ounce of the substance be used to a pint of boiling water.

Sulphate of Copper.—This substance has been employed for centuries to arrest bleeding; it was formerly pounded and placed in "little linen clouts," thus forming the well-known "button of vitriol," and applied. It has often been mixed with tannin.

Perchloride of Iron.—The coagulable properties of the varied preparations of iron render them superior in arresting hæmorrhage. I have used the *perchloride* in very many cases with good success, although of late years I have preferred the persulphate.

Persulphate of Iron may be used in the form of the *liquor ferri persulphatis*, or in powder. It is the well-known "Monsel's styptic," and is decidedly one of the most efficient we possess. I could cite here many cases wherein its efficacy has been proven. There is a precaution, however, which should be employed in using many of these styptics, and that is, knowing their liability to produce unsightly stains on whatever articles of cotton or linen they touch, care should be taken to use only "old rags," as they are termed, or some cheap substitute. I have known many quite valuable articles of clothing, as well as bed and other linen, completely spoiled by these preparations carelessly applied.

Collodion, by its contractile power, and by the cold produced by evaporation, is often efficient. I have arrested a severe and prolonged hæmorrhage from leech-bites, by dipping pieces of lint into collodion and placing

* Medical Record, vol. ii, p. 393.

them over the bleeding surface; over this applying a piece of cardboard, and then freely pouring collodion over the parts.

Styptic Colloid.—This substance, which was introduced by Mr. Richardson, consists of ether saturated entirely with tannin and a collodial substance, either gun-cotton or xylodine. When such is applied, the natural heat of the body evaporates the ether, leaving the tannin and cotton applied to the raw surface.* I can speak well of the efficacy of this agent, having used it very frequently and with good result.

Chloride of Iron and Cotton.—Dr. Ehrle describes a simple preparation of cotton which he has found of great service in surgical operations followed by great effusion of blood. American cotton of the best quality is cleansed by boiling it for an hour in a weak solution of soda (about 4 per cent.), then repeatedly washed in cold water and dried. By this process it will be perfectly disinfected and adapted to more ready absorption. After this, it should be steeped once or twice, according to the degree of strength required, in liquid chloride of iron, diluted with one-third water, pressed and thoroughly dried in the air—*neither in the sun nor by the fire*—then lightly pulled out. The cotton so prepared will be of yellowish-brown color. It must be kept very dry, as it is affected by the damp. Lint may be similarly treated, but the fine texture of the cotton renders it preferable. When placed on a fresh wound, it causes a moderate contraction of the tissue, and gradually coagulates the blood in and beyond the injured veins, thus closing the source of the effusion.

This property of the chloride of iron is increased by the dryness of the cotton, and the extended surface offered for the development of the chemical action.

Dr. Rohland, of New York, prepares a styptic cotton somewhat after the formula of Ehrle. This I have used with success and can highly recommend.

Benzoic Acid and Alum.—Probably the most energetic styptic known is the following:

R.	Benzoic acid, ...	1 part.
	Sulphate of alumina and potash, āā	3 parts.
	Ergotin of Bonjean, ...	3 parts.
	Water, ...	24 parts.

The whole is to be boiled for half an hour in a porcelain vessel, with constant stirring, replacing the evaporated with boiling water. It must then be evaporated to the consistence of an extract, which is of a chocolate-brown color, strongly astringent taste, and having an odor of ergotin. Together with this the following formula is to be taken internally:

Benzoic acid, ...	grs. j.
Pulv. alum,	
Ergotin, āā	grs. ij.

Ft. mass, et div. in pil. no. xvi. S. One pill to be taken every two hours.

There are many other substances which are possessed of astringent properties. Thus the famous styptic of Broussard was composed of the agaric of the oak, while, as remedies against hæmorrhage, the felt of a hat, cobwebs, gallic acid, and the preparations of zinc and mercury have long been known and applied.

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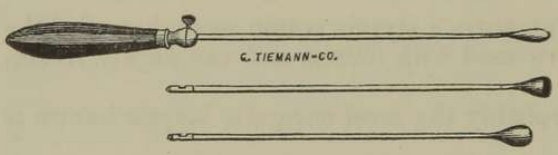
* *Vide* Braithwaite's Retrospect, July, 1867.

The Actual Cautery.—The old surgeons applied almost universally the red-hot iron to arrest bleeding after surgical operations. I have seen depicted in a well-preserved copy of the *Armamentarium Chirurgicum*, of Scultetus, published in Frankfort in 1666, the various methods of its barbarous application. Melted lead, melted copper, boiling oil, and boiling oil of turpentine were also used for the same purpose. The severity of this mode of arresting hæmorrhage, combined with its unsuccessful results (secondary bleeding generally following the separation of the eschar), led to its disuse, and Ambrose Paré, three hundred years ago, in 1564, proposed that surgeons "should cast aside all hot irons and cauteries, and apply the ligature and the tourniquet."* Yet this advice was slowly followed, and Paré was assailed by the surgeons of his time "for *daring* to introduce the ligature, and condemn, as they said, a method so highly commended and approved by all the ancients, teaching in opposition to that, without any authority, without knowledge, without experience, without good sense, some *new* method of his own of tying arteries and veins." It took nearly two hundred years to introduce into general practice the process of ligating arteries, and now, having been adopted, it will take probably as long before the newer methods will be looked upon as sufficiently reliable to be generally accepted. So has it ever been in the history of medicine. The fact is lamentable, but nevertheless *true*. It is said by some surgeons that it may be necessary even at the present day, under certain peculiar circumstances, to have recourse to the heated iron. It can only in the least degree be justifiable when the bleeding vessel is beyond the reach of the ligature. According to Bransby Cooper, no surgeon should ever undertake to remove the whole of the upper jaw without being provided with a variety of actual cauteries. He recommends an iron rod, working in a sheath, to prevent the surrounding structures from being injured. I have on several occasions been obliged to use this method of arresting bleeding, once in the removal of the entire superior maxillary bone, and again in a resection of the inferior maxillary, in which the dental artery bled profusely. Fig. 63 represents Thomas's cautery, made by Tiemann. In its application care must be taken not to have the metal too hot, a moderate red being preferable to a white heat. At present the *galvano*-cautery or thermo-cautery have superseded all others.

FIG. 63.



Thomas's Cauterizing Iron.

Nitrate of Silver used formerly to be much in vogue for the suppression of bleeding, and is now occasionally applied, but the other substances which have already been mentioned are so far superior to it, that only in exceptional cases can it be called for.

Over or Forced Flexion.—Malgaigne asserts, in his *Anatomie Chirurgicale*, that the only points at which obliteration can be obtained by position alone, without the aid of external compression, are at the bend of the arm and at the knee, facts which are of great import in the arrest of hæmorrhage. Forced flexion, as it is termed, is so simple and so easily effected that it should be remembered by both physician and surgeon. The method, though not by any means new, has had many advocates at the present time, among whom are Nelaton, Ansiaux, Malgaigne, Klotz, Hyrtl, Vidal, and others. It is well known that wounds of the palmar arch and plantar surfaces,

* A very interesting account of the methods employed by Paré in arresting hæmorrhage can be found in Simpson's work on Acupressure.

especially the former, often give rise to the most alarming and uncontrollable hæmorrhage, and that cases are upon record where ligature of the radial, ulnar, brachial, and even axillary arteries have failed to arrest the flow of blood.*

Forced flexion will, in the majority of instances, arrest the bleeding from these surfaces. Twenty-five years since, E. Dunvell, Esq., published in the *Medical Gazette*† an interesting article on the subject, stating that in most arterial lesions of the forearm and leg, prolonged and forcible flexion supersedes the ligation of these vessels. Mr. George Y. Heath, in an address delivered in 1870 before the British Medical Association, reported some very interesting cases which occurred in his practice in 1849, in which, by forced or over flexion, hæmorrhage was arrested and life saved.‡ His experiments are both interesting and instructive, and are inserted here because they will show the best methods by which over flexion is accomplished.

(*A.*) *Upper Extremity.*—1. Forearm bent on the arm by muscular action of the individual experimented upon. In persons with considerable muscular development, pulse at the wrist entirely stopped.

2. Forearm bent on arm—simply with the hand flat on the shoulder. Pulse weak and indistinct, but rarely quite stopped.

3. Forearm bent on arm, with hand pronated; pulse more weakened, sometimes stopped.

4. Forearm bent on arm; hand pronated and extended. Pulse usually quite stopped.

5. Forearm bent on arm, hand pronated and bent at the wrist. Pulse almost imperceptible, or quite stopped.

6. Forearm bent on arm, with a roll of lint or cambric pocket handkerchief rolled up and laid in the bend of the elbow. Pulse almost entirely stopped.

(*B.*) *Lower Extremity.*—1. Leg flexed on thigh. Pulse in posterior tibial artery much weakened.

2. Leg flexed on thigh, and thigh on abdomen. Pulse in posterior tibial stopped altogether, almost invariably.

3. Leg flexed on thigh, with a roll of lint or cambric pocket handkerchief laid in the bend of the knee. Pulse stopped in some cases, not always; but with flexion of thigh on abdomen also, pulse invariably stopped.

4. Thigh flexed on abdomen, the trunk *bent* forward. Pulse materially weakened.

It will, from the above, be observed that in wounds of the palmar arch, by flexing the arm on the forearm, pronating the hand, and applying an ordinary compress at the bend of the elbow, severe hæmorrhage can be permanently arrested; and that by applying a compress at the bend of the knee, and flexing the leg on the thigh, and the thigh on the abdomen, the arterial flow in the plantar arch is certainly arrested. But this method is, by no means, a painless proceeding. It must be remembered that the suffering resulting from maintaining the joints in an over, or forcibly flexed condition, is very intense, and in some patients can not be borne for any considerable time without danger. In such cases as these, high elevation of the limb with less severe flexion may answer the purpose.§

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* For an interesting case of this kind, *vide* Butcher's Operative Surgery, p. 386.

† January, 1851.

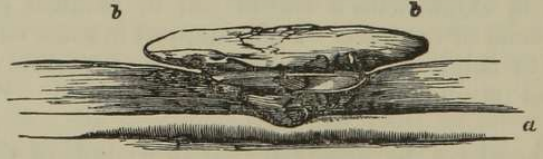
‡ British Medical Journal, August 13th, 1870, p. 165.

§ *Vide* on this subject a paper read before the American Institute of Homœopathy, at its session in Chicago, June, 1870.

Compression.—Although in reality "over flexion" may be placed under this division of our subject, as it is the pressure excited by muscle and bone upon the artery that prevents the bleeding, yet for simplicity it is proper to treat it under a separate heading. Pressure may be either temporary or permanent. "*Permanent compression*" may be necessary when the blood flows from minute vessels, or when hæmorrhage takes place from a vessel imbedded in cartilaginous and bony structures, and when it is impossible to apply any other means to arrest the bleeding. An excellent method of making the compress is as follows: First, sponge away all the blood from the wound, remove all the coagula, and place the finger and thumb firmly over the bleeding orifice; then prepare a dossil of lint, a piece of compressed sponge, or prepared tow, which, if it be thought necessary, may be soaked in a solution of tannin, alum, or of the *liquor ferri persulphatis*, or rolled in the powder of the persulphate of iron; then as the fingers are removed, place the compress, so prepared, accurately over the bleeding orifice, and upon this lay another and somewhat larger one, and so on increase the size of the compress until quite a good-sized mass of the substance is used. Over this carefully apply a roller bandage, and extend it upon the entire part (taking especial care not to make the turns too *tight*), which will complete the dressing. If, however, the blood should appear through the compress, it may be taken for granted that the pressure is not properly adjusted, and the *whole* should be removed and more accurately and carefully applied. As a rule, it must be laid down that we should never be content with merely using a compress over the bleeding vessel alone, but in conjunction with this, the bandage applied, as already mentioned, to complete the effect. The whole apparatus must be allowed to remain three or four days before it is removed, and may then be again adjusted less tightly than before.

Fig. 64, after Miller, shows the plan of a graduated compress: *a*, the artery wounded; *b*, *b*, the graduated compress arranged, so that the apex

Fig. 64.



of the cone is in immediate contact with the arterial orifice, while its mass occupies the general wound, and projects somewhat above the integumental level.

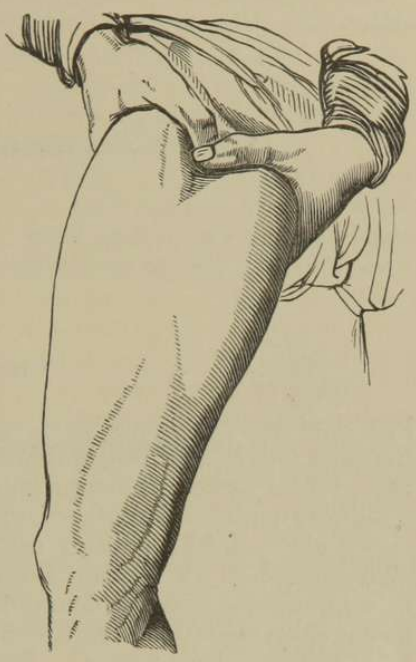
Indirect pressure, or temporary compression, is generally used to restrain hæmorrhage during the performance of surgical operations, and there is no apparatus that can compare with the fingers and thumbs of a competent assistant. (Fig. 65.) The old-fashioned tourniquet, *vide* Fig. 66 (next page), consisting of a strap to encircle the limb, a pad to place over the vessel, and a screw to tighten the band, is very efficient, and is used to the present day in operations that take but a short time for their performance. It was introduced by Morrel in 1674, and modified by Petit. Before the tourniquet is applied for amputation, it is well to elevate the limb, and having it held in this position by an assistant, the surgeon beginning at the extremity,

with both hands encircling the limb, makes friction steadily and firmly towards the trunk, thus saving much venous hæmorrhage.

Various tourniquets have been used at different times, those of Signorini, Malan, Skey, and others. In the United States army, during the late war, an ingenious tourniquet was used for temporarily suppressing arterial hæmorrhage, and allowing the venous circulation to continue unrestrained. It consisted merely of pads with flanges, the latter holding off the straps which keep the compresses in their place. In some of the regiments every soldier was supplied with one, and was taught the method of its application, with what result, however, I am unable to say.

Fig. 67 represents Signorini's tourniquet. Fig. 68 shows the compressor of Prof. Skey.

Fig. 65.



Digital Compression.

Torsion.—The torsion or twisting of arteries to arrest bleeding was mentioned by Galen, and I believe was reintroduced by Amussat, Thierry, and Velpeau, but gradually fell again into disrepute, excepting in those cases where the hæmorrhage proceeded from vessels of the fourth class. After the introduction of the acupressure needle by Simpson (over ten years ago), torsion again came into vogue, and has met with the highest favor

Fig. 66.

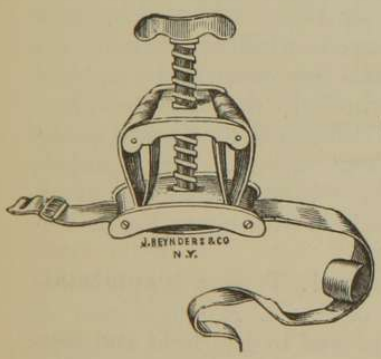
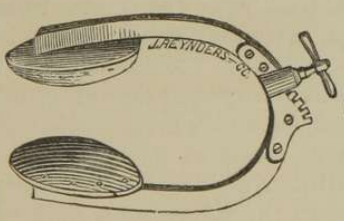
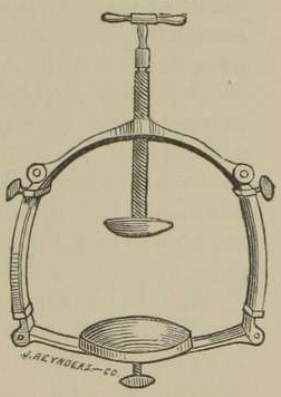


Fig. 67.



Signorini's Tourniquet.

Fig. 68.



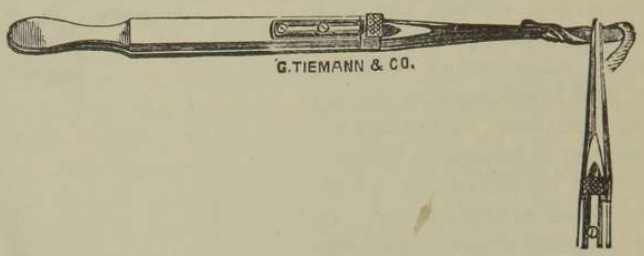
Skey's Compressor.

among surgeons. The method usually recommended is as follows: Seize the vessel with the ordinary artery forceps, taking especial care that *it only* is embraced within the jaws of the instrument. Then draw forward the artery, and with a pair of forceps, with roughened and narrow blades, take hold of it transversely, or at right angles with the vessel; press down the blades of this pair of forceps firmly, in order to lacerate the internal and middle coats of the vessel, and then twist the artery with the artery

forceps several times around upon itself, and the operation is completed. Fig. 69.

In a paper read before the Clinical Society, London, Mr. Cooper Forster states, that after losing two cases from hæmorrhage after acupressure, he

FIG. 69.



Torsion of an Artery.

had employed torsion alone in several cases of amputation, in excision of the knee, elbow, and hip, and forty other operations, with complete success. He prefers torsion to acupressure on account of the reduplication of the middle and internal coats of the artery, thereby affording a mechanical impediment, which increases daily, while acupressure only forms pressure above the pin. Dr. Bryant states that he has not employed the ligature in amputations since January, 1868, and has had no cases of secondary hæmorrhage*—of 300 cases of amputation 110 were of thigh and torsion practiced on the femoral. This is most remarkable success, and Mr. Callender,† in a lecture upon the subject, thus writes: "There is no record, where the operation has been properly practiced, of any sloughing of the twisted end, or of any abscess along the track of the vessel; and whilst the presence of a foreign body in the wound is avoided, the patient escapes the anxiety which the prospect of the removal of the ligature entails. And to add one other, and this is a strong argument in favor of torsion, it is free from all risk of that secondary bleeding which is sometimes associated with the separation of the ligature." It would appear also, that torsion is applicable to the larger vessels, while the smaller are more secure when tied with the ligature. Poland has successfully applied torsion to the femoral artery six times, to the brachial twice, and to numerous smaller vessels. Durham has used it for the femoral four times, to the brachial twice, and to many arteries of a minor calibre. Dr. Addinell Hewson‡ has devised an instrument called the "torsion forceps," which does away with the necessity of using two hands in the operation of torsion, and which exhibits considerable ingenuity.

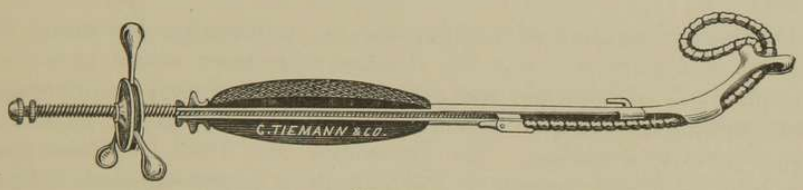
M. Tillaux arrives at the following conclusions: 1. Torsion is applicable to all arteries, and particularly to the larger ones. 2. A single pair of forceps is sufficient, and not two pairs, as employed in England and elsewhere. 3. The artery should be seized obliquely, and not longitudinally, and in such a manner that the three coats in their entire breadth should be included in the grip. 4. The torsion or twisting of the arteries should then be practiced until the portion seized becomes detached. 5. It is unnecessary to adopt measures to limit the extent of the torsion, as practiced by Amussat and the English surgeons, as the operation limits itself either to the part seized, or one or two *centimeters* above it. 6. Torsion is appli-

* Medical Times, October 15th, 1870, p. 22. † Lancet, March 21st, 1874.
‡ British Medical Journal, 1872.

cable to atheromatous or inflamed arteries, as well as to arteries in a healthy condition. 7. Torsion favors union by the first intention, owing to the absence of a foreign body, as in the case of ligatures. 8. Like the ligature, torsion prevents primary hæmorrhage. 9. Torsion acts more effectually than the ordinary ligature in preventing secondary hæmorrhage. M. Tillaux asserts that ever since he began to employ torsion, in 1871, he has never had a single case of primary or secondary hæmorrhage, and yet he has practiced it in about a hundred cases of capital operations.

Ecraseur.—In this connection it may be well to mention the écraseur of Chassaignac, which prevents hæmorrhage by twisting the mouths of the vessels, as the chain, worked slowly by the screw, passes over the part being cut away (Fig. 70). From considerable experience in the use of the écra-

FIG. 70.

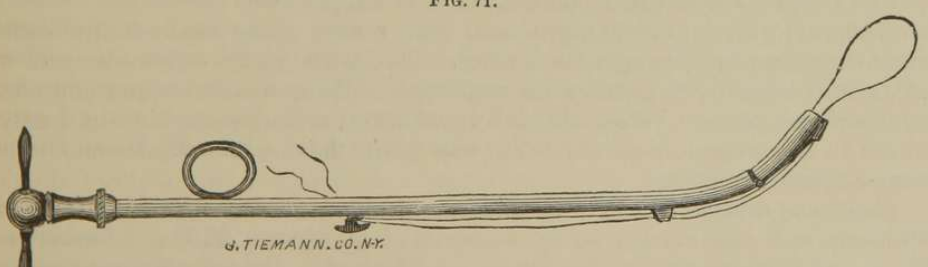


Ecraseur.

seur in very many operations, I can speak of its efficacy. In hæmorrhoids, amputation of the tongue, through the pedicle of ovarian tumors, to divide the stalks of uterine tumors, and in other operations, I have used it with complete success.

The main desideratum in the application of the écraseur is the formation of a pedicle. In flat tumors this can be accomplished by passing below the surface, and especially *beyond the diseased mass*, large needles, beneath which needles a strong ligature is passed and drawn somewhat tightly; this makes an excellent pedicle, and the chain may be passed around this and slowly worked. In some instances an incision around the integument greatly facilitates the operation. If there is much substance to be removed an excellent method of application is as follows: A trocar, with a canula of sufficient calibre to admit the passage of the chain, is passed beneath the parts to be removed, and a small elastic bougie having been tied to the end of the chain, is pushed through the canula and made to emerge at the point desired. In some instances it may be necessary to have two of these canulæ and trocars, one passing at right angles with the other. The chain and screw should always be well oiled, and the instrument should be worked

FIG. 71.



very slowly, especially in very vascular growths, indeed, a minute to a link is allowed by some operators. This rule is a good one, and should be followed by young practitioners. Besides working with a chain, wire is sometimes used. Fig. 71 represents Smith's modification of the wire écraseur.

From my own experience I prefer much the chain to the wire, because the latter is very liable to break.

The late Dr. Nott, of New York, has devised what he terms a rectilinear écraseur, which he claims is less likely to be followed by secondary hæmorrhage than when the instrument of Chassaignac is used. It is not claimed that it severs the tissues entirely, as does the écraseur, but crushes them to a pulp; a ligature is then placed around the pedicle, and the parts may then be cut off.

The écraseur has, of course, as have all similar instruments, the cases adapted for their use, and though it will never be the instrument wherewith to amputate the thigh, it will always be found useful in certain vascular parts where operation is required.

ACUPRESSURE.

If Professor Simpson had nothing else to immortalize his name, the introduction of acupressure into the domain of surgery would have been entirely sufficient. This simple and safe method of arresting hæmorrhage will be more universally adopted when a more thorough trial of its merits has been instituted by surgeons. On December 9th, 1859, Professor Simpson read before the Royal Society of Edinburgh a paper entitled, "Acupressure, an Excellent Method of Arresting Surgical Hæmorrhage and Accelerating the Healing of Wounds;" and he subsequently published a most exhaustive treatise on the same subject,* in which all the advantages claimed for the method are carefully considered, and compared with other means for controlling hæmorrhage. It will be some time no doubt before acupressure will become generally adopted. It is very difficult to overcome preconceived opinions, and especially our actual experience. We know from facts, that in operations of all magnitudes the vessels have been secured by waxed silken ligatures, and that hundreds of thousands of patients have made excellent recoveries after the hæmorrhage has been restrained in this manner, and therefore the *apparent* insecurity of acupressure has, no doubt, prevented many from applying it. For the same reason the ancients rejected the ligature of Paré. But when we contemplate the *rationale* of acupressure we will be convinced of its efficacy. The process which takes place in the artery after the application of acupressure needles is somewhat similar to that employed in natural hæmostatics. The needle presses together the walls of the artery, acting as does the external coagulum; the blood then stagnates in the vessel up to the nearest anastomosing branch, forming the internal coogulum. The lymph is exuded between the pin and the "couvercle," and the vessel is closed.

The needles are bayonet-pointed, vary in length from two to five inches; they should have cutting edges and firm round glass heads to facilitate their introduction through the tissues. The other instruments are needles of various lengths, threaded with iron wire. These needles or pins may be used several times. Those which I have been in the habit of using I procured in Edinburgh from the cutler who made them under Professor Simpson's express direction.

There are several methods of using acupressure, as described by Professor Simpson, and one introduced by Joseph C. Hutchinson, M.D., of Brooklyn, N. Y., which he terms "The Brooklyn Method." In his elaborate paper on this subject Dr. Hutchinson has done much to introduce the subject to

* Acupressure, a New Method of Arresting Surgical Hæmorrhage and of Accelerating the Healing of Wounds, by J. Y. Simpson, M.D., F.R.C.S., etc., Edinburgh. Adam and Charles Black, p. 571.

the American profession, and his statistics are very valuable.* Drs. Pirrie and Keith have also introduced their methods, making in all eight forms of acupressure, Professor Simpson at first describing but three.

1st Method.—The pin is pushed through from the cutaneous surface of the flap, it is then passed sufficiently close to the artery to press together its walls, and the point brought out again on the surface; or, as Professor Simpson remarks, in the same manner as we pin the stalk of a flower in the lapel of a coat.

2d Method.—Take a needle, threaded with iron or silver wire, to render its withdrawal easy, and having raised up the flap, catch up sufficient tissue with the point to make the needle firmly hold, and then bring out the body of the needle closely to the vessel and imbed its point again in the tissue, in the same manner as the tailors "run a thread."

3d Method.—Pass the needle *behind* the vessel, and, having thrown a loop of iron wire around its point, bring the same (the wire) in *front* of the artery and twist it around the needle.

4th Method.—This is similar to the third, with the exception that a pin is used from the cutaneous surface of the flap, rather than the needle on the internal face.

5th Method.—This is known as the "Aberdeen Twist," which is performed as follows: The pin or needle is inserted on one side of the bleeding vessel, and its point made to emerge from the tissue a few lines from the artery. The head is then made to rotate either a quarter or half a circle, and the point pressed close to the artery as it is passed into the tissue beyond.

6th Method.—A loop of wire and a pin are the instruments necessary. "The pin is inserted into the tissues on one side of the artery and close to its mouth, and is carried transversely to the vessel through the tissues of the opposite side; an end of the wire is held in each hand and the loop thrown over the point of the pin, and the ends, brought back on each side of the artery, are crossed behind the body of the pin, and are drawn in opposite directions, sufficiently tight to close the vessel; the ends are then brought up on each side, and the wire is fixed by a half twist around its head."

7th Method.—This is very similar to the second, with this difference: the pin is entered at the cutaneous surface of the flap, and brought out again in front of the artery, thereby compressing it against the bone; it is then entered again on the cutaneous surface on the other side, and buried in the tissues sufficiently to hold it securely, bringing the point out on the flap.

8th Method is that known as the Brooklyn method, and is especially serviceable in closing arteries in their continuity. The artery is first exposed by the usual dissection, then a loop of wire is laid in the wound parallel with the artery. The pin is entered in the integument, brought out beneath the vessel, the loop of wire is then passed over the point of the pin, which is then pressed into the skin on the other side, and the ends of the wire secured by half a turn round the pin.

The pins may be removed in a very short time, indeed, to those employing acupressure, it requires quite an amount of moral courage to remove the pins or needles according to the directions laid down. I have withdrawn a needle from the femoral in 38 hours, and from the brachial in 24 hours, and have employed the pins on the facial on several occasions, twice

* The Merritt H. Cash Prize Essay—"A Practical Treatise on Acupressure, by Joseph C. Hutchinson, M.D." Transactions of New York State Medical Society, 1869, p. 86.

while excising the lower jaw. An instance is upon record where a boy removed the pin from the femoral in four hours after its application without any hæmorrhage. In a case of extirpation of the mamma, Coghill removed the apparatus in two hours after the operation. No bleeding resulted.*

In October, 1867, my friend, Dr. Comstock, applied acupressure to the arteries of the leg in a secondary amputation (the primary being Chopart's, and was performed by myself during my term of service), in which the hæmorrhage was arrested, and the pins removed in forty-eight hours. The cure was perfect, and the wound healed by the first intention.† Dr. Simpson thus sums up the comparison between the ligature and acupressure:

LIGATURE.	ACUPRESSURE.
1. Requires isolation, and consequently some detachment of the end of the vessel from its vital organic connections.	1. Requires none.
2. Produces direct mechanical injury, bruising and lacerating of the two internal coats of the artery.	2. Produces none.
3. Produces strangulation of the external coat.	3. Produces none.
4. Leads on inevitably to ulceration or molecular destruction of the external coat of the constricted part.	4. Produces none.
5. Causes mortification of the artery at the tied point, and usually below it.	5. Produces none.
6. Produces, consequently, as many sites of ulceration and suppuration, and as many dead decomposing sloughs in each wound as there are arteries ligatured in that wound.	6. Produces none.
7. If organic, as of silk or hemp, it imbibes animal fluids, which speedily decompose and irritate the surrounding living structures.	7. Requires only impervious metallic needles or threads, which are incapable of imbibing animal fluids.
8. Requires to produce the three highest stages of inflammation at each ligatured point, viz., ulceration, suppuration, and mortification.	8. Requires to produce inflammation up to the stage of adhesion only.
9. Is not removable, except by slow ulceration and sloughing of the ligatured vessel, and requires a period of from four or five to twenty days or more for its separation.	9. Is removable in an hour or two, or in one, two, or three days, at the will of the operator.
10. Stops only the artery tied.	10. Stops generally both artery and vein.
11. Stops only one artery.	11. May close two or more smaller arteries by means of a single needle.
12. Generally requires two persons for its application.	12. Requires only one person.
13. Is sometimes followed by secondary hæmorrhage, as an effect of sloughing and ulceration.	13. Is seldom followed by secondary hæmorrhage from ulceration or from sloughing, as it produces none.
14. Sometimes fails altogether in cases of recurring secondary hæmorrhage.	14. Has succeeded under such circumstances where the ligature has failed.
15. Sometimes cannot be applied until the surgeon first exposes the bleeding vessel by dissection with the knife, as in vessels retracted in amputations, in wounds of the wrist, etc.	15. Does not necessarily require the exposure of the vessel, and therefore often prevents the necessity for antecedent dissection by the knife.

* *Vide* Simpson on Acupressure and Hutchinson, p. 87.

† Transactions of the American Institute of Homœopathy, 1868, p. 74.

LIGATURE.	ACUPRESSURE.
16. Prevents, as a foreign body, adhesion of the sides and lips of the wound by first intention, in the course of its track, as long as it remained.	16. Is early withdrawn, and is hence far less opposed to primary union.
17. Is apt, as an irritant body, to disturb and upset the process of primary adhesion in its vicinity.	17. Is early withdrawn, and has no irritant effect.
18. Unavoidably creates within the depths of the wound, pus, sloughs, and putrid materials, which are locked up and applied to the imbibing or absorbing cut surfaces of the wound.	18. Does not create nor apply any dangerous putrefying materials to the fresh absorbing surface of the wound.
19. Places the wound, therefore, in a very dangerous local hygienic condition.	19. Places the wound locally in far healthier hygienic conditions.
20. Is not unfrequently followed by surgical fever, from its leading to the formation and absorption of septic matters from the surface of the wound.	20. Is much less likely to be followed by surgical fever, because it does not lead to the formation of septic matter, and closes the veins as well as the arteries.
21. For these various reasons it makes primary union rarer, healing slower, and hectic or surgical fever more frequent.	21. For these reasons it makes complete primary union more frequent, healing quicker, and hectic or surgical fever less common.

The advantages claimed for acupressure are chiefly the absence of foreign substances in the wound, of inflammation and suppuration, the ease of its application, and the facility of the removal of the pins, and the greater tendency to heal by the first intention. I would strongly recommend this method of arresting hæmorrhage, and feel that it will not disappoint those who employ it.

I have found acupressure also very useful, as a means not only of arresting hæmorrhage, but of *preventing* its occurrence. I do not hesitate to say that the pins applied before operation will prevent hæmorrhage in many instances, and that the pressure temporarily excited on the veins and nerves of the part gives rise to slight if any inconvenience.

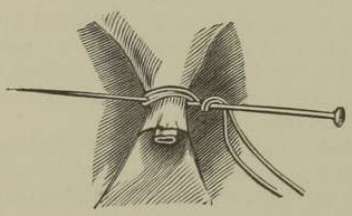
This method, however, has also many opposers, among whom are Dr. G. M. Humphrey, surgeon to the Addenbrook's Hospital, Mr. I. Cooper Forster, whose experiments with "torsion" we have already mentioned, Dr. Lee, Dr. Callender, and others. Out of nine cases, in which Mr. Forster applied acupressure, there were four deaths; one from secondary hæmorrhage and pyæmia, one from the latter cause, one from the former, and one from pleuropneumonia, following gangrene of the stump. Dr. Callender,* assistant surgeon at St. Bartholomew's Hospital, in speaking of Prof. Simpson's success with acupressure says: "He resorted to it in the case of a breast which had been removed in the Hôtel Dieu. Eight needles were employed, and there was no hæmorrhage after their removal, but the edges of the wound became erysipelatous, rigors followed, and the patient died in five days after the operation." Of his own experience he says, "that he amputated a breast of an aged woman for scirrhus; the bleeding was stopped by means of four needles, which were removed thirty-six hours after the operation, but the wound presented an erysipelatous blush, with some dusky discoloration, and beginning rapidly to distend with products of decomposition, had to be speedily opened. Its entire surface was in a state of gangrene, and the woman, sinking with symptoms of blood poison, died six days after the operation." These facts are intro-

* A Report on the Progress of Surgery, by E. A. Clark, M.D., p. 24.

duced here, that the impartial may judge of the merits of this method of arresting hæmorrhage, although it appears to me, that most of the cases cited are scarcely fair samples on which to test the merits of acupressure. Dr. Addinell Hewson,* of the Pennsylvania Hospital, is an advocate for the method.

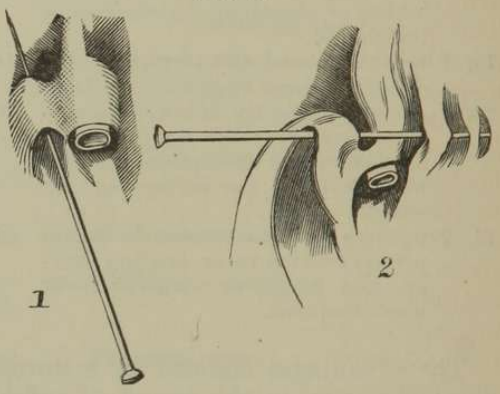
It has lately been proposed by Prof. W. Pirrie, a great advocate of acupressure, that three methods only should be adopted, and Sir James Simpson, before his death, agreed to the proposition, and named the three methods: circumclusion (Fig. 72), torsoclusion (Fig. 73), and retroclusion

Fig. 72.



First method, after Pirrie.
Circumclusion.

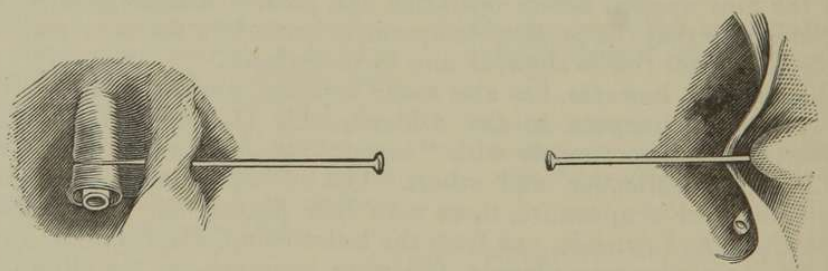
Fig. 73.



Torsoclusion.—Pirrie.
1. Introduction of pin. 2. The torsion.

(Fig. 74). In the first, the pin is passed behind the artery, and an elastic wire looped over the point and twisted around the pin, thus, the pin is behind, the wire in front.

Fig. 74.



Retroclusion.

Torsoclusion has already been described as the "Aberdeen method."

In retroclusion, the pin passes behind the artery, after its point is made to describe the greater part of a semicircle.†

Several modified forms of acupressure have been adopted by surgeons, but it is impossible to mention them in this chapter. A very ingenious one, however, is that devised by R. Clement Lucas, Esq., late house surgeon to Guy's Hospital.

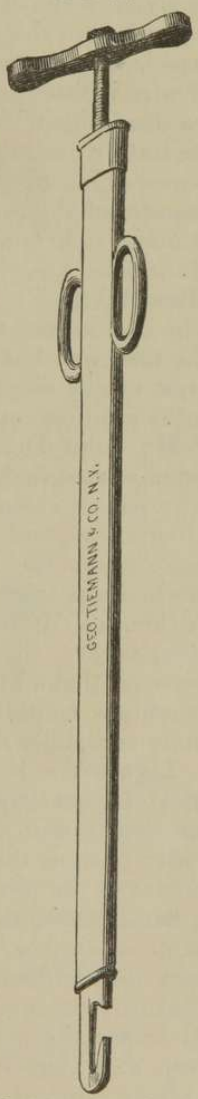
Percutaneous Ligation. — Ledran, in 1720, was the first to mention this method of securing arteries, and in 1856, Prof. Middeldropf, of Breslau, revived it.† It is becoming quite a favorite method of arresting

* *Vide* Pennsylvania Hospital Reports, p. 127.
† Braithwaite, January, 1872, p. 137.
‡ Report on the Progress of Surgery, by Professor E. A. Clark, p. 33.

hæmorrhage, especially from the palmar arch. In recent numbers of the medical periodicals I have observed several cases of its successful application. It consists of casting a ligature around the artery near its division, or in the continuity of the vessel, by means of a curved needle, threaded with silk, or silver or iron wire, which is made to pierce the integument, is carried beneath the vessel, including in its course more or less of the soft parts, and made to emerge, in the integument, on the opposite side, at a point equidistant from its point of entrance. A compress is placed between the extremities of the ligature, which are then tied. The entrance of the needle should be made from one-third to one and a half inches from the artery. The ligature may be allowed to remain from three to seven days. This is easily accomplished and is safe, no danger being apprehended from any particular source. It is indeed a species of acupressure.

Other Methods. — *Speir's Artery Constrictor.*—At a late meeting of the New York State Medical Society, held in Albany, the Merrit H. Cash prize was awarded to S. Fleet Spier, M.D., for his essay on "A New Method of Arresting Surgical Hæmorrhage by the Artery Constrictor," etc. Having myself witnessed the application of this instrument in several cases, with complete success, and having applied it to the common carotid in its continuity, I have great confidence in its power to arrest arterial hæmorrhage. "It consists," says Dr. Speir,* "of a flattened metal tube, six inches (more or less) in length, open at both ends, with a sliding steel tongue running its entire length, and having a vice arrangement at its upper extremity, by which it can be made to protrude from or retract within the tube or sheath. The lower end of the tongue is hook-shaped so as to be adapted to the artery to be constricted. It is so shaped, that having grasped an artery it can be made to contract upon it by means of the vice at the upper end, which forces it within the sheath. The hook of the tongue is so shaped and grooved as to form only a compressing surface, by which means the artery, when acted upon by the force of the vice, is compelled to assume the form of the curve of the tongue, and the artery is constricted in such a way that its internal and middle coats give way, but the external coat is preserved intact. The severed internal and middle coats contract, retract, and curl upon themselves, and are drawn down into the artery in the form of a plug by the continued pressure of the grooved tongue as it passes on into the sheath." (Fig. 75.) The experiments made by Dr. Speir with this remarkable instrument are quite conclusive. For instance, it was applied at two points to the carotid of a horse in the continuity of the vessel; the artery was then divided between the *points d'appui;* no hæmorrhage followed. The horse was then thrown down, but the ends of the vessel remained closed. Experiments were also made upon dead arteries, upon living dogs and sheep, upon the femoral, profunda, and other arteries, with remarkable success. Dr. Speir claims for his instrument its efficiency, its safety, its ease of application, that no internal clot is neces-

FIG. 75.



Speir's Artery Constrictor.

* Medical Record, April 1st, p. 49.

sary on account of the invagination of the middle and inner coats of the vessel; that no foreign substance is left in the wound; that the risk of pyæmia or phlebitis is very much lessened; and that it is applicable to any artery when the external coat is intact. This method of arresting hæmorrhage deserves the strictest attention of the surgeon, and fair and impartial trials should be made with it before it is either too highly lauded or too severely condemned. For my own part I must say, that I am very favorably impressed with what I have seen of its action, and shall take every opportunity to give it a most fair and perfect trial.

Stearn's Artery Clamp.—Dr. C. W. Stearns, of New York, has also introduced to the profession an instrument for arresting hæmorrhage, especially from deepseated arteries. It consists of a slender pair of forceps grooved in the beak; the clamp consists of perfectly annealed iron wire somewhat in the shape of a horseshoe. At the other extremity of the forceps is an arrangement by which the clamps may be removed. The loop of wire is fitted upon the groove in the beak, thrust around the artery, and "a dead pinch" made.* There is no elasticity to the wire, and it "*sets*" immediately over the coat of the vessel. After a number of days the wire is removed, as above mentioned, by a simple contrivance arranged in the handles of the forceps.

Smith's Metallic Snare, and other Methods.—Prof. Nathan R. Smith, of Baltimore, has devised what he terms his "Metallic Snare for Arresting Hæmorrhage."† It consists of an annealed iron wire, and a silver tube. The ends of the wire are slipped around the vessel, and then passed through the tube, so that the flow of blood is instantaneously arrested. The wire must cut its way out before it can be removed, which is rather a drawback to its application.

Mr. John Dix, of Hull, and Mr. Teale, have also tried what they consider a modified form of acupressure.‡ The artery is to be isolated, the wire passed around it, the ends being brought out through the surrounding integument, and fastened over a needle or probe. Dr. Sands, of New York, reported to the Pathological Society, in October, 1867, a case where this method was tried upon the femoral, but the patient died shortly after. Dr. Aitken, of Michigan, has written a paper,§ on what he terms "*Compound Acupressure*," in which two needles are used, the vessel being compressed between them, and Dr. Van Gieson, of Greenpoint, New York, has a very ingenious contrivance for arterial compression by "*a sectional ligature*,"‖ more especially designed for the treatment of aneurism.

Ligature.—Having mentioned the numerous methods for arresting surgical hæmorrhage, which have been proposed at different periods of time, we come last to the ligature, and its consideration has been postponed in order to show that the ideas introduced by many have been entertained by others in the profession in times gone by. For instance, Scarpa employed a flat ligature to arrest hæmorrhage, and placed between the ends of the same a species of compress, because he asserted that it was not necessary that inflammation should be established to obliterate the artery, all that was required being an approximation of the sides of the vessel. Jones, in 1806, affirmed that Scarpa's opinion in this regard was entirely erroneous, and that it was very essential that organizable matter should be thrown around and into the vessel, to permanently restrain the flow of

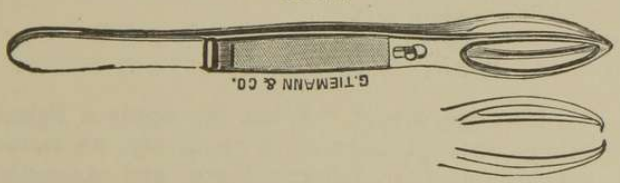
* American Medical Times, November 16th, 1861.
† New York Medical Gazette, vol. i, October 19th, 1867.
‡ Lancet, January 5th, 1867; Medical Gazette, December 30th, 1865.
§ American Journal of Medical Sciences, July, 1865.
‖ Medical and Surgical Reporter, February, 1868.

blood, and that therefore a round ligature must be applied to divide the internal and middle coats of the artery. After a time "the temporary ligature," was introduced, which was much after the manner of what we have said of percutaneous ligation. Then there was introduced "the sudden obliteration," by rupturing the internal and middle coats of the artery at short distances from each other, thus establishing several points where coagulable lymph would be effused, to check the flow of blood immediately, and M. Travers, in his experiments upon horses, found that a ligature kept upon the carotid for the space of six, two, or even one hour, generally effected a permanent obliteration of the vessel. In 1817, he applied a ligature to the brachial artery, and removed it in fifty hours without any hæmorrhage, and M. Robert put a ligature upon the femoral of a sailor, left it twenty-four hours, and then removed it, curing him of an aneurism in twelve days. All these experiments show that the idea of closing arteries by constriction was thought of by these surgeons, and it is a possible fact that a ligature may be removed in a few hours after its application, and that allowing it to remain longer sets up an inflammatory action, which terminates in suppuration, and thus produces the very result the surgeon endeavors to avoid, viz., secondary hæmorrhage. If the thread could be removed at the proper time, viz., when there has been a sufficient effusion of coagulable lymph, would not the hæmorrhage be arrested almost as effectually as by the acupressure pins of Simpson?

Dechamps invented an "artery compressor," in which, a ligature behind the vessel, and a metallic plate in front of it, arrested bleeding, and in Velpeau's Surgery, we have detailed under "a new method," the same proceeding, with a needle threaded with wire, and a loop of the same material, as we have described as Simpson's third method of acupressure.

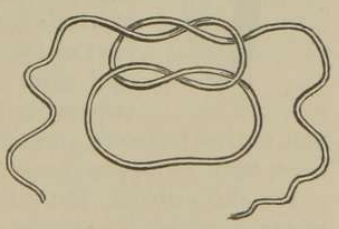
The ligatures most generally in vogue at the present day, are those of silk, silver, iron, and flax, with the animal ligature, which we shall notice below.

Fig. 76.



To ligate a vessel its extremity must be seized with the artery forceps (Fig. 76), drawn forward, and the ligature placed around it, and tied by the surgeon's knot, or the ordinary reef knot (Fig. 77). It is not at all necessary to put much strain upon the ligature; all that is required, is to draw it firmly around the vessel.

Fig. 77.



Sometimes, especially in small vessels, it is better to use the ordinary tenaculum (*vide* Fig. 78), and a portion of structure may be taken up with the hook, although the artery should be as clear as possible from the surrounding substance. When we are ligating an artery in its continuity, after the vessel has been exposed, the ligature must be passed beneath by an aneurism-needle (*vide* Fig. 79), which is a blunt tenaculum, with an eye near its point.

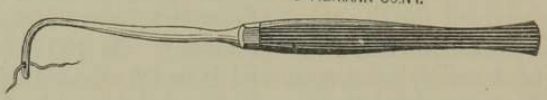
Fig. 80 represents a double tenaculum used at Bellevue Hospital; it is very useful in securing retracted vessels.

If the ligature be of silk, it must be well waxed, and that article known as saddler's silk is preferable. Dr. Philip Syng Physick, known as the Father of American Surgery, had the strongest objection to silken threads, and much preferred those of flax or bobbin,

Fig. 80.

Fig. 78.

Fig. 79.



he being of opinion that the silk was much more likely to slip. It was this distinguished surgeon who introduced the animal ligature,* and this form of thread has been largely used. He used catgut, although the fibrous tissue of the deer is much preferred by some surgeons. It must be dried and twisted into a firm round thread, smooth and regular on the surface, non-elastic, and sufficiently strong to resist the traction made upon it by the surgeon. The ends of this variety of ligature can be cut off short, and the wound closed over them. One objection, however, may be found in the fact that they do not always determine the degree of inflammation necessary to the obliteration of the artery.

Antiseptic Ligature.—Professor Lister, to whom the profession is so largely indebted for the various methods of applying carbolic acid, speaks in terms of unqualified praise of the animal ligature when it is steeped in a solution of carbolic acid. He uses catgut, saturated or steeped in the following preparation:

Carbolic acid,	1 part.
Olive oil,	5 parts.
Water,	3 parts.

He says, also:† "When we apply a ligature of animal tissue antiseptically upon an artery, we virtually surround it with a ring of horny tissue, and strengthen the vessel where we obstruct it." He also highly recommends what are termed antiseptic ligatures, which are composed of silk steeped for a length of time in a saturated watery solution of carbolic acid. He experimented with this ligature upon the carotid of a horse, dressing the wound with a solution of carbolic acid and olive oil—one part of the former to four of the latter. The wound healed by the first intention, and after the death of the animal, which occurred from causes in no way connected with the operation, the vessel was entirely closed, and the ligature was found imbedded in a fibrous structure, with no appearance whatever of any irritation.

On this subject, Dr. Eben Watson reports that, in all the cases of amputation under his charge at the Glasgow Royal Infirmary, he used ligatures of Mr. Lister's prepared catgut. "I cut them," he says, "short off at the knot, and closed the stump over them. Never in any one case have I been able to detect the ligatures in the discharge; I mean the early sero-san-

* *Vide* Memoir of the Life of Philip Syng Physick, by Randolph, p. 84.

† London Lancet, April, 1869.

guineous discharge which flows for a few hours after amputation. I may say that none of the stumps suppurated, except very slightly and superficially. I ought also to state that there was no instance of secondary hæmorrhage in all these cases of amputation. I have, therefore, great pleasure in recording my sense of the value of this reintroduction of organic ligatures into surgery, for which we are indebted to Mr. Lister."

At present there is a good deal of discussion among surgeons regarding the use of the antiseptic ligature, but the testimony of most of them is in its favor. I have used it in many ways, and upon the largest vessels; have applied it to the pedicles of ovarian tumors, and in amputations, resections, removal of all kinds of tumors, and have not had a single accident of any kind occur. I am strongly in favor of this method of securing arteries.

There are a few rules which it is well to observe in the application of the ligature:

1. Draw the vessel forward sufficiently to give a good space for the thread to be passed around the artery.

2. If operating for aneurism, do not place the thread on a trunk near a good-sized branch.

3. Be particular not to draw upon the thread too tightly, or the external coat may be endangered.

4. Be certain that the knot does not slip, the reef-knot being the best for this purpose.

5. Do not draw upon the ligature to see if it is separating, but allow it to come away of itself, the period of time differing in different subjects.

According to reliable statistics, it is found that the longer period of time it takes for a ligature to separate, the less danger is there of hæmorrhage.

The application of wire, either of silver, iron, or platinum, was strongly advocated by both Physick and Dieffenbach, although the systematic introduction of silver sutures into the domain of surgery is claimed by Dr. Sims, of New York. The varied methods of using wire we have already noted in the different apparatuses employed for arresting hæmorrhage—as in Simpson's acupressure, Stearn's clamp, Nathan R. Smith's snare, Van Geison's sectional ligature, and others.

Esmarch's Method of Artificial Ischæmia.—If we include in the meaning of the word "operation," as applied to surgery, the entire process of cutting, ligation of vessels, and dressing of wounds, it cannot be said that Esmarch's method is "bloodless."* During the cutting and tying there is no blood, at least a very little, lost; but after the upper band has been removed, there is often a plentiful supply.

Several surgeons have claimed priority for this method, more especially Silvestri, of Vicenza; Esmarch, therefore, being called the "promoter," and not the discoverer of the bloodless method. Stromeyer, Langenbeck, and many others, have also had similar ideas. This, however, is of little practical importance; the truth is that Esmarch utilized the bandage, and brought it before the profession, as Morton did the ether anæsthesia, and to them the profession at large are indebted.

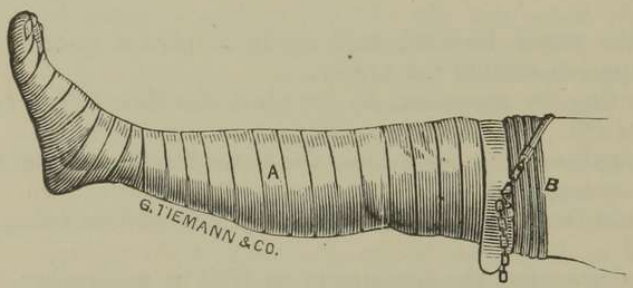
As is well known, the apparatus consists of two rubber bands, one broader than the other, which may be applied in the following manner:

Elevate the limb, and if there be suppurating sinuses, place over them small wads of prepared oakum, and over these pads put on a roller bandage, beginning at the toes or the fingers, as the case may be. Then take the broad bandage, which was formerly made of elastic webbing, but now of pure gum, and beginning at the distal extremity of the limb, put it on tightly, being sure to keep the bandage on the stretch while the turns are

* *Vide* article by R. F. Weir, M.D., Med. Rec., vol. ix, p. 60.

being made. A moderate amount of force is all that is required, and the bandage should be slowly put on to give the blood time to recede. After a point sufficiently far above the site of operation has been reached, this bandage may be turned two or three times around the limb, and secured by passing the extremity under the last turn. This being done two or three times, does away with the upper band. However, if the upper band (which is generally india-rubber tubing, either round or flattened) is to be applied, it is put on over the upper turns of the first, and secured by the hooks and chain at the end (*vide* cut, Fig. 81); or what is better, especially if the band is round, an instrument figured in the cut, which I have found very valuable in many instances, simply because all slipping is prevented.

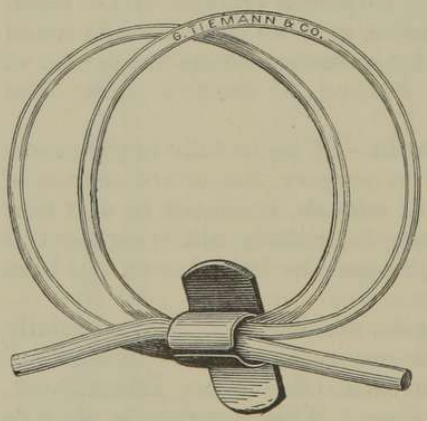
FIG. 81.



Esmarch's Bandage applied, fastened with hooks.

The original instrument is described in Esmarch's prize essay on military surgery, and was introduced to my notice by Mr. Tiemann. The tubing being drawn out, of course becomes thinner, and is then pressed into the slit on the top of the cylinder (Fig. 82), both ends are to be put in, and then the pressure withdrawn. The tubing coming back to its original size, of course becomes firmly fixed.*

FIG. 82.



Clamp for Esmarch's Bandage.

After this, beginning at the distal end of the extremity, or in other words at the point where the bandage was started, the india-rubber and the cotton roller are removed, showing the limb, blanched, pale, with modified sensibility, and at a temperature lower than normal.

If we place the ear upon the chest when the bandage is being applied, there is at once an increase in the action of the heart, which has been supposed to arise from the diminution of the normal difference between the pressure of arterial and venous blood; that is, the blood being pressed up first into the veins produced increased action of the right heart.

Now, the same result, viz., increase in the heart's action, takes place when the bandage is being removed. This, no doubt, is occasioned by the reverse condition, viz., the removal of arterial pressure, and the overaction of the left heart.

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* According to Dr. Robert Weir (Medical Record, February 10th, 1878), who gives a woodcut of this instrument, Langenbeck has also devised a clamp, somewhat like an ovarian clamp, for similar purposes.

Dr. Gamgee has made several experiments regarding the effects of this pressure on the general circulation.* He finds that when the blood is driven from one leg, there was a short increase in the frequency of the heart-beats; when both legs were subjected to the pressure the same results followed. He found also, that the blood first left the veins, then the arteries, and finally the lymphatics, and was of opinion, that compressing the limbs would send no more blood into the veins than into the arteries, and as the lymph would have a tendency to swell, the venous pressure, the venous blood, and the lymph would be greater in amount than the blood sent into the arteries; but the controlling influence of the valves of the veins would prevent the general increase of pressure.

There can be no doubt of the great efficacy of this bandage in restraining hæmorrhage, and *par excellence* is it of service in all operations for bone disease. None but those who have cut down through the very vascular structures which often cover diseased bone, or those who have been groping about in sinuses or through incisions to find dead bone, know the comfort of *seeing* what is being done. The general voice of the entire profession is in favor of this method, although several objections have been found to it. I exsected a shoulder and had paralysis of the arm follow from pressure; motion returned in three months. I removed a large sequestrum from the femur, and had a similar result, patient recovering in one month. These two untoward circumstances are all that I have personally been cognizant of, and I have used the bandage a great many times.

Dr. Weir, in the *Medical Record*,† publishes a case of paralysis of the hand and forearm, caused by the bandage, and refers to three cases reported by Langenbeck‡ where similar results followed. A similar accident is mentioned as occurring in the Roosevelt hospital; and Dr. Stephen Smith§ records a case of fatal cellulitis following the use of the bandage.

A point here is worthy of note, that the elastic webbing is unsafe. When new, it acts well, but after it has been used a few times, the cotton becomes weak, the elastic becomes brittle, and it breaks readily. This has happened to me twice. The plain rubber is best, and has the great advantage of being kept clean. The bloodstains on the webbing and other soiling, which are unavoidable, soon render it unfit for use. Capillary hæmorrhage, said to arise from paralysis of the coats of the vessels from pressure, has also been remarked. The little bleeding that I have observed, generally is soon arrested by exposing the surface to air or the application of ice.

Dr. Kupper,‖ of Elberfeld, points out, as a serious disadvantage of Esmarch's bandage, the free and prolonged bleeding from many small arterial branches, thus compelling the surgeon to tie two or three times the number of vessels that he need have tied, had not Esmarch's apparatus been used. This hæmorrhage he attributes to a paralysis of the arterial muscular tissue produced by the pressure of the bandage, and proposes as a remedy, which he has successfully used, the application of a strong induced current, one pole being placed in direct contact with the divided vessels and nerves, the other at some distance from the seat of operation.

On the immediate capillary hæmorrhage produced through Esmarch's method, Dr. Nicaire¶ states that he is able to immediately control it,

* American Journal of Medical Sciences, January, 1877, p. 230. † May, 1874.

‡ Medical Times and Gazette, January, 1874.

§ Medical Record, 1874, p. 592; Archives Clinical Surgery, vol. ii, p. 75.

‖ Monthly Abstract of Medical Science, Feb. 1877; London Medical Record, Dec. 15th, 1876; Deutsche Medicinische Wochenschrift, No. 43, 1876.

¶ Monthly Abstract of Medical Science, March, 1877; Gaz. Médicale de Paris, No. 34, 1876.

after the removal of Esmarch's bandage after operations, by applying over the surface of the wound a large sponge dipped in a solution of carbolic acid (one to fifty), and firmly retaining it in that position until the tegumentary redness disappears. Eight or ten minutes will generally suffice.

Dr. Henry B. Sands* has given a résumé of 143 cases, in which this bandage has been employed in New York city. In all these cases it was successful, the cases of sloughing and secondary hæmorrhage and paralysis being attributed to the bandage being improperly applied. He suggests also that this bandage would be of great service in cases of compound fractures attended with free hæmorrhage, and that it should always be in the hands of the ambulance surgeon, as life might be saved thereby.

It has been suggested also that this bandage be applied in cases of extreme prostration from hæmorrhage.† It is estimated that if all the extremities were bandaged an addition of twenty-five per cent. of circulating medium could be added to the body.

With reference to throwing back into the circulation impure or decomposing products, a good deal of diversity of opinion exists. I have never seen any bad results, and Mr. Holmes considers the idea as wholly theoretical. Yet there are cases upon record that certainly justify prudence on the part of the surgeon in this regard. It may be proper here to give a few remarks of Prof. Esmarch on his experience in the bandage, and how it should be applied for amputations at the hip and shoulder:‡

"I have never observed any disadvantages. Especially paralysis was never witnessed as a consequence of the constriction. Where paralysis followed, it might have been caused by drawing too tight the india-rubber tube. I always perform bandaging and constriction myself, as assistants are constantly trying to overdo the thing. Nor is every kind of india-rubber tubing available. The heavy stiff tubes of gray vulcanized rubber are not to be used, and I prefer the brown, not vulcanized, tubes, or those prepared from red rubber or rubber bandages. It does not need such powerful constriction to prevent perfectly the afflux of arterial blood. Especially the first turn need not to be made too tight, as every consequent round enhances the action considerably.

"Several surgeons observed gangrene of the flaps after amputations, and ascribed it to the artificial bloodlessness (Guy's Hospital); and as I never observed it, I suppose that gangrene had more to do with the formation of the flaps or with the after-treatment.

"In some cases local anæsthesia is produced in consequence of the local ischæmia and the compression of the nerves, and thus the operation is less painful. We therefore always apply this procedure in small operations on the fingers and toes, in incisions of panaritia, in the extraction of ingrowing toe-nails, exarticulation of phalanges, etc. Stokes (*Dublin Medical Press*, 1874, p. 248) relates a case where he extirpated an epithelioma on the back of the head during ischæmia, where the patient did not feel the operation. Anæsthesia usually sets in after the ischæmia has lasted several minutes, but we can produce it very quickly with Richardson's etherization, as the congelation occurs far more rapidly when the arteries fail to carry more heat with the blood. Even a rain douche of ice-water deprives quickly an ischæmic finger of all sensibility.

"Artificial bloodlessness renders easy, a thorough examination of morbid parts, especially bones and joints. I examined many a joint and bone before the operation, as if it were on the dissecting-table, and only then de-

* Medical Record, vol. x, p. 79. † See Medical Record, vol. ix, 132.
‡ Wien Med. Wochenschrift., 1874.

cided whether resection or amputation was indicated. I could recognize the tuberculous nodules in the degenerated synovial membranes, and in the scrofulous osseous granulations on the living body, and repeatedly cut pieces out of tumors and examined them microscopically, in order to decide on the mode of operation.

"In order to master, in operations of the shoulder-joint, the afflux of blood through the axillary artery, we have only to carry a rubber tube under the axilla, draw it tight above the shoulder, and keep it in that tension by a strong hand, which supports itself on the clavicula, or we hold both ends tight by a clamp, for instance like that one used for the fixation of the pedicle in ovariotomy. I formerly made a spica humeri with the tube, and carried it over the chest and back to the other axilla, but this is not advisable, as the tension of the tube prevents respiration too much.

"In high amputation of the thigh, the tube is carried strongly around the leg once or twice close to the groin, the ends are crossed above the inguinal region, carried around the posterior surface of the pelvis, and finally closed with a chain on the anterior surface of the lower abdominal region. Or a closely-rolled linen bandage may be used as a compressor to the arteria iliaca externa, close above the ligamentum Pouparti, and firmly pressed upon the artery by several spica-rounds of a strong rubber bandage. Only in exarticulations and resections these bandages would obstruct the field of operation; hence we prefer in such cases to compress the aorta in the umbilical region, using a compress or roller, made of a bandage eight meters (27 feet) long and 6 centimeters (a little over two inches) broad. We roll it firmly around the centre of a piece of wood, a foot long, and of the thickness of a thumb, by which the compress is held in its place. This compress is applied closely under the navel, and pressed firmly against the vertebræ by rounds of a rubber bandage about two inches broad, carried five or six times around the body. Thus the arterial afflux through the aorta can be perfectly arrested, if we only use the precaution of emptying the bowels by purgatives and injections. In other cases it may be more to the point, to use a pedunculated compress, which can be pressed more deeply into the abdomen. The handle (made of steel) of my compressor (palotte) is perforated with a large hole, through which the rubber bandage can be easily carried. Should any surgeon be afraid of this abdominal constriction he can carry the rubber bandage around the operating table (Brani), or fasten it to a fenestrated splint put horizontally under the back of the patient."

Dr. Gibb* relates a most successful amputation of the hip-joint where this method was practiced. Dr. Erskine Mason, of New York, reports similar cases.†

The use of this bandage in the treatment and the production of anæsthesia are noted elsewhere.

Dittel's Elastic Ligature.—This method of performing operations should be mentioned in this place, because they are for the most part bloodless. The singular way in which Prof. Dittel was led to investigate the subject is well known,‡ and the results which have been obtained are various. I have removed a fibroid of the knee with the elastic thread, but some time was required for the sloughing, and the odor was very disagreeable. In fistula in ano, of the very worst varieties, I have had most excellent success,

* Lancet, January 31st, 1874.

† Archives Clinical Surgery, vol. i, p. 74, 1876–77.

‡ London Medical Record, December 3d, 1873, or Braithwaite, July, 1874, p. 108.

and have used it in twenty-two cases. Of these, three did not do well—I mean did not granulate rapidly, and in one instance four months elapsed before the wound closed; this, however, is often seen in the knife operations for this disease.

The method I use is as follows: The ligatures are of different sizes, made of solid india-rubber, and they *must be freshly made*, or otherwise they become very brittle, as I have found to my cost. If a fistula is to be cut through, I pass the director into the fistula, and having threaded a probe with the ligature (which must be done by putting it on the stretch, to make its calibre smaller, and then drawing it through the eye of the probe), I introduce it (the probe or needle) upon the groove of the director, and draw it through the internal opening of the fistula. The director is then removed. Having then at hand a small, round, leaden circlet, about the diameter of a small bullet, I pass the two free ends of the ligature into the circle of lead, which I then grasp in the jaws of a forceps held in my right hand; taking in my left hand the two free extremities of the ligature I put them thoroughly on the stretch, and slide the ring of lead close up to the integument; then by forcibly closing the jaws of the forceps, I clamp the ligature. This is a more secure method than tying, because in some instances I have found the elasticity of the india-rubber untie the knot. If the leaden rings can not be obtained, a perforated shot will answer, or the ligature ends may be secured by tying them with a piece of silk.

Prof. Dittel has gone so far as to apply the "elastic thread" not only to the removal of tumors, but also for the ligation of large arteries. Sir Henry Thompson has since introduced this method into England, and has removed a cysto-sarcomatous tumor of the right breast by it. The tumor was pendulous, the mamma shrivelled, and the growth the size of an orange, with fungoid ulcer on its summit. The proceeding was as follows: A large nævus needle was threaded with a tubular elastic ligature, and then passed through the base of the tumor. The elastic was then divided, the needle laid aside, and the ligatures tied on either side of the tumor. There was not much pain, and the operation was successful.

Elastic threads are also useful for other purposes in the practice of surgery. I have lately employed it in the withdrawal of ligatures which are tardy in separating. It not unfrequently happens in a wound healing with rapidity, as after removal of the breast, that granulation tissue appears to overlap the ligature, and thus causes it to remain for a length of time after the vessel to which it has been applied is obliterated. Again, in wounds where tendinous or nervous filaments may have been accidentally included within the loop, the thread is long in separating; in such cases the elastic is a success.

It may be applied as follows: Take one of the thin sections of india-rubber tubing, which are now in general use, and sold by the box at the stationers. Tie the free end of the "dilatory" ligature to one side of this section, slip the upper end over a piece of bougie, and fix the latter, by means of adhesive straps, at a point sufficiently far from the wound to put the elastic ring on the stretch. The constant traction thus effected removes the ligature in a short time, without pain.

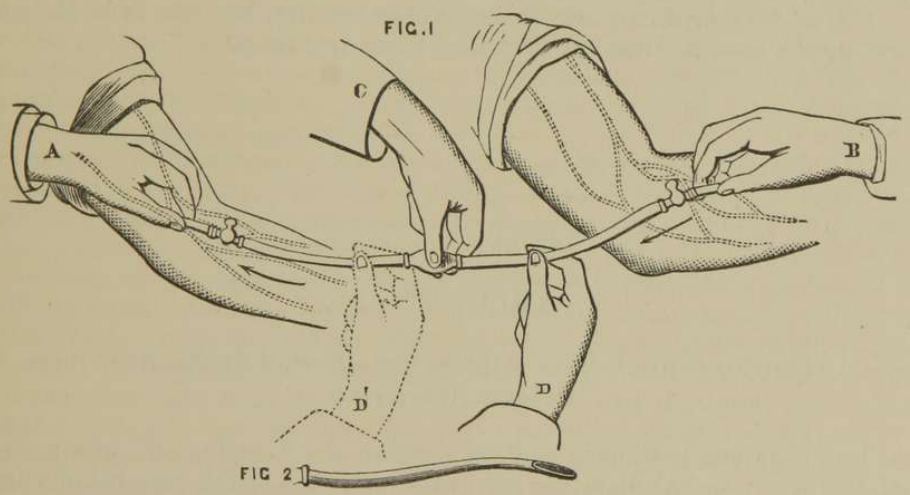
Transfusion of Blood.—This is an old operation, and was regarded by many as a most successful method of restoring life when almost extinct. It has been practiced from time to time, gaining more or less favor, then appearing to be lost sight of, again to be revived. The operation is especially adapted to those anæmic conditions caused by constant and prolonged losses of blood, exhausting suppuration, varied zymotic processes taking place in the system from the absorption of poisons of any kind

(septicæmia, pyæmia, ichorrhæmia). In diseases in which there is a destruction of fibrin or degeneration of tissues, transfusion also may be practiced. The operation consists in abstracting blood from a healthy individual, defibrinating the fluid, and injecting the same into the veins of the patient.

There have been many instruments devised for this purpose, but a very good method is that which I have employed with complete success, and is as follows:*

Having placed a band around the arm, just above the elbow, in order to obstruct venous return, a fold of skin is then pinched up over the median basilic, or median cephalic vein, and with a fine sharp-pointed bistoury the integument is divided from within outward, the back of the knife being placed toward the vein; the skin is then dissected carefully from the vessel, which should be exposed for about an inch and a half. Two ligatures should now be placed under the vein, one at the upper, and the other at the lower angle of the wound, but *not tied.* The next step is to see that the syringe works well, and has a clean nozzle. A silver syringe, holding an ounce and a half, is best. The nozzle may have an aperture about one-eighth of an inch in diameter, must be movable, and fitted with a stop-cock. Have then ready a basin of hot water, and a bowl, which must be placed in the hot water in the basin; bring the arm of the healthy person, from whom the blood is to be abstracted, over the bowl, and perform ordinary

FIG. 8?.



Aveling's apparatus for immediate or direct transfusion. The more muscular arm on the right of the figure is the bloodgiver's; the one on the left, the patient's. The course of the veins is dotted down, as if the skin and the hands lying in front of them were transparent. B represents the hand of an assistant holding the efferent tube and the lips of the small wound together, and A shows the afferent tube secured in the same manner. The bevelled end of the afferent tube, which is made so in order that it may the more easily go into the collapsed vein of the patient, is shown in Fig. 2. The nozzles having been secured in the two veins, the india-rubber portion of the apparatus, filled with water, and kept so by turning the cocks at each end of it, is now fitted into the tubes. Then the cocks are turned and the operation commenced by compressing the india-rubber tube on the efferent side, D, and squeezing the bulb, C. This forces 3ij of water into the patient's vein. Next shift the hand D to D', and compress the tube on the afferent side. The bulb will expand slowly and draw blood in from the bloodgiver's vein, which is then to be passed into the patient's; and by repeating this manœuvre as often as required any amount of blood may be injected, so long as the tube is not clogged by coagula.—See *Obstetric. Soc.'s Trans.*, vol. vi, May 4th, 1874.

venesection. After having allowed several ounces to pass into the bowl, the blood must be thoroughly "whipped" with an egg-beater, to defibrinate

* The first operation made by the author was on November 15th, 1869. *Vide* Western Homœopathic Observer, vol. vii, page 152.

it. While this latter act is being performed by an assistant, the operator will tie in a *single* knot the ligatures, which are already beneath the vein, and raising up the vein, make a longitudinal incision therein, only of sufficient length to admit the end of the nozzle of the syringe, fitted with the stop-cock. Before entering the nozzle it must be warmed, and be filled even with its end with the defibrinated blood, in order that no air be introduced into the vein. The nozzle now must be carefully placed in the incision made in the vein, and its end insinuated gradually along until it passes the upper ligature, which then must be tied over it. The syringe then must be filled with blood from the basin, its end fitted into the nozzle fixed in the vein, the stop-cock turned, and the piston gradually pressed home. This part of the operation must be conducted with care, and the piston pressed slowly down, to allow the blood gradually to enter the venous system; if the blood be forced in too rapidly, the patient will experience a sense of faintness, and the heart, in endeavoring to accommodate itself to the additional quantity of fluid introduced into the circulation, will begin to act irregularly, and serious consequences may ensue. The operation of transfusion is not a very difficult one, but requires careful and nice dissection and much time. The instruments should all be very clean, and several assistants are required to perform the varied steps of the process. The wound, after the nozzle of the syringe is withdrawn, should be immediately closed with the thumb, the ligatures removed from the vein, and a stitch or two taken in the integument.

For mediate or direct transfusion, the engraving, Fig. 83, from Holmes, will give a most accurate description of the operation.

CHAPTER XIV.

AMPUTATIONS.

DEFINITION—QUESTION OF AMPUTATION—INSTRUMENTS—METHODS—MORTALITY AFTER.

THE term amputation in surgery signifies the "cutting off" of a portion of the body; and though it is generally restricted to the removal of either the upper or lower extremities, or portions of them, it is employed also to designate other operations, thus: "amputation of the breast," "of the penis," "of the tongue," and other parts. By a *disarticulation* is to be understood the removal of a limb at its articular surfaces, which operation is also designated "an amputation *in contiguity*." When amputations are made through the shafts of bones, "*in continuity*" is the expression used. When two of the extremities are removed at the same time, "*double amputation*" is made; and when it becomes necessary to remove a limb a second time, it is said to be "*re-amputated*."

The question as to *when* an amputation is to be performed must remain an open one for the consideration of the surgeon in each particular case. In some instances, it would appear that the only opportunity the patient may have for the preservation of life, rests in *immediate amputation*. In severe accidents, where there is crushing, and the hæmorrhage cannot be arrested, such a course is the only one to be pursued. In other cases,

twenty-four or forty-eight hours may be allowed, to enable the patient to recover from the shock, but not to postpone the operation till the occurrence of that inflammation, which the surgeon apprehends from the extent of the injury, will surely follow. This amputation, the "*intermediate*," is of such danger, that it should, if possible, not be practiced at all, or only in extreme cases. The *secondary* amputations are often followed by success, especially when performed after the full process of suppuration has set in.

For further particulars the reader may consult the chapters on "Gangrene," and "Wounds."

So long as the destructive effects of injuries and diseases of the extremities cannot, in every instance, be prevented by the employment of other means, a necessity for amputation must continue to exist, and the sacrificing of a branch, as it were, thereby making use of the only rational means for maintaining the integrity of the trunk, frequently becomes indispensably proper. It is, however, the imperative duty of the surgeon never to have recourse to this serious, and sometimes fatal operation, without a perfectly clear and fully substantiated conviction of its necessity; it should always be regarded as the last expedient to which the surgeon should resort, justifiable only when farther attempt to save the injured or diseased part, would be fraught with danger to the life of the patient. With this conviction, it is evident that a *precise* knowledge of such cases as demand amputation, as also those in which it should be dispensed with, and the exact periods at which its performance is most conducive to the welfare of the patient, are considerations demanding the most marked attention.

The various conditions demanding a performance of this operation are as follows: Compound fractures, extensive contused and lacerated wounds, gangrene and mortification, gunshot injuries, diseases of the joints, exostosis and necrosis, hæmorrhage, etc.

Compound Fractures.—The necessity for amputation in injuries, of this nature, does not depend entirely upon the seriousness of the accident, but also, in a measure, upon other circumstances: as the condition of the patient, his mode of life, the facilities for ventilation, etc. If, however, a compound fracture occur in which the soft parts have been extensively involved, and the bones have been so seriously injured that perfect quietude and constant attention are required to afford any chance of recovery, amputation should, in the generality of instances, be performed. On the contrary, when the soft parts have been less extensively injured, and the bones have been broken in such a manner that they can readily be readjusted, and maintained in their proper position; or if but one bone be involved in the injury, amputation is deemed both unnecessary and inhuman; accompanying circumstances, however, are to be considered in concluding for or against amputation.*

In compound fractures, as Mr. Pott† pointed out, there are three distinct periods when it is deemed proper to perform amputation.

The first of these is immediately, or soon as practicable after the receipt

* The circumstances adverse to a favorable prognosis, in cases of compound fracture, are thus detailed by Professor Miller: "Comminution of the bone, or fracture at several points; extension of the fracture into an important articulation; an open state of the joints; much bruising and laceration of the soft parts, rendering extensive sloughing inevitable, with a risk of gangrene involving the whole limb, and with a certainty of extensive and tedious suppuration following separation of the sloughs; laceration of a large artery, as evinced either by hæmorrhage or by rapid formation of a large bloody swelling; old age; and enfeeblement of the frame by disease, by privation, by intemperate habits," etc —Principles of Surgery p. 717.

† Remarks on the Necessity, etc., of Amputation in Certain Cases.—Surgical Works, vol. iii, London, 1808.

of the injury. The second, when the bones continue for a great length of time without manifesting any disposition to unite; and the discharge from the wound has continued so long and is so excessive that the patient's strength fails, together with general symptoms foreboding dissolution supervene. And third, when mortification has so completely involved the soft parts of the inferior portion of the limb, quite down to the bone, that upon separation of the diseased portions, the bone or bones are left bare in the interspace. The first and second of these are matters requiring serious consideration. The last demands scarcely any.

A disposition to mortification is often evinced when fracture occurs in the middle of a bone; but much more frequently when any of the larger joints are involved; and in many of the above-mentioned instances a decision favorable or adverse to amputation is really a determination for or against the patient's life.

If, after judicious treatment, throughout every stage, by the united efforts of medicine and surgery, the sore, instead of granulating kindly and contracting daily, does not diminish in size, has a tawny, spongy surface, discharges a large quantity of thin sanies; the fractured ends of the bones, instead of tending to exfoliate or unite, remain as perfectly loose and ununited as at first, whilst the patient is deprived of sleep and appetite, becomes greatly weakened, hectic fever, with a quick, small, hard pulse, and profuse sweat, contributing at the same time to bring him to the brink of the grave, notwithstanding all efforts to the contrary; under these circumstances, if amputation be not performed, what else can rescue the patient from destruction?

Extensive Contused and Lacerated Wounds.—These form the second class of general cases requiring amputation; though, when not in conjunction with fracture, they seldom render the operation necessary. But, if a limb is extensively lacerated and contused, and its principal bloodvessels are injured to so great an extent, that a continuance of the circulation cannot reasonably be expected, an immediate removal of the affected limb is recommended, even though no bone is involved in the injury; and as all efforts of the surgeon to preserve a limb so seriously injured generally prove unavailing, and such wounds are more disposed to assume a gangrenous condition than any other, the sooner the operation is performed the more favorable will be the prognosis.

In the preceding varieties of injuries, although amputation may not always be necessary in the first instance, yet it may become so subsequently. Sometimes mortification rapidly takes place, either in consequence of the extreme violence of the injury, or, consecutively, from greatly excited action going on in parts whose powers of resistance have been much impaired; or profuse suppuration, with its consequences and accompanying conditions, ensues, which the system is unable to resist; in these instances amputation should be resorted to.

Gangrene and Mortification.—Gangrene is another cause, which, when advanced in a certain degree, renders amputation indispensable. At page 85 I have given some remarks on this subject, which are further elucidated by Mr. Fergusson.

It sometimes happens that gangrene appears so extensive in either the upper or lower extremities, or that mortification has committed such ravages, as to preclude the hope of saving the limb, or even the life of the patient, if such a source of irritation is allowed to remain. The surgeon will seldom be performing his duty, if, in this instance, he leaves the case to the efforts of nature so entirely as in partial slough; for although experience proves that a portion of the hand, foot, forearm, or leg, may drop off, or that either member may be separated at its articulation with the trunk, by the

process of molecular death, it is equally certain that the work is done in a tedious, painful, and unsatisfactory manner—months sometimes elapsing ere the parts are entirely separated; and when, at length, this has been accomplished, months more may pass ere cicatrization takes place. There cannot be a doubt that the surgeon is justified in many of these cases, in performing amputation; and the only difficulty is to determine the proper period for such a procedure.*

Practitioners have entertained very opposite opinions concerning the time when the operation should be performed. Some declare, that whenever the disorder presents itself, especially if it be the result of external violence, amputation should immediately be performed, as soon as the disease has began to form, and while it is in the spreading state. Mr. Pott says, that he has often seen the experiment of amputating a limb, in which gangrene had begun to show itself, tried, but never saw success follow, and it invariably hastened the patient's death.†

The operation, however, may be postponed too long, and it is sometimes advisable to amputate to prevent gangrene; thus, when the limb has been much injured by mechanical or chemical means—in the case of severe compound fracture or burn, for example—and it is apparent that mortification must ensue, involving the whole thickness of the limb, of an acute character, tending to spread, and from the first accompanied with the most formidable constitutional symptoms—amputation is to be performed above the injured point, as soon as the primary shock has passed away, and the system rallied so far as to afford sufficient tolerance of the operation.

In injuries of this nature, when gangrene has set in, delay, with the object of waiting for the spontaneous line of separation, will be in vain. The gangrene spreads upwards and upwards, with a diffused and streaky margin; typhoid symptoms grow more and more intense; the trunk is reached, rendering operative interference hopeless; or, long ere this, the system has sunk and the patient perished. The only hope of escape is by early amputation; it is a slender chance, but it is the only one, and to it the sufferer is entitled.‡

When gangrene is an attendant upon one particular cause, as cold, the line of disjunction is to be awaited, and as soon as it has become evident that this is fairly formed, the surgeon should resort to amputation, which may be performed either at the point of separation of the dead from the living textures, or at a distance above, according as the circumstances of the case may demand.§

Diseases of the Joints.—Scrofulous diseases of the joints, involving the bones, with morbid alteration of the structure of the adjacent ligaments and cartilages, so extensive that resection cannot be resorted to, is another condition in which amputation may become an absolute necessity. An unpleasant circumstance attending these affections is that the majority of subjects are young children, incapable of determining for themselves. All efforts at cure sometimes prove unavailing, and operation is the only resort.

It is a highly important fact that amputation in these instances is attended with a greater degree of success, when the disease has considerably advanced, than when undertaken at an earlier period. This is particularly fortunate, as it affords ample opportunity for the administration of those medicines that have been mentioned, and thus, perhaps, all necessity for the operation may be obviated.

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* Fergusson's System of Practical Surgery, p. 108.

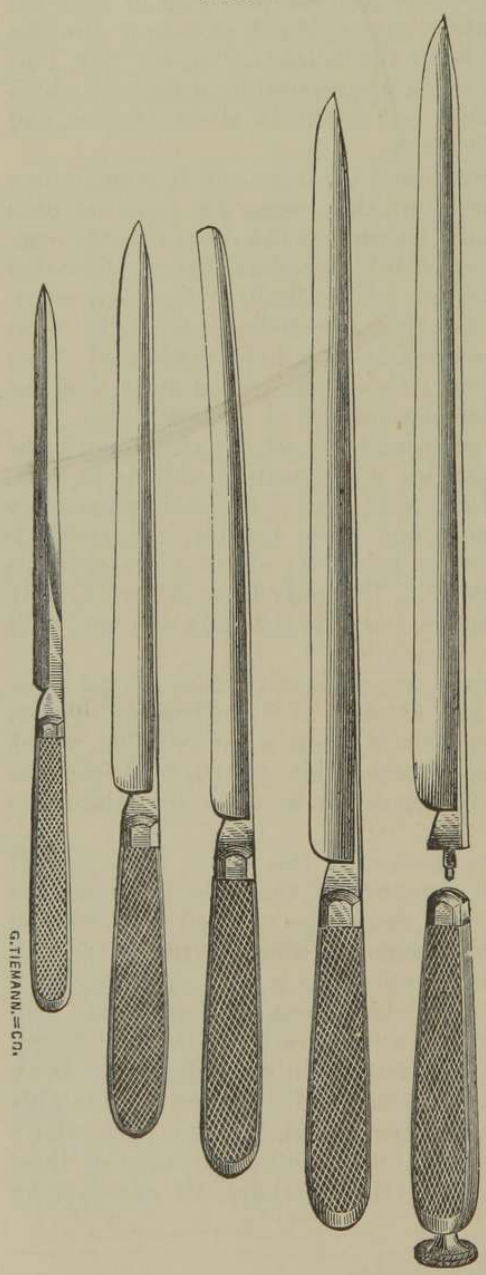
† Surgical Works, vol. iii.

‡ Miller's Principles of Surgery, p. 289. Lectures by Tyrrell, vol. i, p. 132.

§ See Question of Amputation in Gunshot Wounds.

Bony tumors, under certain circumstances, sometimes occasion a necessity for amputation; but when they merely produce deformity, without pain or inconvenience from the pressure which they exert on neighboring parts, the performance of an operation for their removal is not advisable, for, as Boyer has observed,* in a great number of instances, the local affection is much less to be dreaded than the means used for its removal. When, however, the tumor becomes hurtful to the health, and its situation permits of a ready removal, this may be done without an entire division of the part on which it is situated; but frequently its base is so extensive and deeply seated as to preclude the possibility of a removal by this method. If, in this case, it is situated on the extremities, and has become insupportable on account of its weight, amputation should be performed in preference to any operation having in view the saving of the limb.

Fig. 84.



Another affection of the osseous system which sometimes demands the performance of amputation, is *necrosis*—or the death of the whole, or a very considerable portion of the bones of the extremities.

The performance of this operation in these cases, however, is the exception, not the rule. It may happen that in acute necrosis in the young subject, violent inflammatory action is followed by severe irritative fever, which latter is quickly succeeded by a formidable hectic that must evidently be relieved at all hazards by a removal of its cause; or, in more chronic cases, a like summary procedure may be required at a more distant date, after weeks and even months have elapsed, when the separation of the sequestrum is far advanced, but not yet complete, after the system has long resisted the exhausting burden of irritation and discharge, but when, nevertheless, it has evidently become unequal to a prolongation of the contest. On the one hand the surgeon must beware of sacrificing life in endeavoring to save a limb, and, on the other, must be equally careful not to sacrifice a limb in endeavoring to succor life not yet actually endangered; and, in connection with this subject, it is important to remem-

* Treatise on Surgical Diseases, vol. ii.

ber that necrosis is not always so extensive as outward appearances would lead one to suppose.

The *instruments* used, besides those to be mentioned in the chapter on minor surgery, are chiefly knives, of different lengths, sharp-pointed, rounded, or double-edged (catlings). Fig. 84 shows the different forms of amputating knives.

Saws.—Fig. 85 shows an amputating saw; Fig. 86, metacarpal saw; Fig. 87, Hey's saw. Bone forceps, to remove any projections of bone spiculæ which remain after the use of the saw, is shown by Fig. 88.

Retractors, or split cloths to draw back the soft tissues after they are divided with the knife, are made either with a single or double split, as follows: Take a piece of muslin, a yard in length and ten inches in width; fold it upon itself to mark its middle point, then slit one-half lengthwise into two parts, or into three. The former is used in amputations where but a single bone is to be divided, the latter where two bones are to be sawn through, the middle tail of the retractor passing between the bones.

Methods.—There are two principal methods of amputation, one being denominated the *circular*, in which the integument is divided with a circular cut *around* the limb, and then dissected and turned up like the cuff of a coat-sleeve, after which the muscular and other tissues are severed to the bone, the knife being held nearly at right angles with the shaft. The other, the "*flap amputation*," consists in passing the knife through the integument above and below the bone, and cutting outwards, forming sufficient covering to make a good stump. It is not always easy to determine exactly which method is best adapted to the case, especially in severe accidents, when much tissue is lacerated. Often a combination

Fig. 85.

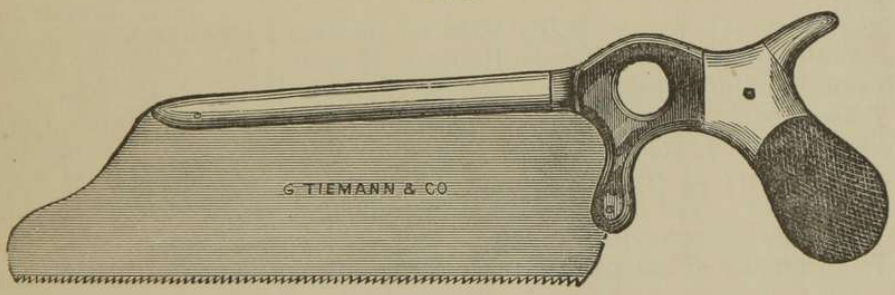
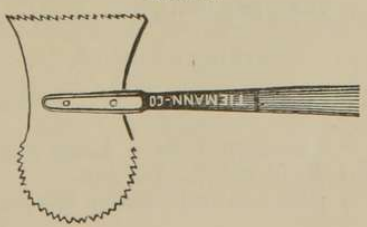


Fig. 86.

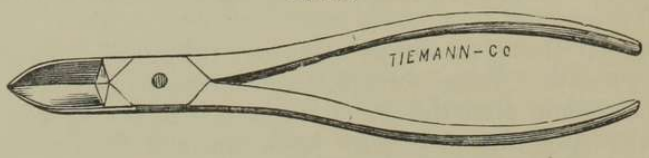
of both the circular and flap operation is necessary. In civil practice the circular variety is generally performed at the middle of the forearm and leg, while the flap is resorted to in the arm and thigh. In the lower portion of the thigh, however, I have known the circular give as satisfactory, if not better results than the flap, because in the former there is not nearly the tendency to retraction of the flaps, which will often ensue when the ends of so many powerful muscles are divided.

Fig. 87.



Amputation by a Long and a Short Rectangular Flap.—(Teale's Amputation.)—The advantages claimed by Mr. Teale for this method of amputation are: Avoidance of tension, a better stump for the accommodation of

FIG. 88.



an artificial limb, a soft and pliable covering for the ends of the bone, the non-disturbance of the plastic process, and a favorable outlet for the discharge.

In this operation the long rectangular flap is perfectly quadrangular in shape, and is of sufficient length to fall readily over the end of the bone, and is made of parts devoid of important bloodvessels and nerves; the short one contains these structures, and is made about one-fourth the length of the other. Mr. Teale, in his work,* gives some statistics of his method, which are very favorable. The directions for the operation will be found in the special amputations to which it is applicable.

Carden's or the Mixed Method.—This amputation, as its name implies, is partially circular and partially flap. It was devised by Young, and revived and systematized by Carden. The flaps are formed from the integument and fat, are oval and dissected up; the circular portion of this operation is then made by dividing the muscular tissue down to the bone. This amputation is a valuable one, and it is very applicable to forearm, leg, and knee.

Mortality.—Of the mortality after amputation I have arranged a few statistics from the reports of the Bellevue Hospital, New York, the Pennsylvania Hospital, Philadelphia, and St Thomas's Hospital, London.

Table of Amputations in Bellevue Hospital, from 1864 to March, 1869, compiled by F. J. Metcalfe, M.D., Acting Junior Assistant. The number of cases is said to represent but about one-sixth or one-eighth of those operated upon. The classification is that adopted by the Surgeon-General of the United States Army.†

Total number of amputations and reamputations fifty-five.

	Cases.	Cured.	Died.
Amputations,	52	26	26
Reamputations,	3	1	2
Immediate or primary,	37	20	17
Intermediate,	3		3
Secondary,	12	5	7
	52	25	27
Reamputations,	3	1	2
Making a total of		28	27

* Amputation by a Long and Short Rectangular Flap, by Thomas P. Teale, F.L.S., F.R.C.S., London.

† Bellevue and Charity Hospital Reports, 1870.

Ether was used in 43 cases, 22 being cured, and 21 died; chloroform in 9 cases, of which 5 were cured, and 4 died; nitrous oxide, 1 died; bichl. methylene, 1 died; no anæsthetic, 1 cured.

AMPUTATIONS IN CONTINUITY.

	Cases.	Cured.	Died.
Forearm,	4	3	1
Arm,	11	5	6
Leg,	19	10	9
Thigh,	7	3	4

AMPUTATIONS IN CONTIGUITY.

	Cases.	Cured.	Died.
Wrist,	1	1	0
Elbow,	1	1	0
Knee,	8	3	5
Hip,	1	0	1

REAMPUTATIONS.

	Cases.	Cured.	Died.
Leg,	1	1	0
Thigh,	2	1	1

This latter is a mortality of nearly 50 per cent.

AMPUTATIONS FROM JANUARY, 1872, TO JUNE, 1873.

Number of amputations, excluding those of the fingers and toes,		58
Recoveries,		30
Deaths,		28
Causes of death,	4 from shock.	
	2 " secondary hæmorrhage.	
	1 " tetanus.	
	11 " pyæmia.	
	1 " hospital gangrene.	
	8 " exhaustion.	
	1 " osteo myelitis.	

Hand, 5 amputations; 2 recovered, 3 died. Forearm, 4 amputations; 3 recovered, 1 died. Arm, including shoulder-joint, 11 amputations; 6 recovered, 5 died. Thigh, 3 amputations; 1 recovered, 2 died. Leg, including knee-joint, 28 amputations; 15 recovered, 13 died. Foot, 8 amputations; 4 recovered, 4 died. 9 amputations for disease, 49 for injury. In one case both forearms were amputated. In two cases both legs. In two cases both feet.

Amputations at the Pennsylvania Hospital.—Dr. George W. Norris, in the *Pennsylvania Hospital Reports* for 1868,* gives an elaborate and very carefully prepared table of the amputations performed in that charity, from January, 1850, to January, 1860. There were 228 amputations made, and of these 173 were cured, and 55 died. They were as follows:

Thigh, 43; leg, 70; foot, 8; shoulder-joint, 6; arm, 38; forearm, 52; wrist-joint, 8; elbow-joint, 1; hand, 2.

	Cases.	Cured.	Died.
Primary (within 24 hours),	146	119	27
Secondary (within 24 hours),	42	27	15

* Loc. cit., p. 164.

Forty were for the cure of chronic diseases, of which 27 were successful, and 13 died.

Twenty-five were done at the joints, with two deaths and 23 cures.

	Cases.	Cured.	Died.
Upper extremity,	107	94	13
Lower extremity,	121	85	36

Dr. Norris then makes a summary of the whole number of amputations performed within a period of thirty years, as follows:

There were 428 amputations performed upon 424 patients during the thirty years from 1830 until 1860. 321 of these were cured, and 103 died.

	Cases.	Died.
Primary,	261	54
Secondary,	83	31
For chronic diseases,	84	18
Upper extremity,	194	21
Lower extremity,	234	74
Joints,	46	6

	Cases.	Cured.	Died.
Age—under 20 years,	118	118	10
between 20 and 30 years,	133	101	32
" 30 " 40 "	87	60	27
" 40 " 50 "	62	40	22
" 50 " upwards,	21	16	5

Amputations at St. Thomas's Hospital, from 1862–69:

LIMB AMPUTATIONS.	1862.		1863.		1864.		1865.		1866.		1867.		1868.		1869.	
	Cases.	Died.	Cases.	Died.	Cases.	Died.	Cases.	Died.	Cases.	Died.	Cases.	Died.	Cases.	Died.	Cases.	Died.
Thigh	10	5	7	3	7	4	6	2	7	2	5	2	1	.....	1	.....
Leg	1	.....	4	.....	5	4	4	3	3	1	2	1	1	.....	6	1
Arm	2	.....	.....	.....	.....	.....	3	2	2	1	3	1	1	.....	.....	.....
Forearm	5	.....	3	1	.....	.....	.....	.....	4	1	.....	.....	1	.....	4	.....

During the eight years that the hospital has been at Surrey Gardens, Music Hall, there have been 111 amputations, with a mortality of 36; for the first four years, 57 cases and 24 deaths; for the last four years, 54 cases and 12 deaths, or about half the mortality of the preceding period. The use of carbolic acid, and care being taken to exclude all sufferers from foul suppurating sores, may to a certain extent account for the improvement.

Frederick Churchill, M.D., has analyzed these cases, and separated those which were primary, secondary, and for disease. The mortality will be found to vary considerably. For 1861–63, and 1866–69, the amputations were tabulated under these three headings, and during these seven years there were 41 primary amputations with 10 deaths; 16 secondary amputations and 8 deaths; and 39 amputations for disease with 7 deaths, *i. e.*,

Primary amputations,	1	death	in	4.1
Secondary "	1	"	"	2.
For disease, "	1	"	"	5.5

The late Sir James Y. Simpson furnished statistics showing that out of 2089 limb amputations, "in large and metropolitan British hospitals," there were 855 deaths, or a mortality of 1 in 2.4, and out of 2098 limb amputations "in patients operated on in single or isolated rooms in British private country practice," there was a mortality of 226, or 1 death in 9.2 cases. That such a result does not tally with the experience of the surgeons at St. Thomas's Hospital is evident from the table above quoted. Mr. Callender has recently published statistics of limb amputations at St. Bartholomew's Hospital, by which it appears that the mortality is greatly influenced by the class of cases under treatment. That, whereas the average death-rate, after all amputations, at St. Bartholomew's Hospital, is 1 in 3.6, the mortality of country cases in the same hospital, under similar circumstances, is 1 in 5.8, showing that other things must be taken into consideration in comparing the death-rate of hospitals with that in private country practice.

The statistical tables of St. George's Hospital, London, for the year 1867–1868, which were at the hospital, and examined, give the following results: 54 amputations, 27 recoveries; 32 for disease; 11 deaths from pyæmia; most of them of the thigh, leg, and foot.

CHAPTER XV.

SPECIAL AMPUTATIONS.

1. AMPUTATION AT THE HIP-JOINT.

According to the report of the Surgeon-General of the U. S. Army, Kerr, of Northampton, in 1774, was the first surgeon who performed this formidable operation, although, in 1748, Lacroix, of Orleans, completed the exarticulation of the limb at the coxo-femoral joint, which sphacelus, from ergotism, had already almost removed. Since then, the operation has been performed many times. In civil surgery, out of forty-seven cases, there were sixteen recoveries, and in America, in twenty-four examples of amputation, fifteen successful results are published. The report reads thus: "Of one hundred and eleven amputations at the hip-joint in civil practice here recorded forty-six succeeded, and sixty-five ended fatally."

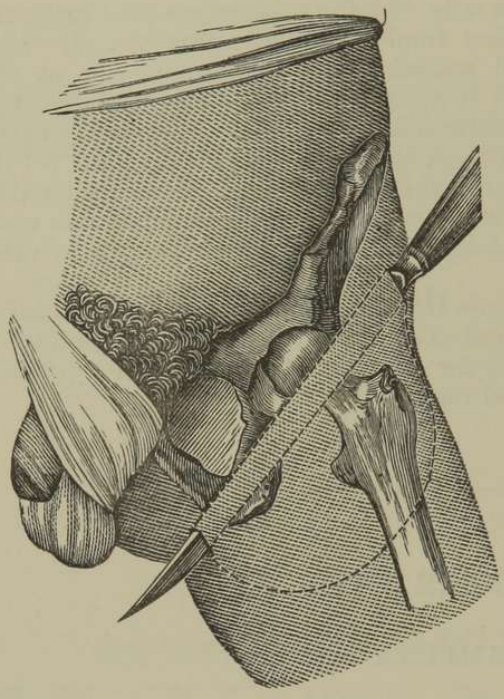
During the late civil war there were fifty-three amputations performed at the hip, thirty-four of which were done in the service of the United States, and nineteen in the Confederate armies.

These cases, which have been tabulated and arranged with great care by Dr. Otis, are classified into primary, of which there were nineteen; the intermediate numbered eighteen, the secondary nine, and the reamputations seven. In the first the mortality was very large, being 94.73 per cent. The case of Dr. Shippen is said to be the only perfectly authentic one of 72 on record, of recovery after primary amputation at the hip; of the second classification all terminated fatally; of the third there were two recoveries; in the fourth, four were successful, making the mortality rate 42.85.

In performing the operation six assistants are necessary; to one must be given the charge of the anæsthetic, a second hands the required instruments, a third and the most experienced takes charge of the limb, making the

requisite movements at the proper time; a fourth controls the bleeding, with the aortic compressor, and with his finger compresses the femoral artery as it passes over the brim of the pelvis; a fifth attends to the sponging, and the sixth takes care of the sound limb, carrying it away from the body, at the same time holding the scrotum aside with a towel, as represented in Fig. 89.

Fig. 89.



Anatomy of the Hip-joint, with position of the knife in forming anterior flap.

The operation which appears the most simple, is that of Mr. Bryant,* who says:

"The best flaps appear to be the external and internal. The patient being brought to the edge of the table, with the tuberosities of the ischium in view, Lister's valuable abdominal tourniquet is to be adjusted, and, when the patient is under chloroform and everything is prepared, screwed up. The surgeon should then make the external skin flap by means of a semicircular incision, starting from the tuberosity of the ischium, downwards and outwards, one hand's breadth below the great trochanter, and then upwards and forwards to the centre of the groin on the outer side of the femoral vessels, and this should then be reflected upwards above the trochanter so as to expose it and allow the joint to be opened and disarticulation to be completed, the limb being forcibly adducted by an assistant to facilitate this step. In doing this no vessels of any importance are opened while the most difficult part of the operation is completed.

"The inner flap now remains to be made, and this is readily done by transfixing the thigh on the inner side, inserting the knife (twelve inches long) in the anterior wound, passing it backwards close to the inner side of the neck of the femur, and bringing it out near the tuberosity of the ischium where the external incision was commenced, and then cutting out through the soft parts, including all the adductors, etc. In doing this all the pelvic muscles are separated at one clean sweep from the thigh-bone, and a few touches of the knife completes the amputation. Should there be much fear of loss of blood the common femoral artery may be ligatured in the wound before the second flap is made, or it may be divided and twisted. The vessels are then to be secured in the way the surgeon proposes, and the parts brought together, the two flaps usually forming an excellent covering to the pelvic cup; the wound is a vertical one, and therefore good for drainage and a good scar results."

In the *lateral flap operation* a line one inch in length should be drawn downwards from the anterior superior spinous process of the ilium; from the lower extremity of this line a second, half an inch in length, should be

* Practice of Surgery, p. 956.

drawn inward to mark the head of the bone. The surgeon then, standing on the outer side of the limb, enters a straight single-edged amputating knife, with a blade twelve to fourteen inches in length, on the inner end of the last line, and passes it perpendicularly down to the head of the femur. The handle of the instrument must now be slightly inclined towards the pubis, and the blade pushed on the outer side of the *cervix femoris*. The assistant in charge of the limb now raises the femur and slightly abducts it. The surgeon grasps with his left hand the soft parts, and brings the point out a little below the tuberosity of the ischium, about an inch from the anus. The great trochanter then must be cleared as the blade of the knife cuts out the flap from seven to eight inches long.

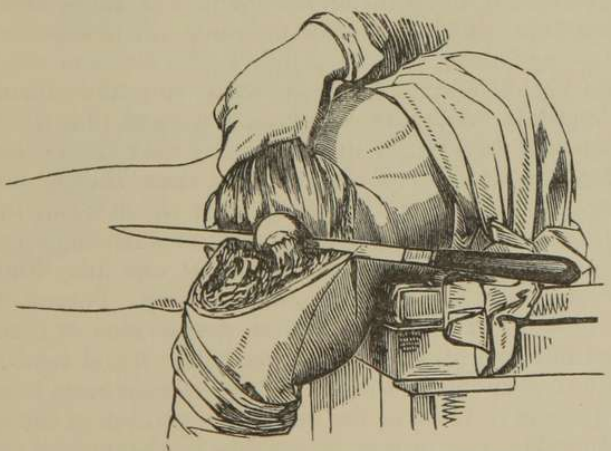
The assistant now puts the capsular ligament upon the stretch, which must be divided with the point of the knife, and the head of the bone is then disarticulated. Passing the knife then close to the head of the femur, and behind it, an inner flap six inches in length is cut out. As the instrument passes close to the bone, the thumb of the assistant should follow it, and immediately compress the artery.

The *anterior and posterior flap operation* is performed as follows:

The patient having been prepared as before, and the requisite number of assistants at hand, the surgeon flexes the leg slightly, rotates the thigh inward, and introduces the point of the knife just above and posterior to the trochanter major, and carries the blade across the front of the thigh-bone, entering, if possible, the capsule of the joint in its passage, and bringing out the point in the perineal fold, in front of the tuberosity of the ischium. (Fig. 89.) The knife then is made to cut out the anterior flap, six to eight inches in length. The vessels may now, if it is expedient, be secured, and without loss of time the operator proceeds to the formation of the posterior flap as follows:

The femur must be drawn downwards, in order to stretch the orbicular ligament of the articulation, which must be divided with the point of the knife, inserted behind the head of the bone (Fig. 90), and guided by the bone cuts out the posterior flap somewhat shorter than the anterior.

Fig. 90.



Amputation at Hip-joint—making the posterior flap.

Dr. Hamilton makes a somewhat different line of incision, to prevent the point of the knife entering the belly or wounding the iliac artery and vein,* and directs that the point be introduced "one inch in front of the trochanter major, the edge of the knife being directed downwards in the line of the

* The Principles and Practice of Surgery, p. 378.

axis of the limb. From this point the knife is made to penetrate transversely, and with a slight inclination backward, so as to strike the head of the femur in its upper half, and near the upper margin of the acetabulum." The handle of the knife must then be carried toward the head of the patient and the point, cutting the capsule, must be thrust in front of the neck, and made to emerge below the *tuber ischii*. As the flap is cut out, assistants follow with their fingers in order to arrest the bleeding. The thigh must then be forcibly abducted and carried backward, and the articulation opened (provided it has not been done by the manœuvre just mentioned) with a large scalpel, and the round ligament cut. The centre of the blade is then passed above the head of the bone, and the knife brought out at the gluteal fold.

The operation of Dr. Van Buren* consists in making the anterior flap by transfixion; the flap is drawn upward by the assistant, and "the surgeon, partially kneeling, carries the knife beneath the thigh to its inner side, as in a circular amputation, and placing its heel in the integuments at the internal angle of the wound, sweeps it firmly across through the tissues on the back part of the thigh, cutting with a slightly sawing motion down to the bone, and joining the two extremities of the first incision. The long knife is then immediately relinquished, and with a large straight scalpel, the femur being forcibly abducted, the capsule of the joint is laid open as near as possible to the acetabulum, the round ligament divided with the rotator muscles inserted into the trochanter, and the fossa at its base, the assistant regulating the limb, so as to keep these parts successively on the stretch, and the operation is completed."

Amputation of the Thigh.—This operation is generally performed at the lower, middle, or upper third of the thigh, and may be either the circular, the flap, or the rectangular flap of Mr. Teale. The selection of the method of forming the flaps is a subject for serious consideration. The ordinary flap amputation is the most readily performed, and immediately after the operation the stump appears well covered with muscular tissue; but experience has taught me, and I believe others also, that this muscular covering, especially at the lower third of the thigh, gradually and steadily retracts, and that after a year or more nothing remains but a covering of skin; and even this, in many instances, likewise retracts, exposing the end of the bone, which may finally become necrosed. The arguments in behalf of the flap amputation are, that its rapidity of execution renders it much less painful and prolonged; that soft parts can be readily furnished to form an excellent muscular covering for the stump, and that the different textures, being allowed to remain in connection without dissection, there is much more likelihood of rapid union. But these reasons in its favor are counterbalanced by others, among which are: shock from the rapidity of the operation, that there is a greater extent of surface exposed, and that the contraction of muscles, even after the most carefully conducted operation, often leaves what is called the conical stump. Therefore, the numerous powerful muscles of the thigh, which are divided at their extremities in the ordinary flap operation, at the lower third, would tend to the formation of the undesirable conical stump. These reasons seem to be sufficiently forcible to determine in favor of the circular operation at the lower third of the thigh. Moreover, the nearer we operate to the neck of the femur, the more likelihood will there be of a good stump by the flap procedure.

When the lower or middle third is selected, a tourniquet must be applied high up in Scarpa's space, but when the operation has to be performed at the upper third, an assistant must compress the artery where it passes over

* Trans. New York Academy of Medicine, vol. i.

the brim of the pelvis. This is readily done by grasping the greater trochanter with the fingers, and pressing the thumb firmly upon the artery, upon this the thumb of the other hand may be firmly pressed and the artery kept under complete control. Esmarch's bandage may also be used.

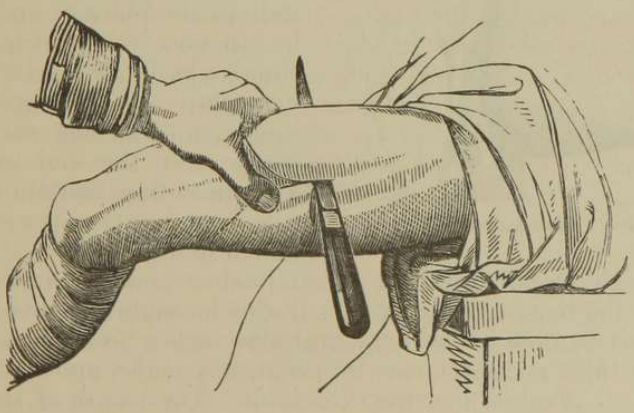
Sometimes the condition of the limb will admit of no choice, and the place for operating will then be where flaps can most readily be secured. A double circular operation may be practiced at any part of the thigh with success. The military surgeon frequently finds the tissues entirely destroyed upon one side; under such circumstances the covering of the bone must be obtained from the opposite side.

Lateral Flaps.—The thigh may be removed by a lateral flap operation in the following manner: The exterior or outer flap is first made by entering the point of the knife at the middle of the thigh, about three inches above the patella, carrying it close around the bone and bringing it out through the centre of the ham, and cutting downwards and outwards. The point of the knife is again entered at the upper angle of the incision, and carried around the bone on its inner side, and made to cut out a flap of similar dimensions to that first formed.

By keeping the knife close to the bone the danger of splitting or pricking the femoral artery is avoided. The bone then must be well cleared and sawn off at about four and a half inches above its articular surface. At the middle and upper third of the thigh, if flaps are determined upon, the anterior and posterior flap are preferable.

Anterior and Posterior Flap.—In the majority of cases the anterior is the flap first made. The surgeon, standing on the outside of the limb, raises with his left hand all the structures from the bone, and enters the point of the knife about the site where the division of the bone is contemplated (Fig. 91). This flap must be cut out and held back by an assistant,

Fig. 91.



or, as is preferred by some surgeons, the flap may be made from without inwards. The soft parts are then drawn down on the posterior side, and the knife entered at about the same point at which it passed to make the anterior flap. Then the knife is allowed to cut itself out, making the posterior flap. The two-tailed retractor is then placed around the bone, which is evenly divided with the saw. The spiculæ of bone are then carefully removed with the bone pliers, the vessels secured either by acupressure or ligature, and the wound closed with silver sutures and the collodion and gauze dressing. If, however, the patient is much emaciated it is very

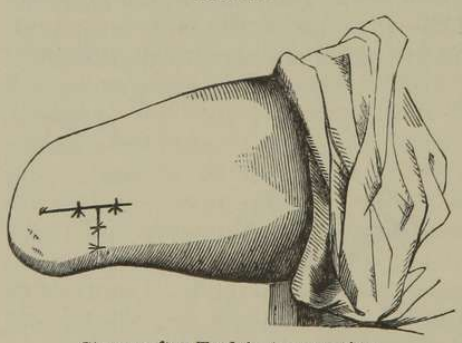
difficult to procure a good cushion from the anterior flap; in such instances it is better to follow another course and make the posterior flap first by transfixion, and the other by cutting from without inwards. When the muscular tissue is much mutilated an excellent stump can be made by a long square anterior flap, and then with one stroke of the knife cutting through the soft parts on the back of the thigh, obliquely from below upward; thus the anterior flap, when laid down, will form the cushion at the end of the stump.

Dr. Child, of Mobile, Alabama, suggests a single oblique flap operation, the division of the soft parts being made by cutting from without inward, on the anterior face of the femur, and after having transfixed the tissues on the posterior surface of the bone, cutting downward and backward.

The Rectangular Flap of Mr. Teale.—In his work on amputation, by a long and short rectangular flap, Mr. Teale speaks of the imperfections of many stumps after the usual methods of amputation, and remarks that in the stumps formed after the circular and transfixion methods, it is extremely rare to find a soft movable mass of tissue over the ends of the bone; secondly, that with very few exceptions, the cicatrix is adherent to the ends of the bone, and that, in addition to this, such stumps are generally unable to bear pressure on their extremity. To remedy all this he proposes the operation named above, and which will be described below. It has been regarded with a good deal of favor by some distinguished surgeons, and makes a most excellent stump for the application of a patent limb.

In this operation the long flap folds over the ends (Fig. 92) of the bone, and is, in the majority of instances, devoid of important bloodvessels and nerves, while both are found in the short flap. Mr. Teale says: "The size of the long flap is determined by the circumference of the limb at the place of amputation, its length and its breadth being each equal to half its circumference. The long flap is, therefore, a perfect square, and is long enough to fall easily over the end of the bone. The short flap, containing the chief vessels and nerves, is in length, one-fourth of the other."

Fig. 92.



Stump after Teale's Amputation.

In the thigh amputation, the circumference must be measured at the point where the bone is to be sawn; if this be eighteen inches, then the long flap must be nine inches long, and nine inches broad, and it is recommended that these measurements be accurately made, and the lines traced with ink, or other substance, upon the limb. The length of the short flap will be one-quarter of nine, or two and one-quarter inches in length and breadth.

In the commencement of the operation, the lateral incisions are to be made *through the integument* only. The transverse incision joining these two cuts is to be made down to the femur. The flap must then be made, by cutting the fleshy structures from below upwards, close to the bone.

The posterior flap must be made with one sweep of the knife down to the bone; the soft structures being afterward carefully separated from the periosteum. The vessels may then be secured, and the flaps united.

Amputation through the Condyles.—This method of amputation is now receiving much attention from surgeons, and has many points of interest.

When the femur is sawn through at the condyles, the medullary canal—the largest in the body—is not opened; there is not a compact structure of bone to be removed, and the soft or cancellated structure opened, is more rapidly reproduced than the hard ivory texture of the shaft. Prof. Fergusson has recorded several interesting cases of this successful amputation. Mr. Jessup, of Leeds, and Mr. Wm. Stokes, also speak highly of it. In this operation there are two flaps—an anterior oval, and a posterior, one-third the length of the former; the patella is allowed to remain, and is brought into apposition with the cut surface of the femur.

The special advantages of this amputation are described as being the following: 1. The resulting stump is more useful, as pressure can be borne on its extremity. 2. There is a diminished liability to tubular sequestra. 3. The operation is less hazardous to the patient than amputation of the thigh, its situation being more distant from the trunk. 4. It is accompanied by less shock. 5. There is less tendency to the occurrence of suppuration. 6. In the posterior surface of the anterior flap, which is lined with a natural synovial membrane, no vessels or nerves are included. 7. The preserved portion of the patella acts as an osseous curtain, covering the cut surface of the femur, and has not yet been known to slough away. 8. The attachment of the tendon of the quadriceps extensor muscle to the patella, gives an increased power of extending the thigh in progression, and renders the formation of a conical stump impossible. 9. The vessels are divided at right angles to their continuity, and not obliquely, as in all flap operations, thus being less exposed to inflammatory action from the extent of the wounds.

Circular Method.—In performing this operation a medium-sized or rather a small amputating knife, with a sharp point, should be used. The surgeon stands on the outside of the limb, which having been raised, he places his arm underneath the thigh and touches the heel of the knife at a point on the anterior aspect of the limb, and with a single sweep around the limb, divides the integument and superficial fascia; the parts are then to be drawn backward by an assistant, or a free dissection of the skin from the muscles may be necessary for two or three inches; then with the arm and hand placed in the same position as that when the first incision was made, he divides all the parts down to the bone; a retractor or the hands of an expert assistant may be used to retract and hold the flap, and the bone sawn through. The arteries are secured and the flaps adjusted according to general principles.

Amputation at the Knee-joint.—The advantages claimed for this somewhat popular operation, are thus stated by Dr. Markoe, of New York, who has arrived at his conclusions from careful observation of fourteen cases:

"1. The grand advantage of this operation is the useful character of the stump that results, strongly contrasting with the uselessness of the stump left after amputation of the thigh, and enabling the patient to wear an artificial limb with comfort and advantage. 2. The seat of operation is farther removed from the trunk, and the constitutional shock is probably, therefore, less. 3. The section at the knee-joint is less extensive than that of amputation higher up, no parts being divided but the integuments, and, although a large surface is exposed, a great portion of it, the femoral cartilage, is a healthy, not a wounded surface. 4. No muscular interspaces are exposed by the knife, excepting those of the heads of the gastrocnemius, which are of small extent and depth. There is, therefore, less chance of any inflammation that may attack the stump travelling upwards, and forming burrowing abscesses, amidst the soft areolar tissue filling such interspaces. The section of tendons that takes place in this operation, is rarely followed

by any other than reparative inflammation. 5. Fewer ligatures are required, and the orifices of the divided arteries lie close together in the centre of the popliteal space. By following Blandin's procedure, therefore, of making a small opening through the integument, of which alone the posterior flap consists, we are enabled to bring all the threads out of the stump by a short and direct route, in the most depending position, and thus the space between the flaps and condyles, where we are most anxious to procure adhesive inflammation, is not fretted into suppuration by the presence of the ligatures crossing it, to be brought out between the lips of the wound. 6. The muscular attachments concerned in the movements of the limb are not divided. Those which are severed are merely for the movements of the leg, all the muscles proper to the thigh being left untouched. The result is, that the patient is able to move the stump with astonishing freedom and facility. 7. Another advantage directly resulting from this is, that there is no muscular retraction after the healing of the wound. Dr. S. Smith has made a comparison of this operation, and that of amputation at the thigh, and finds that in European practice, of 28 cases of amputation at the knee, 12 died and 16 recovered. There have been 18 American cases, with 13 recoveries, and 5 deaths; making in all 46 cases, and 17 deaths. The proportion of deaths in European practice has been, therefore, 43, in America 28, and together 37 per cent. Of 987 cases of amputation at the thigh, collected by Phillips, 435 died; and in 68 American cases, collected by Dr. Markoe, there were 29 deaths, being an average mortality of about 43½ per cent., and making a difference of 6½ per cent. in favor of amputation at the knee-joint."

In amputation at the knee it must be remembered that it requires more integument to cover the broad surface of the condyles than to protect merely the shaft of the femur, and, therefore, it is well to make the anterior flap long, and the posterior flap short (Fig. 93 shows lines of incision), although circumstances may demand that the posterior be the long, and the anterior the short flap. If we desire to make the former operation it must be done as follows: the leg should be bent at a right angle with the thigh, the surgeon takes a large and strong scalpel, and, beginning at the posterior surface of either condyle, makes a semicircular incision, extending about an inch and a half, or two inches, below the tubercle of the tibia; the flap is then raised, and the joint opened; the ligaments of the articulation are divided, and the knife kept close to the posterior surface of the tibia, is made to cut itself out with a short flap (Fig. 94). When it is necessary to make the posterior flap the long one, the leg is placed in a horizontal rather than the flexed position; the incision is made as before, with the difference that instead of extending some distance below the tubercle of the tibia, it passes just above that prominence; the ligamentum patellæ is then cut through, and the leg flexed as for resection of this joint, then an amputating knife is thrust behind the bones, and a flap of six to eight inches is cut away from the posterior surface of the limb.

Carden's, or the Mixed Amputation at the Knee.—"The operation consists in reflecting a rounded or semi-oval flap of skin and fat from the front of the joint (knee), dividing everything else straight down to the bone, and sawing the bone slightly above the plane of the muscles, thus forming a flat-faced stump with a bonnet of integument to fall over it. The operation is simple. The operator, standing on the *right* side of the limb, seizes it between his left forefinger and thumb at the spot selected for the base of the flap, and enters the point of the knife close to his finger, bringing it round through skin and fat below the patella to the spot pressed by his thumb, then, turning the edge downwards at a right angle with the line of

the limb, he passes it through to the spot where it first entered, cutting outwards through everything behind the bone. The flap is then reflected, and the remainder of the soft parts divided straight down to the bone; the muscles are then slightly cleared upwards, and the saw is applied. Or the

FIG. 93.

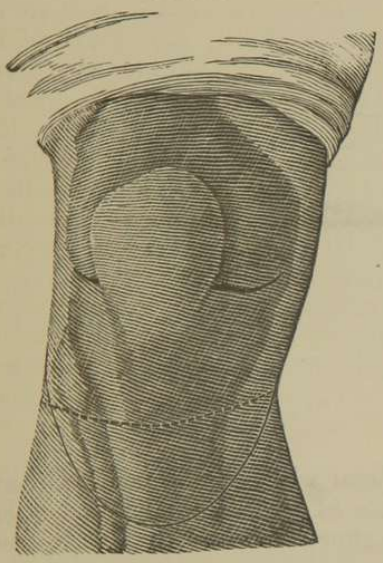
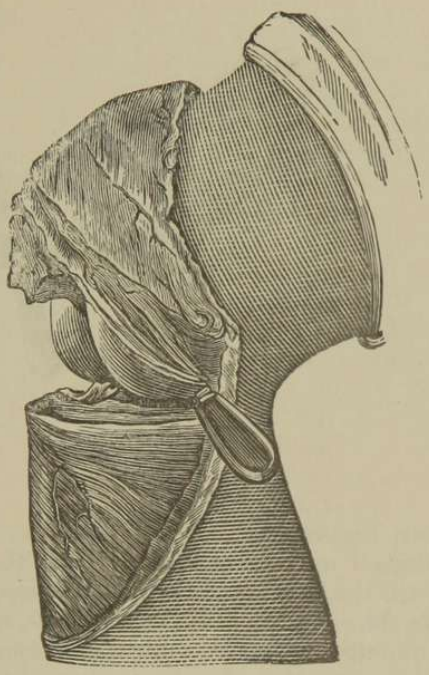


FIG. 94.



limb being held as before, the hand and knife may be brought round under the limb, as in the circular operation, and the blade entered near the thumb and drawn round to the opposite side, when the ham may be cut across by turning the edge of the knife upwards, and the operation completed as before. In amputating through the condyles the patella is drawn down by flexing the knee to a right angle before dividing the soft parts in front of the bone; or, if that be inconvenient, the patella may be reflected downwards."

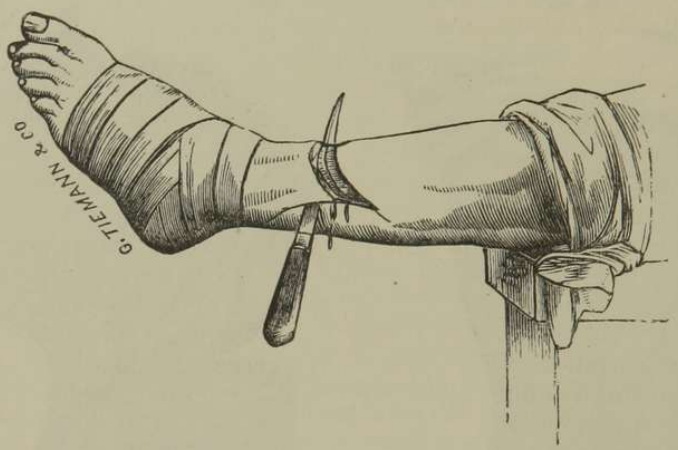
Amputation of the Leg.—*Flap Operation.* This is a very favorite operation with many surgeons, although I am, from the satisfactory results obtained in my own cases, very partial to the circular, especially in the lower third. The operator, standing on the outer side of the right leg, or the inner side of the left, introduces a knife behind both bones, cutting downward and forward, making a flap four or five inches in length, from the posterior muscles of the leg. He may then relinquish the catling, and with a strong scalpel join the points where the posterior flap begins, with a similar incision, having its convexity downwards. This integumental anterior flap is then dissected up, and the bone sawn through, dividing the fibula first, and removing the spine of the tibia to prevent its afterward cutting through the flap.

Mr. Fergusson's method, which is illustrated in Fig. 95, is described as follows:

He first places the heel of the knife on the side of the limb farthest from him, and draws it across the front of the limb, cutting a semilunar flap of

skin; when its point has arrived at the opposite side, it is at once made to transfix the limb—this stage of the operation is represented in the figure, and then the flap is cut as above directed. When transfixing the right limb, the surgeon must take great care not to get his knife between the two bones. When the operation is performed high up, the popliteal artery will be divided, instead of the two tibials. The tibia, however, should never be

FIG. 95



sawn higher than its tuberosity, or the joint will be laid open. The amputation may be performed near the ankle in the same manner. If low down, the *tendo Achillis* will require to be shortened after the flap is made. The flap is to be brought forwards, and confined by a stitch or two, the line of junction being, of course, horizontal.

Circular Method.—The patient having been brought to the edge of the table, an assistant supports the ankle, while a second draws back the integument and steadies the knee; the surgeon (on the inner side, if the right leg is to be removed, and *vice versâ*) places his arm beneath the leg and brings the heel of the amputating knife in contact with the integument near the spine of the tibia; with a circular motion he divides the skin and fascia around the leg. This can be conveniently done with the small catling, the use of which renders a change of instruments unnecessary in the after stages of the operation. The integument is then dissected up and turned back, and the tissues divided down to the bone. The catling is then passed between the bones to divide the interosseous ligaments and muscles. When this is thoroughly done the three-tailed retractor is to be used, the middle "tail" being passed between the bones, and the flesh well drawn back. The knife is now laid aside, the saw applied, and the bones sawn through. If any spiculæ remain they must be removed with the bone-pliers, and the flaps are then adjusted with silver wire sutures. The integuments, when put together, should make a *perpendicular line* of junction.

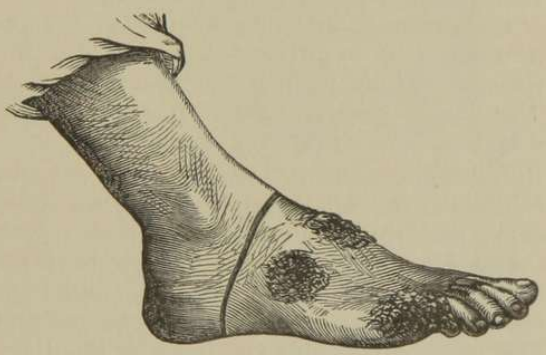
Teale's Amputation.—In removal of the leg by this method the point selected should be at the junction of the lower and middle third of the leg. The measurements are made according to the same rule as for amputation of the thigh. Two lateral incisions, through the skin only, are to be made, the transverse one being carried through all the structures down to the bone. The long flap is then dissected up, *keeping close to the periosteum.* The short flap, by a direct cut through all the structures down to the bones, is made and dissected upwards, the bone is sawn, and the flaps placed in apposition as before mentioned.

In the mixed method the skin flaps should be lateral, and should be made of sufficient length to fall readily over the ends of the stump. The circular incision should be made about an inch below the point of union of the skin and muscular tissue, making thus a better stump.

Amputation at the Ankle-joint.—*Syme's Operation.*—This operation is by no means new. Sedellier is said to have first performed it, and by referring to Velpeau it will be seen that it was held in repute by many French surgeons. Mr. Syme, of Edinburgh, systematized the operation, and it has since gone by his name, and to him is due the credit of removing the objections, first, of scantiness of flap, which he has practically demonstrated can be taken from the heel, and, secondly, the exposure of larger articulating surfaces, which are lessened by the removal of the malleoli and the cartilages. The latter plan was first practiced by M. Baudens. The results of this operation are not always satisfactory.

The operation is performed as follows: The patient is subjected to the influence of an anæsthetic, and the arteries compressed by assistants, or Esmarch's bandage applied. The foot then being held at a right angle, the point of the knife should be introduced directly below and a little posterior to the external malleolus, and then cutting down to the bone, is to be carried under the sole of the foot to a point on the inner side, directly opposite its place of entrance. (Fig. 96.) The incision is then continued to the front of the ankle-joint till it reaches the incision already made. The lower flap must then be detached, which requires an accurate dissection, and is somewhat tedious, the knife being kept close to the bone. After the calcis is completely denuded, the tendo Achillis must be severed. The next movement is to open the joint in front, which is done by applying the knife to each side of the astragalus, dividing the lateral ligaments and liberating the joint, during which procedure it is advantageous to depress the foot.

Fig. 96.



Incision for Syme's operation.

The malleoli are then to be exposed by careful dissection, and their articular projections sawn off, taking care to remove the cartilages with them. The anterior tibial, the external and internal plantar arteries, and smaller twigs requiring ligation. The flaps are then brought together and secured by metallic sutures. The objections which are urged against this operation are that, in some cases, the large band of muscular fibres acting upon the tendo Achillis, no longer antagonized by the anterior and plantar muscles, would draw the stump upwards and backwards, and destroy or remove the line of cicatrix which would point to the ground. Mr. Syme met these objections by expressing his belief that the cut extremities on the forepart of the foot would speedily acquire new attachments and act as extensors. Experience shows such to be the fact.

In this operation there is also a tendency *to sloughing of the lower flap*, and, therefore, a flap may be made of more than sufficient length to come into close apposition. This has been proved to be of great advantage.

Amputation at the Ankle-joint by a Lateral Plantar Flap.—This operation is performed as follows: Having extended the leg, mark a point on

the dorsum of the foot equidistant from each malleoli. With a small sharp-pointed amputating knife pierce the tissues down to the bone at the site above mentioned, and cutting steadily carry the knife outside of the joint, a very little below the malleolus of the fibula, and finish the incision at the insertion of the tendo Achillis. Enter the knife again at this point, namely, at the extreme projection of the heel, and, making an acute angle, bring it downwards and forwards to the sole, and then mounting over the dorsum of the foot, it divides the tendon of the tibialis anticus, and reaches the point where the first incision commenced. The foot must now be strongly everted and the joint opened, the inferior flap is dissected off the heel. The tendons of the calf muscles must now be divided, and the foot turned out of its socket. By a careful dissection the internal adherent flap is dissected off and the foot removed. The after treatment is the same as before stated.

Pirogoff's Operation (Osteo-Plastic).—This amputation thus differs from that of Mr. Syme: In that of Pirogoff the posterior portion of the calcaneum is allowed to remain in the heel flap, and its advantages are a longer limb and a more perfect stump.

The incisions are made in the same manner as those directed for a Syme's amputation, but the heel flap is not dissected up. The lateral ligaments are divided, and the foot disarticulated in front; the calcis can then be seen behind the astragalus, when the former is to be sawn through in the line of the heel; the foot is then removed, and the ends of the tibia and fibula are sawn off. Watson and Pirrie performed the latter portion of the operation without previous disarticulation.

Pirogoff's operation, as modified and amply tested by Professor Hayfelder, of Prussia, in the Prusso-Austrian war of 1866, seems to be highly meritorious. The modification is performed, according to the account in the *Half-yearly Abstract of the Medical Sciences* (January, 1869), as follows: "Make a curved incision, which, commencing above the posterior edge of the internal malleolus, passes along the dorsal surface of the foot and terminates at the outer malleolus. After this incision (which divides only the skin), and the preliminary separation of the incised parts, the subjacent tissues are completely cut through down to the bone, and the epiphyses of the two bones of the leg are removed by the saw. The soft parts covering the os calcis are next divided, and the bone sawn in the same direction. The sawn surfaces of the bones of the leg and of the os calcis are easily brought in contact, which is impossible by the unmodified procedure even after section of the tendo Achillis."

Chopart's Amputation through the Tarsus is as follows: The foot must be held, as for the operation just described, and the position of the articulation ascertained by the same guiding marks. The thumb of the left hand should rest upon the external extremity of the joint, and the index finger on the tuberosity of the scaphoid. A semilunar incision is then made, with its convexity downward around the dorsum of the foot, about half an inch beyond the line of the articulation. The flap may then be raised about an inch, and the tendons divided down to the bone. The fibrous bands connecting the astragalus and the scaphoid bones are then to be carefully and completely divided in order to facilitate the opening of the joint, which is effected by entering the point of the knife from above, recollecting that the edge of the scaphoid overlaps the astragalus. The articulation being opened, pass the flat of the blade behind the bones, and cut the flap from the sole of the foot as seen in Fig. 97.

Subastragaloid Amputation.—This operation removes all that Chopart's amputation effects, and with it the calcis also. Malgaigne described the

operation in 1846. The dorsal flap is made in the same manner as directed above in the performance of Chopart's; the heel flap after the manner of Syme. The knife is then entered between the scaphoid and astragalus, the joint opened, and the foot removed by disarticulating the calcis from the astragalus. Hancock has made a modification of this operation, by removing only the forepart of the heel-bone, leaving its tuberosity to be

FIG. 97.

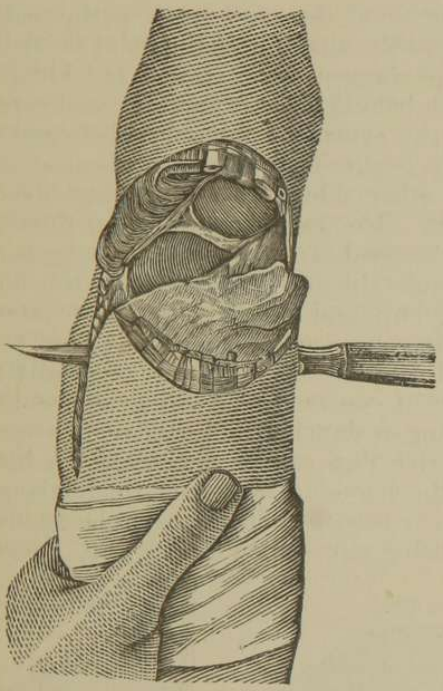


FIG. 98.

turned up in the flap. The under surface of the astragalus is "freshened" by the removal of a slice of bone, thus making an osteo-plastic operation.

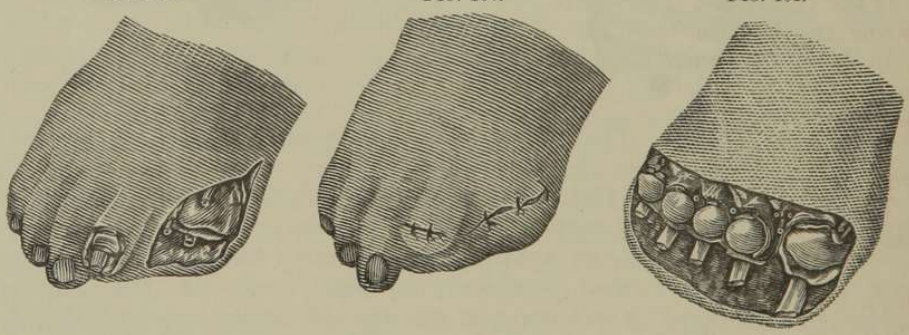
Amputation through the Tarso-meta-tarsal Articulation.—In the removal of the forward portion of the foot, no matter which operation be selected, a knowledge of the anatomy is absolutely essential. The tarso-meta-tarsal joint is formed posteriorly by four bones, viz., the internal, middle, and external cuneiform, and the cuboid bone; anteriorly by the articular surfaces of the meta-tarsal bones. The outline of this joint is very irregular, but the following directions will assist the operator: Grasp the dorsum of the foot with the palm of the left hand and extend it. With the finger of the right hand on the *inner side* of the foot, trace the *inner border* of the first meta-tarsal bone backward until a prominence is detected. One or two lines anterior to this point is the commencement of the articulation internally. On the outer side follow the border (external) of the fifth meta tarsal bone, until its proximal extremity is recognized by the protuberance at the end of the bone. The outside of the articulation lies immediately behind it.

The operation is performed as follows: Find the outer and inner margin of the joint as directed, and holding the foot as described, the operator makes a semilunar incision, with its convexity downward across the dorsum of the foot, about half an inch anterior to the line of the articulation. This incision must extend to the bones, and the flap raised with the point

of the knife. The dorsal ligaments are divided on a line with the joint, and the articulation of the head of the second meta-tarsal bone opened by carrying the point of the knife between the internal cuneiform, and the head of the first meta-tarsal bone (*vide* Fig. 98). When this has been accomplished, pressure downward with the left hand will separate the articular surfaces and meta-tarsus; the remaining attachments must be divided, and the knife is then passed beneath the heads of these bones, and a flap cut out from the sole of the foot.

Amputation of the Toes.—*Amputation of the great toe* is performed as follows: The surgeon having satisfactorily ascertained the point of articulation between the meta-tarsal and phalangeal bones, enters the knife on the dorsum of the foot, about an inch behind the articulation, and carries it around the inside of the toe to the centre of the space between the toes. A second incision is then made, beginning at the point of entrance of the first, and is brought around the other side of the toe to meet the extremity of the first cut (*vide* Fig. 99). The soft parts are then dissected up, and the bone disarticulated, or the head of the meta-tarsal bone is exposed and sawn off, which latter is preferable, as the removal of this large protrusion will yield a much better stump, and allow the patient to wear a boot without much inconvenience. In some cases the toes may have to be removed at the second joint, which I found to be necessary, especially the second and third toes, in consequence of contraction of the flexor tendons, causing great inconvenience in walking or dancing. Should their removal be demanded, an anterior and posterior flap can be made, and the bones divided with the pliers, just behind the articular surface of the phalanges, as also may be seen in Fig. 99. *Two or more toes* may have to be removed together, the character of the stump being represented in Fig. 100. In gen-

FIG. 99. FIG. 100. FIG. 101.



eral, however, in disarticulation of a single toe, it is the better practice to remove it at the meta-tarsal joint, as the small size of the phalanges, and their comparative unimportance, render the preservation of parts of far less moment than those of the hand.

Disarticulation of all the Toes.—The surgeon, seated before the patient, takes in his left hand all the toes, and with a strong scalpel makes a semicircular incision in front of the meta-tarso-phalangeal articulation, from the border of the fifth to that of the first meta-tarsal bone. The point of the knife, which should be narrow-bladed and sharp, is introduced into the joints of each toe successively, and the ligaments divided; the knife is then carried behind the phalanges, and the flap cut out on the plantar surfaces. (Fig. 101.)

AMPUTATION OF THE UPPER EXTREMITIES.

Amputation at the Shoulder-joint.—There are many methods proposed for removal of the shoulder. An excellent one consists in making the flaps from the outer and inner aspect of the joint, The operation is thus performed: Supposing the left arm is about to be disarticulated, the head of the humerus must be depressed as far as possible, by raising the arm at right angles with the body, and the knife entered at the posterior border of the deltoid, and in front of the tendons of the *latissimus dorsi* and *teres major* muscles, and brought out below and in front of the clavicle, and made to cut its way outward around the head of the humerus. This flap will be mostly composed of the deltoid muscle, which must be held aside, and the head of the bone can then readily be detached from the glenoid cavity. The bone must then be turned upon its longitudinal axis, and thrust outwardly and upwardly (Fig. 102). The operator then carries the knife behind it, and grazing the humerus cuts out the internal flap, by carrying the instrument downward and forward (see Fig. 102).

Fig. 102.

If the right shoulder requires removal, the first incision should be made by entering the knife at the infra-clavicular triangle, and bringing it out at the posterior margin of the deltoid, thus reversing the method as described for the left shoulder.

As the anterior flap is cut, compression is made by the assistants on the great vessels contained in it.

The method of Larrey, or that known as the *oval* shoulder-joint amputation, is done as follows: The surgeon first enters the knife at the edge of the acromion process, and makes a vertical incision to a point about an inch below the head of the arm-bone. Two long oval incisions are then made, one on the anterior and another on the posterior surface of the shoulder, extending from the centre of the short vertical cut already mentioned, through the tissues composing the anterior and posterior walls of the axillary space. The next step is to draw downward the humerus, to stretch the ligament and open the joint from the top, and disarticulate the head of the bone from the glenoid cavity, and finish then, by joining the extremities of the oval cuts already made, by division of the soft parts in the axilla. The last incision severs the artery, which must be immediately secured. A somewhat similar operation may be performed by making the flaps by transfixion, and not from without inwards.

Amputation of the Arm.—In amputation of the arm, the patient having been placed under anæsthetic influence, a tourniquet, or Esmarch's bandage, applied, and the arm placed at right angles from the body and held by an assistant, the operator then, if *the flap operation* is selected, grasps the skin and all the tissues, and, raising them from the bone, enters the knife in the

middle of the arm, grazes the posterior face of the humerus with its point and brings it out on the inner side. He then cuts a flap of several inches, according to the circumstances of the case. The anterior flap is then made in the same manner, the retractor applied, and the bone sawn through.

If the *circular* method be preferred, the arm is drawn from the body at right angles, and the surgeon, standing on either side of the limb, passes his arm underneath the arm of the patient, enters the heel of the amputating knife on the upper surface, and draws it steadily around the arm, dividing only integument and fascia. The flap is then dissected and turned up, and the muscular tissue divided down to the bone; the two-tailed retractor is then applied, and the bone sawn through. Teale's or Carden's operation may also be performed if the operator prefer them.

Amputation of the Forearm.—When it is necessary to remove the forearm, the arm should be held securely by two assistants, one of whom steadies the elbow, the other grasps the wrist. The circular or flap method may be selected according to the circumstances of the case, although I must say that I prefer the circular. If the right forearm requires removal, the surgeon stands on the outer side of the limb; if the left, he places himself on the inner side. The integument and fascia should be divided with a single sweep of the knife, taking care to commence the incision with the heel of the instrument (Fig. 103). The integument must then be dissected and turned back; the soft parts are then divided down to the bone, and with a narrow knife the interosseous muscles also cleared from

FIG. 103.

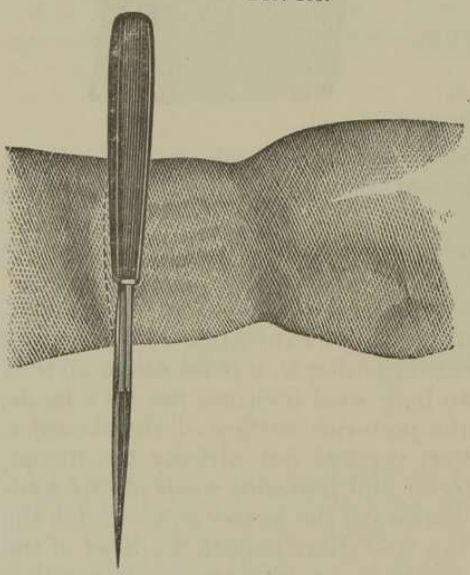
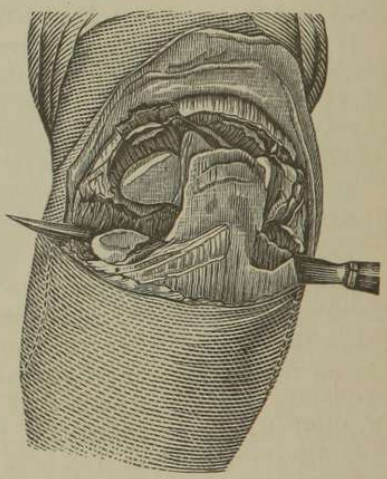


FIG. 104.



the bone; a "three-tailed" retractor is then applied, the centre piece, or tongue, being drawn through between the bones. The saw is now applied carefully, and in this instance, both bones should be divided at the same time. The vessels, sometimes two, more frequently three, are to be secured, the flap turned down, and properly adjusted.

The *flap operation* is performed in the following manner: An assistant compresses the brachial artery, or applies Esmarch's bandage, and the limb extended in a position between supination and pronation. The surgeon

then may transfix the flaps with a small amputating knife, or, may cut from without inward, forming an anterior or a posterior flap. The interosseous muscles are separated, and the bones sawn through as before.

Teale's Method.—In the forearm the long flap must be taken from the dorsal aspect, and, as in all like amputations, it is recommended that the lines of incision be traced on the limb. In this amputation, in marking out the long flap, a longitudinal line is drawn over the radius so as to leave the radial vessels in the short flap. At a distance equal to half the circumference of the limb, another line, parallel with the former, is drawn along the ulna. These are then joined at their lower ends by a transverse line equal in length to half the circumference of the forearm. The short flap is marked by a transverse line on the palmar aspect, of one-fourth the length of the long one. The operator, in forming the long flap, makes the two longitudinal incisions merely through the integuments, but the transverse one is carried directly down to the bones. The short flap is made by a transverse incision down to the bone, care being taken to separate the parts upwards close to the periosteum and membrane.

According to Mr. Bryant, amputation of the forearm should always be a "*mixed*" one; he says: "Two well-cut and fairly long skin-flaps, and a clean circular section of the muscles are far preferable to the flap operation, and yield a good stump."

Amputation at the Elbow-joint.—This operation is usually performed by a long anterior and short posterior flap. The forearm should be slightly flexed upon the arm, and the knife entered in front of the joint close to the bone, and brought out by cutting upwards and forwards in order to make a sufficient flap of the muscular tissue. The operator stands on the inner side of the right arm and the outer side of the left. A transverse incision is then made behind the joint, the extremities of which cut should meet the beginning of the first cut, or at the base of the flap. The external lateral ligament must then be divided, and the joint opened between the external condyle of the humerus and the head of the radius; the internal lateral ligament must then be severed, and the olecranon process of the ulna sawn through below the point of insertion of the triceps, a portion of the process being left in the stump, which is to be treated on general principles. It is sometimes thought advisable to make the posterior flap first, which may be done by an incision carried around the posterior aspect of the joint, its line being a little below the head of the radius, which can be detected by pronating and supinating the hand; this flap is to be dissected up as high as the upper border of the olecranon process, as seen in the figure. The forearm must then be flexed, and the joint entered above the olecranon, and carried through the joint and made to cut itself out on the anterior face of the limb. In Fig. 104 the position of the parts and knife are represented.

An anterior and posterior flap of skin and fat may also be made and the bone disarticulated; then with a circular sweep of the knife the remaining muscles are to be divided.

Amputation at the Wrist-joint.—The circular method of amputating at the radio-carpal articulation is as follows: An assistant should draw back the integument, and hold the arm firmly with both his hands, making pressure with his thumbs on the brachial artery. The surgeon then makes a circular incision, from an inch to an inch and a half below the styloid process of the radius, through the skin and superficial fascia, down to the tendons; the flap must then be carefully dissected up to a point above the line of articulation, which flap must be reflected. A second circular in-

cision must then be carried through the tendons, and the joint opened from its dorsal to its palmar aspect (Fig. 105).

There are several important points to be considered in performing this amputation. First, that the two styloid processes are marks by which to distinguish the line of articulation, and that the styloid process of the radius projects lower than that of the ulna, consequently the joint is more accessible at that point; second, that the first fold of the skin on the palmar surface of the wrist, reckoning from the arm toward the palm, almost covers the joint. Recollecting these important bearings, and entering the joint from the dorsal surface, and on the ulnar side, the facility of opening the articulation will be increased, and the operator be much less likely to enter the knife between the rows of carpal bones, a mistake which might otherwise easily occur.

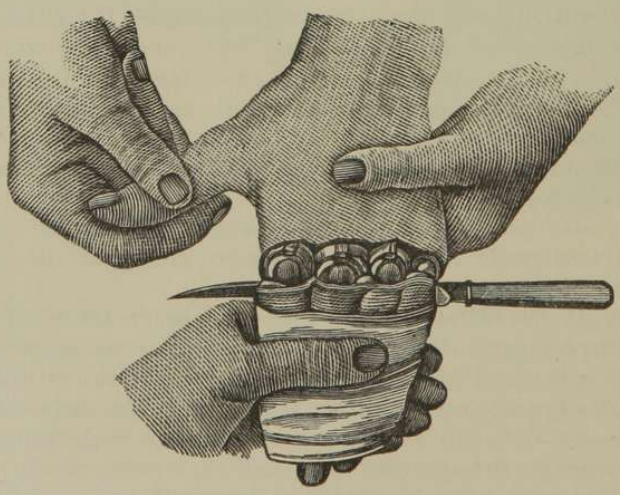
Fig. 105.

Fig. 105 represents amputation at the radio-carpal articulation; the joint is opened upon the back of the hand, and the skin and cellular tissue reflected back.

Amputation of the Fingers.—There are different methods proposed for the removal of the fingers, but the size and direction of the flaps must be in accordance (adhering to the general rule for all amputations) with the amount of integument left to cover the bone.

Meta-carpo-phalangeal Amputation of the Fingers.—All the fingers may have to be removed at once, in consequence of mill, railroad, or machinery casualties; from gangrene, frostbite, or embolism. The best

Fig. 106.

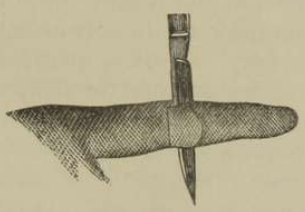


method for these operations is for the surgeon to take the fingers to be removed, prone, in his own hand, and have a good assistant steady the wrist

and draw aside the thumb. A semilunar incision is then made with a strong scalpel, extending from the outside to the inside of the hand, a little in advance of the joints; the fascia and integument must then be dissected up, and the extensor tendons be divided (Fig. 106). The fingers, still held firmly, are then flexed at a right angle, the lateral and other ligaments divided, and each joint fully and carefully opened; a small-sized narrow-bladed catling, its *flat being placed close to the phalanges*, is made to cut itself out *on the palm of the hand*, forming a sufficient flap.

Amputation through the Meta-carpus.—If it is necessary to amputate *through* the meta-carpus, a double flap is made, one on the anterior, the other on the posterior face of the joint, and the bones exposed. Then a five-tailed retractor is placed between the fingers to protect the tendons, and the saw may be evenly applied to the whole. As a general rule, when a single finger is to be amputated, it is not necessary to ligate the arteries; the surgeon may remove clots, wait awhile, making slight *lateral* pressure, and then dress the parts with cold dilute calendula.

FIG. 107.



Amputation of a Finger.—To remove a finger is a very simple performance. A flap anteriorly and posteriorly (*vide* Fig. 107) is made, the flaps held aside with the finger and thumb of the left hand, and the bone forceps applied just behind the protuberant extremities of the phalanges or meta-carpal bones. If it is deemed advisable to disarticulate, after the superior flap is made, the finger may be flexed, the joint entered, and after having divided the tendons make the inferior flap.

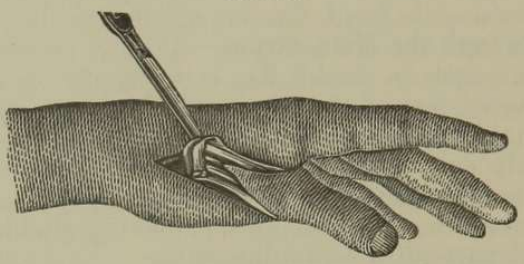
Amputation of the Index Finger.—The important office subserved by the index and ring fingers, has given rise to the question among surgeons, whether it is more advisable to save as much of the palmar phalanx as possible to give the patient a more useful stump, or to remove the entire phalanx and a portion of the meta-carpal bone, thereby making a much more seemly stump. It is better, as a rule, that in all the fingers, except the index, that the extremity or head of the meta-carpal bone should be taken away, otherwise it leaves a projection which is oftentimes much in the way, and is liable to be struck or injured. This is accomplished by making a V-shaped incision, the apex looking toward the wrist, and having reached the bone, with a pair of strong bone pliers, held at right angles with the hand, the meta-carpal bone is divided close behind the head.

In removal of the index finger much depends upon the judgment of the surgeon. He must determine as to "usefulness" or "appearance." If the applicant is a laborer, depending upon manual exertion for support, save as much as possible of the finger, but if it be a person in the upper ranks of life, who might be horrified at an unseemly finger, then operate in a manner to leave the least possible deformity. As a general rule, a better stump is made by removing the bone in its continuity than at the joint, on account of the rounded and protuberant extremity of the articulation presenting a knobby appearance after the parts have healed. When the *little finger is to be removed*, in conjunction with the meta-carpal bone, an operation which, as yet, I have never been called upon to perform, a somewhat oval incision is necessary. Enter the knife at the junction of the meta-carpal bones with the wrist, bring the incision upward around the back of the hand, and terminate it on the palmar surface. This may be continued around the finger, down its outside, to the point of beginning.

The tendons are carefully divided and disarticulation effected as in other cases.

Amputation of Carpo-meta-carpal Articulation of the Thumb.—The same rule is followed with the thumb (*vide* Fig. 108), beginning at about half an inch in front of the styloid process of the radius, carry the incision

Fig. 108.



around the thumb, and back again to the point of entrance. Divide the extensor tendons from behind, and by flexing the thumb the disarticulation is easy. In this operation two or three small arteries may require torsion.

Treatment After Amputation.—The management of the stump is of great import, and differs materially at the present from that practiced a few years ago. It was the custom, after having secured the flaps, to strap the stump closely, then to apply a wad of charpie or lint; over this the "Maltese cross," and then to envelop the limb with a roller bandage, thus doing everything to cause retention of the effete fluids, and keep the parts hot and feverish. It has been my custom, in all the varieties of amputation, to dispense with the greater part of this pernicious treatment. After an amputation, when the oozing has ceased, I carefully cleanse the wound from all clots, and spray upon its surface, a solution of calendula and carbolic acid, ten drops of the acid, and an ounce of calendula to four ounces of water. The silver sutures are then applied, and drainage-tubes inserted, and cut off close; the limb is then laid upon a pillow, upon which some prepared oakum has been spread. Over the cut surfaces I apply a compress of a single thickness of linen, saturated with a solution of calendula, one part to six of water. Over this is placed a compress four times doubled, saturated with a solution of carbolic acid, 1 to 20, and again over this a piece of mackintosh or india-rubber cloth, thoroughly sprinkled with a solution of the acid, 1 to 10. Having placed a double hoop over the limb to prevent the pressure of bedclothes, I administer a dose or two of aconite, and leave the patient in charge of the nurse. The dressing is wetted afresh, whenever dry, without removing it from the stump, the compress to be changed every three hours. I have never known any untoward result from this treatment. Lister's and other methods, especially the "open" (so much practiced by Dr. James R. Wood) and the "dry," are so fully described in Chapter XI, that space forbids any repetition in this place.

Neuralgia of the Stump.—This is a most distressing affection, and often very intractable. It may arise from a bulbous affection of the nerves, or their adherence to the cicatrix, which subjects them to constant and continued pressure; this latter cause, however, is not always present, the pain arising from irritation of the spinal cord. The symptoms generally appear in paroxysms, are almost unendurable during the night, with spasm and twitching of the stump, which not unfrequently terminates in muscular contraction, causing the bone to protrude. The sensations vary in different individuals, and at different times in the same individual. A successful

treatment depends upon an exact correspondence between the symptoms of the medicine and the sensations experienced. Such similarity may be found in the Homœopathic Materia Medica, which contains ample means wherewith to mitigate or entirely subdue the sufferings of the patient.

To this storehouse the surgeon must resort, and with patience and precision select his weapon.

Perhaps among the primary influential impulses which homœopathy received was the successful treatment by Hahnemann of the distinguished cavalry chief at the battle of Waterloo, the Marquis of Anglesey, who underwent amputation of the leg in consequence of a wound inflicted by a cannon-shot. Neuralgia of a torturing kind followed, and the fruitless efforts of many physicians induced this renowned nobleman to solicit the advice of Hahnemann, then practicing in Paris. The private physician of the marquis (Dr. Dunsford) became a convert to the homœopathic doctrine after having witnessed the salutary effects of the medicines which Hahnemann administered. The medicines I have found most serviceable are acon., bell., ignatia, cuprum, veratrum, hellebor., and spigelia, according to the presenting symptoms, which must be looked for in the Codex. But, I desire here to invite attention to a medicine which was brought to my notice by Dr. Shelton, of Jersey City, and accidentally came to his knowledge after the following manner: He had amputated the thigh of a man, and the wound had almost entirely healed by the first intention, when most intense neuralgia of the stump followed. The Doctor prescribed all the medicines that appeared indicated, with little or no relief. I saw the patient in consultation with him, but nothing we tried gave permanent service. After both high and low potencies had been given without benefit, the patient became desperate. Extract of hyos., zinc. valer., codeia, chloroform, and chloral were administered. An ointment of bella. and opium was rubbed into the stump. The muriate of ammonia, in half-drachm doses, produced for a time decided effect; a repetition of the same medicine was of no avail whatever. Hypericum and cannabis in tincture, and 200th were equally unavailing. The following is the record for September 5th:

"The patient picked up a scrap of printed paper with which to light a cigar. Before doing so, he whiled away a few moments in looking it over. It was in French, and, rather strange to say, his eye met a little paragraph on raw onion in neuralgia. He resolved to try it. He ate a whole one at bedtime. All pain immediately ceased, and he slept quietly that night. He continued to do so nightly until the 23d, with entire relief, when the onion was omitted for two nights, to see what the result would be. The pain returned.

"Sept. 25th.—*Allium cepa*[200] was given for two days, without any effect. Ten-drop doses of the tincture were taken for two days, when all pain ceased from that date to the present—8th of November, 1871."

Protrusion of Bone.—This is a complication which cannot in some cases be avoided, even after a most carefully conducted amputation. It may arise from gangrene attacking the flaps, spasmodic retraction of the muscles, especially in nervous or hysterical persons; neuralgia, or perhaps disease of the bones themselves. In some cases where the patient rapidly increases in flesh, there appears to be a great tendency to this untoward occurrence. When such a result threatens, traction may be made upon the muscles by adhesive plaster, and the pulley and weight applied in the same manner, as for making extension in fractures. If this does not suffice, a longitudinal incision should be made over the bone on the side opposite the vessels, and the protruding portion removed with the saw, leaving a sufficient covering of the soft parts to protect the bone.

CHAPTER XVI.

PLASTIC SURGERY.

THERE is no branch of surgical science that demands more inquiry, and that is so often both satisfactory and unsatisfactory in its results, as that of plastic surgery. Auto-plastic and other varieties of plastic surgery signify methods of reconstruction of parts that are deficient. These may be either congenital defects or the products of accident or disease. The celebrated Mr. Wells, of ovariotomy fame, gives this definition of plastic surgery: "It is," he says, "that department of operative surgery, which has for its end the reparation or restoration of some lost, defective, mutilated, or deformed part of the body."

It is said that Celsus and Galen were acquainted with this method of restoration of parts; but it is generally conceded that the father of "plastics," was Gasparo Tagliacozzi or Taliacotius, who lived in the sixteenth century, was professor of surgery and anatomy at Bologna, and who was supposed to be a necromancer, on account of his being able to restore parts which were lost; to fit on a nose if it were gone, to put on a prepuce if it had been destroyed by a chancre, etc.

Until recently, plastic surgery was mostly limited to the integumentary surfaces, but recent operations, termed the *osteo-plastic*, have given such favorable results, that they will necessarily come under the head of "plastics" in surgery. The skin-grafting of ulcers, transplantation of flesh and tissue, either with or without pedicles, the operations for harelip, cleft palate, lacerated perinæum, operations upon the eyelids and urethra, all these belong to this interesting field.

The osteo-plastic operations on the maxillary bones, Pirogoff's amputation, amputation through the condyles of the femur, with attachment of patella, and the recent operative measures for removing tumors of the antrum and naso-pharyngeal polypi; as well as various operations on the vagina, etc., render the domain of plastics a wide one indeed.

The great points to be remembered in performing such operations are:

1st. The general condition of the patient.

2d. Complete arrest of hæmorrhage before closure of the wound.

3d. Union by the first intention.

All patients about to be subjected to plastic operations, should be allowed to remain in bed for several days. Abernethy remarks, that he found that patients who had been confined in bed for a length of time, underwent operations better than those who had not been so rested, and I am disposed to agree with him. A bath should be given daily, and all food prohibited which would tend to cause dyspeptic symptoms. Cheerful apartments, attentive nurses, good ventilation, and proper diet are essential in all operations, and especially in the more delicate ones of which we treat. During this period, *silicea*, in the 30th trituration, should be given twice a day, about three grains at a dose.

A peculiar fact I have noticed, especially in the treatment of ulcers, is, that the grafts do better, and are not so likely to abort, when the patient has been using *silex* for a week or two previous to the operation. In syphilitic patients *silicea* has no effect, but I am positive the *iodide of potash* has, particularly when administered in tangible quantities.

It would give me a great deal of pleasure if our surgeons would experiment with these medicines in "plastics."

The best method of arresting hæmorrhage in the operation, if it be possible, is by torsion. Speirs's artery constrictor will often serve the purpose, as will the acupressure pin, well applied. After the bleeding has ceased, every clot should be washed away, and oozing allowed to cease. The sutures to be used are those of silver wire, for the reintroduction of which into the domain of surgery we are so much indebted to Dr. Sims.

In closing the wound, such sutures must be used as will in the least degree obstruct the circulation of the flaps. These, perhaps, are the bar sutures with the perforated shot, or the ordinary quilled sutures. The needles should be round, slightly curved at the point, and without cutting edge. In making our flaps, much time and discrimination must be used, and many patient measurements taken, especially if the flap is to be twisted or bent upon a pedicle. It has been recommended by some surgeons that the dimensions of the flap should be taken on card-paper, or gutta-percha; but I can recommend a better article in parchment which has been wetted. It is very pliable, and will twist upon itself as easily as the integument; it is semitransparent, and being laid over the part to be closed, the boundaries can be clearly defined and traced. It is especially serviceable in the many manipulations which are often necessary, because it does not tear. I have used this substance for a number of years, and have reason to speak well of it, for the purposes mentioned.

In repairing parts of the body wanting, either from arrest of development, or from the ravages of disease or accident, the surgeon should bear in mind the fact that he cannot expect to have a result equal to nature, and he, be it patient or surgeon, who anticipates such a result, will certainly be disappointed. "Nature ever triumphs over art, and here is the boundary between what is God-like and what is human."

Another item to be remembered, is the *shrinkage of the flap*, which almost invariably occurs, and which should be in a measure anticipated by always dissecting off a flap which will be somewhat larger than the exact size of the wound.

Gangrene, which may result from a defective supply of blood, either from too much constriction of the pedicle, or the pressure of the sutures, together with the presence of the so-called nodular tissue, which must be cut away entirely if we expect a good union—are often the causes of failure. The simplest plastic operation is skin-grafting in ulcers. It is a method which, according to Jobert, was known long ago in India. The grafts were taken from the nates, having been previously slightly bruised to increase vascularity. This method, however, failed frequently, probably from the bruising process to which the parts were subjected.

There is no doubting the fact, that portions of the body have been entirely cut off, and having been speedily replaced, have been known to unite themselves perfectly.

Dr. Prince, in his *Plastic Surgery*, mentions a case of a man, who, having cut off two of his fingers, replaced them, and then consulted a surgeon; he, for the sake of greater security, applied additional dressings to them. The fingers united firmly, but their ends became gangrenous, in consequence of the tight strapping which had been employed.

Prof. Eve, in his *Remarkable Cases in Surgery*, cites the case of a woman who had the whole of the soft parts of her nose bitten off in a fight with a man. Three hours after she was seen by the surgeon, who insisted upon searching for the lost olfactory. After a considerable time the missing member was found, "contracted and covered with filth." It was thoroughly

cleansed, adjusted, and reapplied. In thirty-seven days it was firmly united, but had assumed a bluish hue. A solution of nitrate of silver was applied to the tip, and in five days it had resumed its natural color.

Brown-Séquard, in 1850, grafted the tail of a cat on a cock's comb with success.

On one occasion I replaced the end of a finger which had been severed by an accident, and held it *in situ* by straps and bandages. Not the slightest attempt at union resulted. In a second case my efforts were followed by success. I do not propose to occupy any space with the simple methods of the skin-grafting process, which, no doubt, is familiar to all. It is generally attributed to M. Reverdin, who, in 1870, published a paper on "Epidermic Grafting." In Holmes's *System of Surgery* the following paragraph occurs, written by Holmes while surgeon to St. Bartholomew's.

Speaking of the "transplantation of skin" he says: "The ingenuity and merit of the invention, which is due to M. Reverdin, of Paris, the readiness of adoption, which is due to Mr. Pollock, and the great success which has followed the numerous trials now made in every direction, warrant the conclusion that the proceeding is one of the most striking and successful in modern surgery." We can claim for this country priority for this operation, as we can for excision of the jaw, by Deaderick, of Tennessee, and of ovariotomy by McDowell, of Kentucky. In a report of the Dispensary of the Geneva Medical College, 1847, can be found the record of the case of a boy whose leg had been stripped of integument eight years before, and the wound not having healed, Dr. F. H. Hamilton proposed the transplanting of a piece of sound integument, in the centre of the ulcer, to which, however, the patient did not consent. On January the 21st, 1854, Prof. Hamilton made his first operation in the case of one Horace Driscoll, at the Buffalo Hospital of the Sisters of Charity. The ulcer was large, and the healthy integument was taken from the opposite leg. In ninety days cicatrization was complete. On the 24th of June, 1854, Dr. Hamilton read a paper before the Buffalo Medical Association, on "Old Ulcers Treated by Anaplasty," which gives to him the priority of claim in this department. His views and some interesting remarks on skin-grafting are detailed by him in his work on the *Principles and Practice of Surgery*.*

The varied methods of performing plastic operations are as follows:

I. Sliding in a direct line.
II. Sliding in a curved line.
III. Jumping. (Indian method.)
IV. Inversion or eversion.
V. Taliacotian. (The part obtained from a distance.)
VI. Grafting. (Already considered.)

As we have already remarked, no rules can be laid down for plastic operations. Every case is so different that each requires a careful consideration, as to the number and character of the operations to be performed. Sometimes the result is so satisfactory that the surgeon is more than gratified with the result; while at others so unsatisfactory, that every one experiences nothing but discouragement.

As a rule, however, it may be said that the *sliding* method, having previously cut under the edges of the flaps, and the *torsion* method, are the two which are the most practical and give the best results. In the proper place, rhinoplasty, cheiloplasty, and autoplasty are mentioned.

* Principles and Practice of Surgery, by F. H. Hamilton, A.M., M.D., LL.D., p. 42.

SURGERY OF SPECIAL REGIONS AND TISSUES.

CHAPTER XVII.

DISEASES AND INJURIES OF THE SKIN AND CELLULAR TISSUE.

Erysipelas.—In a work upon general surgery, only a description of those diseases of the skin which fall within the province of the surgeon can be mentioned; the varied and multiform affections, with their classification and treatment, which belong to Dermatology, must be sought for in works upon that specialty,—a department indeed of medicine which, within the last few years, has assumed a vast importance.

Erysipelas is an inflammatory affection, accompanied with fever, which, together with drowsiness, is generally present a few days before the attack, the latter symptom disappearing when the disease is fully established.

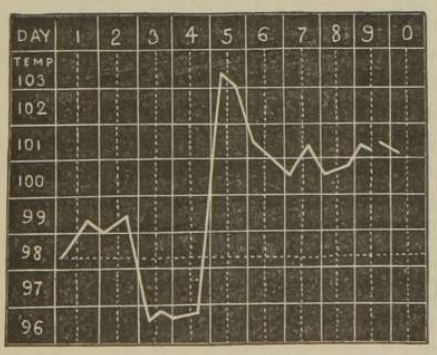
The inflammation is generally confined to the epidermis, which becomes hot, red, and swollen, and sometimes covered with blisters (erysipelas bullosum), but in very violent cases the deeper-seated tissues are affected, and the disease is termed *phlegmonous erysipelas*. Every part of the body is liable to be attacked, although the face, legs, and feet are most frequently affected.

Erysipelas does not often attack persons before the age of puberty; it is a disease of advanced life, and is more frequently encountered among females than males, particularly those of a sanguine, irritable temperament.

In some individuals there appears to exist a predisposition to the disease. In other instances it returns periodically, attacking the patient once or twice a year, and sometimes oftener, thereby greatly exhausting strength.

Erysipelas is occasioned by the several causes that are liable to excite inflammation, such as injuries of all kinds, the external application of acrid substances to the skin, exposure to cold, obstructed perspiration, suppressed evacuations, etc., etc. The disease also appears to be, under certain circumstances, epidemic, caused by a peculiar state of the atmosphere, and this is frequently the case in crowded ships or in hospitals.

FIG. 109.



Heat-line in Erysipelas.

In slight cases, when the extremities are attacked, this disease makes its appearance with roughness, pain, heat, and redness of the skin, which becomes pale when the finger is pressed upon it, but immediately returns to its former color when the pressure is removed. There also prevails a slight febrile disposition, and the patient is rather hot and thirsty. If the attack

is mild, these symptoms will continue for a day or two, when the surface of the affected part assumes a yellowish tinge; the cuticle may separate in small scales, and the patient experience no further inconvenience; but if the attack is severe, and the symptoms of high inflammation are present, there will be intense throbbing pain in the head, pain in the back, great heat, thirst, and restlessness; the affected parts will swell, the pulse become frequent, and either hard and tense, or it may be small and rebounding, the temperature often rises abruptly, as is seen in the accompanying cut, No. 109. About the fourth day a number of small vesicles make their appearance, containing a limpid, or in some cases a yellowish fluid. In unfavorable cases these blisters have sometimes degenerated into obstinate ulcers, which assume a gangrenous character. This, however, does not happen frequently, for though the surface of the skin and the bullæ may assume a bluish, or even a blackish tinge, yet such appearances generally disappear, together with the other symptoms of the complaint.

The appearance of these vesicles is not always present in an attack of erysipelas, and when they do show themselves, the period of their eruption is very uncertain.

The trunk is also attacked with erysipelas, but less frequently than the extremities; but infants a few days after birth may be affected in this manner, the genital organs being generally involved.

When erysipelas attacks the face, the premonitory manifestations are chilliness, succeeded by heat, thirst, restlessness, glistening eyes, coated tongue, redness of the cheeks and other febrile symptoms; and when the disease attacks this portion of the body there is drowsiness, or a tendency to coma and delirium, and the pulse is very frequent and full. At the end of two or three days, a scarlet redness appears on some parts of the face, which may extend to the scalp, and then gradually down the neck, leaving tumefaction in every part occupied by the redness. When the swelling and redness have continued for a time, blisters, varying in size and containing a thin, colorless, and sometimes acrid liquor, arise on the face, which becomes turgid and swollen, and the eyelids are sometimes swelled to such a degree that the patient for the time is deprived of sight. The fever sometimes becomes less when the inflammation is established, but in the majority of cases it increases as the latter extends, and, unless checked by the appropriate means, may continue for the space of eight or ten days. If such is the case, the coma and delirium increase greatly, and the patient may be destroyed between the seventh and eleventh day. If the attack be mild, the inflammatory symptoms subside gradually, and the disease terminates in a few days.

In ordinary practice, erysipelas cannot be said to be contagious; but in hospitals, or where many persons are crowded together in a small space, with poor ventilation, the character of the disease assumes a far different type. It sometimes causes the surgeon great apprehension, especially for the welfare of other patients suffering from wounds. I well recollect my consternation when, after having performed a resection of the elbow-joint at the hospital, on going through the wards I found a case of erysipelas in a little girl in one of the lower rooms. Although every precaution was used, on the next day symptoms of the disease developed themselves in a boy from whom I had removed half of the inferior maxillary bone about ten days previous. The patient from whom the elbow-joint had been exsected died about the twelfth day. In the case of the little girl I administered belladonna[38] every two hours, and in a few days she was able to undergo the operation of removal of the limb.

With reference to "hospital erysipelas" Mr. T. Holmes,* in his late admirable work on surgery, thus writes:

"I cannot but protest against the assumption involved in the terms 'hospital erysipelas' and 'hospital diseases' as descriptive of the complications of wounds. Such complications are met with, it is true, most commonly in hospitals, for the simple reason that wounds are also met with most commonly there; but they occur very frequently in private practice, even under the most favorable circumstances, and they have never really been *proved* to be relatively more frequent in good hospitals than in private practice, in similar cases. There is much need for us all to do our best to improve in every way the air, the treatment, the dressing, and all the other circumstances of the wounded in our hospitals—and thereby, doubtless, the prevalence of these complications will be lessened—but it is a sad error to impair the reputation and thus diminish the usefulness of our hospitals by reckless aspersions on their salubrity."

Erysipelas of the face is more dangerous than when other portions of the body are attacked, because there is a tendency of the inflammation to attack the brain. The prognosis is unfavorable if the fever assume a malignant type, or when there is threatened metastasis to internal noble organs.

Treatment.—The medicines that are most serviceable in erysipelas are acon., apis mel., bell., bry., euphorb., puls., rhus t., sulph., canth.

Acon.—In simple erysipelas, with the ordinary fever and other accompanying symptoms, this remedy will frequently be sufficient to arrest the disease, without the administration of any other medicine; it is also of great service when in violent cases, there is intense synochal fever, but *belladonna* is preferable in many cases, where there is coma, delirium, flushed cheeks, throbbing carotids; where the swelling is tense, and there is present a stinging or shooting pain, increased by contact or at night; when the erysipelas extends in rays, and there appears to be a disposition of the inflammation to attack the deeper-seated tissues (erysipelas phlegmonodes). In a majority of cases acon. in the commencement of the disease, and bella. exhibited when the affection has fairly set in, will be sufficient to complete the cure.

Apis mel.—The honey bee poison has a specific influence upon erysipelas, especially when the swelling is very great, and rather of the pale than purple variety. There is much testimony in its favor, in the treatment of this disease, and it should never be forgotten by the practitioner in the selection of his medicines.

Cantharides.—This medicine has proven very excellent in my hands in the vesicular variety of erysipelas, particularly when the vesicles are small and very numerous. It is not necessary, in the exhibition of this medicine, to look for its well-known action upon the urinary apparatus. Its beneficial results will be fully seen without any such manifestation.

Hydrastis canadensis has been highly lauded in this disease, particularly as a local application. Dr. E. B. Warren (A. H. O., vol. iii, 469), reports favorably of a solution composed of 20 grains of the powdered hydrastis to 32 fluid ounces of water.

Bryonia may be employed in cases in which the affection attacks the joints, when there are drawing-tearing pains, increased by motion.

Euphorb.—This is suited to erysipelas of the head and face, with digging, boring, and gnawing pains, followed when ameliorated by creeping and itching of the part. When there is considerable swelling, and the vesicles are small, the fluid rather yellowish than white, and a considerable amount of heat, this medicine is also indicated.

Pulsatilla is indicated when the erysipelas shifts from one place to another (*erysipelas erraticum*), and when the hue of the skin is less intense, and there are shooting pains. This medicine should also be recollected when the disease affects the ear. Hartmann remarks: "Pulsatilla is never indicated in pure erysipelas of the face, except when accompanied with stitches, in which case the disease is apt to go

* A Treatise on Surgery, its Principles and Practice, 1876, p. 70.

to the brain; this can be more effectually prevented by belladonna than by pulsatilla."

Rhus tox.—This is the principal medicine for vesicular erysipelas; it is also indicated in erysipelas where there is extensive œdema, or where there is a tendency to metastasis of the disease to the brain; rhus radicans has been very highly extolled for facial erysipelas, as has been also graphites and hepar, but of course there must be corresponding symptoms to indicate their use.

According to Reissig, nux vom. is well adapted to this disease when it attacks the knees or feet, when there is intense pain and bright-red swelling.*

If there be a tendency to metastasis to the brain, cuprum acet. is an extremely valuable medicine, as the author has had opportunity of witnessing. Dr. Schmid, of Vienna, also corroborates this statement.

Belladonna and Rhus tox. are adapted to that form of this disease which is found in hospitals. The erysipelas partakes of the phlegmonous character, and therefore the former remedy would perhaps be preferable. If the disease assume a gangrenous form, the vesicles become dark and blackish, with prostration, dry skin, frequent but easily quenchable thirst, *arsen.* should be administered, or perhaps *carbo veg* may also be indicated in erysipelas gangrenosa, particularly if there be night and morning sweats, excessive prostration, and disposition to typhoid symptoms.

Rhus should also be remembered, and administered if suitable for such a condition. If there be a disposition to ulceration, sulph , hepar, graph., silic. are important medicines.†

I have never witnessed satisfactory results from the use of local applications in the treatment of erysipelas. It is very fashionable (and fashionable folly too) to apply poultices or mercurial ointment, or the acetate of lead in solution, or to pencil the parts with tincture of iodine and nitrate of silver. These are worse than useless. The homœopathic medicines are so marked in their action in the disease, and so extremely efficacious, that all outside applications positively retard recovery. If there be much itching towards the close of the affection, rye flour dusted over the parts is quite sufficient to allay it, and even this symptom is more quickly relieved by hepar sulp., or sulphur.

Boil, Furunculus.—A boil is a prominent, hard, red, and circumscribed tumor, very often extremely painful, and though terminating in suppuration, the process by which the pus is formed is frequently of long duration.

The inflammation is of the sthenic type, affecting the skin and areolar tissue; the latter becoming disorganized, constitutes what is termed the *core* of a boil.

A common furuncle differs from a carbuncle, because the latter is asthenic, not only constitutionally but locally, the life of the patient being often endangered by the disease; while a boil is sthenic in itself, is generally indicated by a robust and plethoric temperament, and is in most instances free from fever or any constitutional disturbance. The cases in which

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* "I had a case of erysipelas where the disease reappeared frequently, always on one side of the face only, and where every attack was preceded for several days by a violent cardialgia. A single dose of nux vom.[15] effected a permanent cure, showing that accompanying symptoms often indicate a different remedy from what are generally considered specifics for erysipelas. In such cases sulphur might likewise be resorted to, particularly when a throbbing-stinging pain is experienced in the swelling."—Hartmann's Acute Diseases, vol. ii, p. 39.

† There have been many interesting cases of erysipelas reported in the homœopathic periodicals of the day. One of the best can be found in the British Journal of Homœopathy, vol. vi, p. 532.

fever may be expected, are those in which the tumor is large, and situated on a sensitive part, or when a number of these swellings appear at the same time in different places. A carbuncle contains no core, and has several openings for the exit of sloughs.

As suppuration progresses in the tumor, the apex of the cone becomes yellowish, and surrounding this, the hardness of the swelling disappears, though still the base is firm and unyielding. The pus is superficial, the slough or core being at the base.

According to Richerand, the origin of boils depends upon a disordered state of the gastric organs; this is frequently the predisposing, while the exciting cause may be a prick, a scratch, or some other slight irritation. Constitutional irregularity, however, is, in very many instances, sufficient in itself to produce this variety of inflammation.

Boils may appear in any part of the cellular tissue, and are mostly found among young plethoric individuals, or in those persons who are given to high living and suffer from dyspepsia. Some individuals appear to be particularly liable to the formation of furuncle, and the hips and buttocks are frequently the seat of the disease; it is in this locality that they are extremely vexatious, as the afflicted mortal can neither sit with comfort, or walk without pain, which is occasioned when the muscles are rendered tense, and, moreover, the individual is constantly kept in a ferment of anxiety and suffering, consequent upon the frequent blows that are invariably, unaccountably, and inadvertently inflicted upon the tender and painful tumor.

A boil, after suppuration is complete, bursts at its apex, and the purulent secretion is discharged, after which, the pain, heat, and swelling subside, but unless the slough is also extracted, the part may remain in a subacute inflammatory condition, the disorganized tissue acting as any other mechanical irritant.

At certain periods of evolution of the system, a number of boils are apt to make their appearance in the same individual. At the climacteric age, during teething, or about pubescence, we often are called upon to treat a succession of these disagreeable visitors. A systematic constitutional treatment must then be adopted. The medicines being chiefly hepar, kali hydriodicum, and sulphur.

Treatment.—The homœopathic treatment of boils is very efficacious; indeed the careful practitioner can frequently administer prophylactic medicines to those in whom there is a tendency to this variety of inflammation, thereby saving the patient from great inconvenience and a considerable amount of pain.

In the treatment of furuncle a poultice may be sometimes necessary. The heat and moisture of an unmedicated fomentation produces often great relief. Such means, however, I have not always found essential. There is naturally existing in the minds of the older portion of the community, whether physicians or laymen, a favorable predisposition in regard to the application of a poultice. Those who have been born, bred, and habituated to the application of such means for almost every variety of local inflammation, cannot, without some hesitation, resign the adjuvants; but experience teaches, that patients *are* cured as speedily, and in most instances more radically, of such inflammation, by homœopathic medicines than by purging the patient with drastics, "touching the liver" by means of mercury, and enveloping the tumor with a poultice of mush, oatmeal, flaxseed, or slippery elm.

The medicines that are most applicable in the treatment of boils are

arn., bell., calc., hep., lyc., phos., sulph., or alum., antim. c., led., merc., mur. ac., nit. ac., nux vom., sep., thuj.

To eradicate the disposition to boils, the medicines are: calc., lyc., nux vom., phos., and sulph.

If the boils are large, hepar, lyc., nit. ac., sil. or hyos., phosph., tart. e.

If small, arn., bell., sulph., zinc.

If suppuration progresses slowly, merc. will hasten the formation of pus.

When there are *stinging* pains in the boil the medicine is nux vom.

When there is troublesome itching, carb. veg. or thuja, the latter particularly when the redness extends to some distance around.

If the pain is lancinating, calc. carb. If the pain is stinging, when the boil is touched, lyc. If this be present during motion, mur. ac.

If burning, colocynth.

If there is burning pain extending to some distance around, antim. crud.

Dr. Gallupe, of Bangor, has seen good results follow the exhibition of crotalus horridus in furuncle.

There are also many other remedies mentioned for boils, appearing on the different parts of the body, but it is probable that if the above symptoms are present the medicines will relieve, without regard to locality. However, the student is referred to the Symptomen Codex, to ascertain the particular situation of the boil, if the treatment above recommended has been unsuccessful.

Berberis vulgaris is an excellent medicine to hasten suppuration in boils, and by its proper administration it has removed the predisposition to them.

In the *British Journal of Homœopathy*, for July 1st, 1861, p. 499, is described the lotion (so highly lauded by Rademacher) of the solution of calcarea muriatica. This I have used topically for boils, but think it better adapted to anthrax.

Dr. Dudgeon has witnessed the beneficial effects of the solution. The prescription is as follows:

℞. Calc. mur., ... ℥iij.
Aquæ puræ, ... ℥iij.
M.

Dr. Kallenbach, Sr., of Utrecht, gives an excellent paper on the subject.

In *Hale's New Remedies*, asclepias, erigeron, gnaph., nymph., phyto., and sanguin., have all been proved to be beneficial; and hamamelis, iris ver., and stillingia would, by provings, seem to be indicated as efficient remedies.

Anthrax, Carbuncle.—A carbuncle is, in some respects, analogous to a furuncle, though the former is much more dangerous, the inflammation being more extensive and gangrenous in character.

The tumor is deepseated, hard, and circumscribed, and rapidly advances, becoming livid and attended with severe burning or lancinating pain. The inflammation, as has been before stated, is of the asthenic type, and attacks the skin and subadjacent areolar tissue.

As the inflammatory process progresses, the tumor becomes soft, of a purple hue, and spongy; suppuration, ulceration, and sloughing of the cellular tissue supervene, and numerous small apertures form in the skin, through which a thin sanious pus is discharged, together with the disintegrated areolar tissue. This condition is one of the most important diag-

nostic signs between anthrax and common boil, for in the latter, however large, there is but a single opening.

The usual situation of carbuncle is the back, from the nape of the neck to the pelvis, though any portion of the body may be attacked. The size varies from that of a chestnut to that of the palm of the hand, the constitutional symptoms, when the tumor is large, being dangerous in the extreme.

The fever, primarily, is simple, or may be bilious in its character; but as the disease progresses, typhoid symptoms make their appearance and increase, and as the occult gangrene extends, prostration becomes more extreme, and hiccough, delirium, coma, and even death may ensue.

The swelling is generally flat, bluish, and spongy, only slightly elevated above the surrounding skin, and in most instances circular, and circumscribed by a distinct line of demarcation, which, as in other sloughs, indicates the separation of the dead from the living tissues.

Carbuncles are most common in advanced life, although they may be seen in young persons, especially among those who have been accustomed to hardships or severe privations. They are also encountered in adults who indulge in the excesses of the table, or who have debilitated their constitutions by a life of debauchery.

The medicines for carbuncle are: arsen., bell., chin., hyos., acid. mur., acid. nit., rhus, secal. cor., silic.

Arsenicum is indicated, when the burning in the seat of the carbuncle is intense, and when this symptom is present for some distance around the tumor, or when there is a sensation in the swelling as though boiling water was running beneath the integument; when the pulse is small, irregular, and frequent, and there are cold perspirations. It is also adapted to individuals of a nervous choleric temperament, who have been reduced by long sufferings; when there is emaciation, vomiting of fluids, burning thirst, or bilious diarrhœa.

Belladonna.—When the cerebral symptoms are well developed, red face, shining eyes, severe heat—when the parts around the carbuncle have a tendency to erysipelatous inflammation. Dr Pardo thinks bell. is best adapted in the transition from gangrene to sphacelus.

China is recommended by Dr. Pardo, "when the asthenic character of the disease is particularly well marked, with symptoms of a febris putrida, the more so when the patient is leucophlegmatic and much reduced by loss of blood, or if the carbuncle develop itself under the influence of swamp miasms."

Hyos. is particularly serviceable when the disease is present in nervous or hysterical individuals; when there is coma vigil or great restlessness, caused by excessive nervous excitement, shaking of the head in all directions, optical illusions, constriction of pharynx, when there is itching around the part.

Mur. ac. is said to be the main remedy, when the carbuncle appears in scorbutic individuals, with ulcers on the gums, and if in addition to the local symptoms, there be a feeling of emptiness in the stomach and abdomen; frequent desire to urinate, with profuse emission of clear urine.

Rhus tox.—When there is burning itching around the carbuncle, with vertigo, as if one were about to fall, stupor, pale face, disfigured, and convulsed; pointed nose, sanguineous or serous frothy diarrhœa.

Lachesis or **Kreosote** may also prove serviceable in this disease.

Calcarea muriatica has also been employed by Rademacher with great success.

Dr. Pardo* and Dr. Victor de Iturralde† mention several cases of carbuncle that were cured by homœopathic treatment; the medicines employed were ars., bell., and silic. The latter named gentleman used chiefly bell., and after relating his success, he remarks: "The irritability under

* Bulletin Official de la Soc. Hahnemann, vol. ii, No. 12, 1848.

† Loc. cit., vol. ii, No. 1, 1847.

the usual treatment was great; by homœopathic treatment, however, nine-tenths less."

It is usually laid down in the textbooks, that free incisions into the inflamed surface is the proper and appropriate treatment. For some years, however, indeed ever since we have had mental fortitude enough to lay aside the routine practice of the schools and think for ourselves, we have had our doubts with reference to these free incisions, and when we carefully review the cases we have seen treated by others, as well as those that have come under our own observation, we have as yet to discover that *decided* benefit accrued from the "free incisions," to prevent spreading. We are, therefore, glad to observe that the celebrated Mr. Paget, of St. Bartholomew's, is also averse to this method of treatment. In the *Practitioner* he says:

"I have seen carbuncles spread in as large a proportion of cases after incisions as in cases that have never been incised at all. I have in my mind a striking case that occurred to me early in practice when I followed the routine, and a friend of mine divided the carbuncle most freely. I cut it after the most approved fashion in depth and length and width, and then it spread. After two or three days more, all the newly-formed part was cut as freely as the first, and then it spread again, and again it was cut as freely. Then it spread again, and was not cut. Then in a natural time it ceased to spread, and all went on well. . . . On a very strong general impression, however, I say that carbuncles will spread after cutting in as large a proportion of cases as they will spread without cutting." In reference to the supposed relief of pain by incision, and the alleged acceleration of the healing powers by this operation, Mr. Paget expresses grave doubts; indeed, in regard to the latter, he distinctly states that the "healing without incisions is very cleanly, and certainly a great deal the quicker."

In every particular we believe Mr. Paget is correct, and to homœopathists who know there are medicines for the constitutional treatment of the disease, we would say, avoid the use of incisions, unless there be a large slough to be removed. Dress the sore with a hot solution of calendula, several times daily, covering the compress with a piece of oiled silk, and rely on *internal* rather than *external* medication, and the cases will proceed with much greater celerity to a successful termination than if the cutting and slashing practice be resorted to, with all manner of poultices, cataplasms, and ointments. Remove the sloughs as they are formed, with delicate forceps, and keep the parts clean, bathing them frequently with tepid water. Allow the patient a good, but unstimulating diet, and the results will be satisfactory.

In the *Transactions of the New York State Homœopathic Medical Society*, for 1871, Dr. Vincent, of Troy, relates a most remarkable case of anthrax of the face, which he treated successfully with calendula, followed by pix liquida and beer, as an application.

Carbolic acid, or permanganate of potash, or Labarraque's solution must be employed to allay fetor.

Effects of Cold.—If a portion of the body is exposed for a period to intense cold, gangrene results, although it must be borne in mind, that parts may be frozen for a short period, and yet regain their natural color and warmth without any untoward circumstances. This is daily exemplified in the practice of local anæsthesia. If, however, the cold be continuously applied, the parts first become shrunken and hardened, and are redder than natural, from the diminution of the arterial supply; if the exposure is continued, the shrinkage increases, but the cold changes to a pallor, and sensibility is lost. This may go on until death of the frozen parts results.

A still more serious effect of intense cold when applied generally to the

body is that of *coma*. The first sensations are those of pain and numbness, sometimes accompanied with a feeling of sickness at the stomach; after this, there gradually steals over the patient an irresistible drowsiness, an unconquerable desire to sleep. The patient generally is aware of his condition, and endeavors to rally himself, by exercise or motion of some kind. He is often conscious of the fact, that if he yields to the drowsiness, death will be the inevitable result.

From this, it will be seen that there are several effects which are produced by exposure to cold, the milder form being a simple chilblain, the next actual frostbite occasioning gangrene, and finally the constitutional effects resulting in coma and death. It is a most remarkable fact, that persons who are habitually used to taking alcoholic beverages, or those who ply themselves with stimulants before exposure, are those in which the dangerous constitutional effects of cold are most manifest. The history of many Arctic expeditions, and the personal experience of those who have been obliged to face intense cold, prove this fact beyond a doubt. Cold water, or what is better, cold tea, taken before exposure, offers better chances for endurance than any other kinds of hot or cold stimulating drinks.

Treatment.—When a part is frozen, care must be taken not to expose it too suddenly to a heated atmosphere. The parts should be briskly rubbed with snow or ice-water, until a slight degree of warmth is obtained. After this, water of ordinary temperature may be employed, and the part elevated and often *actually suspended*, the friction being always made from the periphery toward the centre of the circulation. So soon as the circulation is restored the room may be made gradually warm, and the parts enveloped in flannel cloths.

At this time, the pain from the reaction may be intense, and fever may appear. This is allayed by the internal administration of aconite, and the application of the same tincture, diluted one half with water, over the part, or the local application of tincture of iodine may be used, or what is better, the following preparation, which was employed most successfully in the Austrian Polar expedition:

℞. Iodinii, ... 4 parts, by weight.
Etheris sulphurici, ... 30 " "
Collodii, ... 100 " "
Apply with a brush.

If a person has become comatose from the general effects of cold, the same principles must apply that have been already recommended. The patient must be taken into a *cold* room, and while Sylvester's method of artificial respiration is resorted to by some of the persons present, others must rub briskly the whole body. This must be done for a few moments with great briskness. *Perseverance and regularity of all the movements are essential.* After this, when signs of returning vitality begin to be manifest, the room may be gradually warmed; the frictions and artificial respiration may be less frequent, and finally may cease. The patient at this time generally will have sighing respiration and some slight movement; a partial return of color to the lips and a more healthy appearance of the skin indicate that the circulation is being established. At this stage, drop doses of spirits of camphor, at first every quarter of an hour, and at longer intervals as the reactionary symptoms progress, should be given. This medicine, however, must give way, in the course of a few hours, to *aconite* and *belladonna*, which should be given in alternation every hour if violent inflammatory symptoms supervene.

If the exposed parts are dead beyond resolution, then an emollient poultice must be applied, disinfectants used, and the surgeon wait for nature to draw the line between the living and dead tissues. Other medicines of course must be given according to the presenting symptom, in the varied conditions mentioned.

Pernio is an inflammatory affection, usually the secondary effect of cold, caused by heat and circulation being prematurely restored. It is commonly met with in the extreme parts of the body, as the fingers, toes, heels, ears, and nose, as these are not only habitually exposed to cold, but also are of comparatively weak circulation, and consequently of low power.

The skin is at first pale, and presents a somewhat shrivelled appearance, but this is in a short time succeeded by tumefaction and dark redness, with a sensation of heat and intense itching. The swelling also sometimes cracks and bleeds, and there is a tendency to ulceration.

These are usually the presenting symptoms in ordinary chilblain; however, if the disease advances, the skin assumes a purplish cast, the tingling, burning, and itching become intolerable, and vesicles form, which contain a serous fluid; these do not desquamate in the ordinary manner, but burst and disclose beneath a painful and ill-conditioned sore, that discharges a thin, watery fluid; this ulcer is often slow to heal, and may assume the character of an irritable or indolent sore, which is generally superficial, but may become gangrenous, or may penetrate to a considerable depth, involving tendons or bone.

The milder form of the complaint—that unattended with ulceration—is of frequent occurrence in this climate during the winter season. It particularly appears on the feet of those who have been compelled to stand or labor in the snow, which, melting, penetrates through the leather of the shoe or boot, thus wetting the feet, which are often imprudently held near a warm fire and allowed to dry; this premature restoration of heat engenders the affection.

Chilblains often disappear spontaneously in the summer, but return again in the winter season, generally attacking those parts that have previously suffered.

This affection is also very liable to occur in those individuals afflicted with dyspepsia or other disease which renders extreme circulation imperfect.

The medicines for chilblains are: agar., arn., ars., bry., bell., carbo a., kali c., lyc., nit. ac., nux vom., petr., phosph., puls., sulph., zinc. met.

Agaricus is of great service when the itching is *very intense*, and accompanied with burning. This medicine is frequently sufficient to cure the affection, and allays the *itching* in a short time.

Arnica "is a certain remedy when the inflammation of the chilblain is caused by pressure, friction," etc.*

Arsen. should be used if the vesicles appear to become blackish, and there is tendency to gangrene, and china may be prescribed under such circumstances if other symptoms correspond; it is particularly indicated if humid gangrene should have set in; opium also may sometimes be indicated.

Kali carb. for inflamed chilblains, with aching, or with cutting pains.

Nit. ac. when there is much itching with swelling and pain. Petrol. and phosph. are also very serviceable when the suffering is intense.

Nux vom. is indicated when the inflammation is superficial, with bright-red swelling, with burning itching, or when the tumefied part cracks and bleeds readily.

Puls. must be administered if the swelling is bluish, hot, and attended with

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* See Hartmann's Acute Diseases, vol. ii, p. 41.

throbbing pains, particularly if the patient is of a gentle or phlegmatic disposition. Bell may also be indicated in this form of chilblain, if the disposition of the individual is sad and indifferent, though at times vehement.

Rhus tox., "when there is burning itching in the afternoon and evening; when not scratching there is a pricking in the chilblain, obliging him to scratch; blotches after scratching."

Sulph. is suitable when there is redness and swelling, with a tendency to suppuration, and also "for thick red chilblain on the finger, itching during warmth, also painful."

Zinc. met. "Chilblains on the hand, itching and swelling violently."*

Nit. acid and **petroleum** have been recommended when the inflammation sets in with very cold weather.

For "chilblains on the feet, with pain and redness during the summer season," antim. crud.

The feet should be bathed night and morning in cool water, and rubbed thoroughly with a coarse towel, hair mitten, or flesh brush. Persons subject to pernio should wear cotton stockings or socks. If any external application is needed a preparation called cosmoline, which is pure petroleum, is preferable. In the country coal oil is used, and I have seen much benefit from it.

Burns and Scalds.—The practitioner is frequently called upon to treat injuries that have resulted from the application of heated solids or fluids to the skin. Sometimes the danger to the system is slight, but at others, when the heated matter has come in contact with a large surface, the prognosis is very unfavorable. By the term scald is understood the effect of heated fluids when applied to any portion of the body, while the consequences of hot solids or ignited combustibles are termed burns. The latter class is, in the generality of instances, the most serious, although the former, though not injuring the skin deeply, gives rise to very alarming symptoms when a large extent of surface is involved.

Dr. Magill† has recorded one of the most interesting cases of instant rigidity, from the effects of heat, in the annals of surgery. The reader is referred to it, as it indicates the rapid coagulation of the muscle fibrin of the entire body by intense heat.

A slight degree of heat is only productive of a sharp hot pain, with redness of the surface, and these may both subside without any other unpleasant symptoms, but in very many instances effusion of serum immediately takes place beneath the cuticle. In other cases the cutis may be destroyed by the intensity of the heat. Parts also that at first do not present appearances of any very serious injury may afterwards be involved, perish, and be cast off as a slough. The surrounding textures also have their vitality diminished, and when they come to be the seat of the inflammatory process are unable to sustain the increased action, and from the want of corresponding power sloughing very often ensues.

In this era of steam, coal oil, and beer making, accidents are very frequent, occurring chiefly among the lower classes. Brewers, engineers, soap-boilers, manufacturers and refiners of sugar are most liable to *scalds*, which implies the application of heat, together with a certain degree of moisture; while iron-workers, machine-makers, foundrymen, who work among metals, are the most frequent subjects of burns.

Certain substances, having a greater capacity for caloric than others, necessarily produce, under similar circumstances, more severe burns than others. Thus, molten lead causes a more severe burn than boiling oil, and

* See Mat. Med., vol. ii, pp. 690, 924, 1033. Ibid., vol. i, p. 121.

† British and Foreign Medico-Chirurgical Review, January, 1877.

boiling oil more severe effects than boiling water; copper, when heated, is said to act more severely than iron at the same temperature.

Burns on the trunk and genital organs are very serious and productive of the most disastrous results, and extensive injuries of this kind, no matter in what portion of the body, are much to be dreaded. The constitutional symptoms are often well marked; they are, great sinking of the vital powers (which generally is present immediately after the reception of the injury), shivering, weakness, cold extremities, anxiety, vomiting. And these may be readily accounted for, when it is remembered what an important office is fulfilled by the texture that is in almost every instance the first to be implicated.

Authors differ in their classification of burns. One makes three divisions: 1. Redness; 2. Vesication; 3. Mortification. Another, of equal celebrity, divides these accidents into four varieties, according to the intensity of the heat applied. Dr. Thompson* arranges them,

1st. Into such as produce an inflammation of the cutaneous texture; but an inflammation which, if it be not improperly treated, almost always manifests a tendency to resolution.

2d. Into burns which injure the vital powers of the cutis, occasion the separation of the cuticle, and produce suppuration on the surface of the cutaneous texture.

3d. Into burns in which the vitality and organization of a greater or less portion of the cutis is either immediately or subsequently destroyed, and a soft slough or hard eschar produced.

Pearson also names three varieties, and his arrangement is approved and followed by Dr. Gibson, viz.:

1st. Superficial; 2d. Ulcerated; 3d. Carbunculous.

The best classification, however, is that of Dupuytren, which is recommended by Dr. Henriques.† He divides burns into six degrees.

The first occurs when a small quantity of caloric has been applied for a short space of time, which determines simply a *greater or less degree of inflammation of the skin, and resembles much, simple erysipelas.*

In the second degree, there is not only cutaneous irritation or augmented organic action, *but there is also vesication, or the formation of bladders, more or less considerable, which resemble strikingly the blisters of very acute vesicular erysipelas.*

The third degree is characterized by disorganization of the dermoid tissue, and its *conversion* into a *hard, black,* and *dry slough.*

In the fourth degree, both the *dermoid and subcutaneous tissues are completely disorganized.*

The fifth degree comprises those only in which there is disorganization of the skin and all the subjacent tissues, except the osseous; and in the sixth, there is carbonization of the osseous tissue, as well as of the surrounding soft parts.

From the fact, says Dr. Henriques,‡ "that caloric does not act with the same degree of intensity upon the whole burnt surface, it will readily be understood that only the first degree can occur alone, and that two or more degrees will be found in all other cases of burns. This is admirably illustrated in the application of the moxa, where it will be found, at the part where the heat is immediately applied, the skin diseased and gangrenous, whilst simple inflammation will be present around the edges of the slough, which gradually diminishes, the inflammation assuming the figures of concentric circles."

A burn covering a large extent of surface is a fearful disaster. Imme-

* Lectures on Inflammation. † See British Journal, vol. xi, p. 97. ‡ Loc. cit.

diately after its occurrence the surgeon may be compelled to cut away the charred and blackened clothing. The sufferer has to encounter shock, then pass through the periods of reaction, suppuration, ulceration, and sloughing, and, after all, death probably may be the result. This series of trials will require untiring vigilance and call forth all the knowledge and skill of the surgeon.

Widespread injuries from heat are often accompanied with diarrhœa, and when the surface of the abdomen is extensively involved a fatal hæmorrhage sometimes follows. In a case that I lately attended of a servant girl, whose clothes were ignited, before the flames were extinguished the entire surfaces of her back and abdomen were covered with large bullæ; diarrhœa set in with the reaction and continued until her death, which happened on the fourth day.

In children *perforation of the duodenum* is known frequently to have taken place.

There are *four periods of danger* during the progress of a case of severe burn:

1st. Immediately after the injury, the patient may die of shock.

2d. After the third or fourth day, sympathetic fever or sympathetic affections of the brain or bowels may produce an unfavorable result.

3d. During the period of suppuration, hectic or pyæmia may appear.

4th. From the prolonged irritation the patient may perish from hectic fever or pulmonary consumption. The *degree* of danger is measured, first, by the extent of the burned surface; second, by the depth of the burn.

A burn or scald covering a large surface is always dangerous, although only the integument be involved. It has been stated that when two-thirds of the surface of the body is implicated the patients never recover.

A burn, though dangerous from its extreme depth, is not so likely to be followed by as great prostration and collapse as in the former case, where so many of the peripheral nerves are implicated.

Treatment.—The treatment of burns varies according to the period of time at which the practitioner is called. If shortly after the accident and the patient is suffering from shock, opium, camphor, arsenicum, or veratrum may be indicated. During this period, when the patient is partially insensible, a favorable opportunity is offered for the removal of the charred and burnt clothing, which must be carefully cut away, raising it gently from the burned surfaces, to prevent tearing off the elevated epidermis. The parts are then to be washed with a solution of cantharides, spirits of turpentine, or urtica urens, a drachm of either to four ounces of warm water, and the parts gently though well covered with the solution.

Dr. Henriques applies a solution composed of ten drops of either arnica, cantharides, or urtica urens to half a pint of pale brandy.* If no symptoms of reaction should have supervened, a small quantity of opium in water will assist the efforts of nature if given internally.

An excellent lotion at this period of burn is the creasote water of the new *U. S. Pharmacopœia:*

℞. Creasote, ... fl ʒi.
Water, ... O
M.

Shake the bottle until the creasote is dissolved, and apply carefully.

The next thing to be done is the application of such dressings as will absolutely exclude the external air. Before, however, applying these, the

* *Vide* B. J. H., vol. xi, p. 100.

vesicles must be pricked with a needle and their contents evacuated. Many substances are recommended to protect the parts; cotton, in thick layers, is especially commended. The value of this application was discovered accidentally by a lady living in Harford County, Maryland, whose child was scalded by boiling water over nearly its whole body. The mother was carding cotton in an adjoining room at the time of the accident, and having no medical assistance within reach, undressed the child as quickly as possible, and covered the whole burnt surface with masses of cotton. The effect was wonderful, for the child soon became perfectly quiet, fell asleep, and upon removing the cotton a few hours afterwards, no inflammation whatever could be perceived.*

Dr. Morris, of Baltimore, is averse to the old-fashioned carron oil treatment, and recommends that the patient be entirely covered with loose bran. This strikes me as an excellent method, for the soiled or lumpy particles can be replaced with fresh material without disturbing the patient.†

Many surgeons apply a thick coating of soap or the emplastrum saponis; others prefer a solution of glue or a mucilage of gum. Dr. W. F. Jackson,‡ of Roxbury, Mass., commends very highly the whites of eggs and olive oil, in equal quantities, beaten together and applied with a soft brush.

The application of cotton upon which has been poured a mixture of one part of carbolic acid with six parts of olive oil, then covered with tin foil and a bandage, is well spoken of.

Cosmoline, a substance prepared by Mr. Houghton, of Philadelphia, from crude petroleum, is likewise used with favorable result. I can testify to its efficacy from experience.

Carbolic acid, dissolved in glycerin and afterward in olive oil, is reputed as having been successful in a severe case.

Dr. Gross recommends highly the *carbonate of lead*, mixed with linseed oil to the consistence of cream.

Collodion has also been used.

Carbolated cotton is another excellent dressing.

And, finally, *dry earth* has its especial advocates.

In domestic practice *molasses* and *honey* are also used. The once popular application of linseed-oil and lime-water has not been mentioned, indeed it may be considered obsolete, as numerous better applications have superseded it. Most of those just mentioned I have employed in the treatment of burns. Of these the carded cotton is the simplest, and often proved satisfactory. The carbonate of lead, recommended by Gross, I have used in severe cases, and found it very efficacious, especially when over the painted surface carded cotton was applied. I have not known any unpleasant symptoms follow. Dry earth I have used with success during the profuse suppuration, but have ascertained that it must be carefully watched. It destroys fetor immediately, but as soon as the pus soaks through the dressings, the odor is extremely disgusting. As soon as suppuration begins to be profuse and reaction commences, I place upon the parts carded cotton, and keep it wet with calendula; administer calendula likewise internally, unless other medicines are indicated, in the third decimal preparation. The effect of this plan of treatment often is surprising. The dressing is cleanly and easily applied.

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* Gibson's Institutes and Practice of Surgery, vol. i, p. 72.

† Naphey's Surgical Therapeutics, p. 174.

‡ Publication of Mass. Hom. Med. Society, vol. ii, p. 417.

If the pain is severe, the following will, as a rule, not disappoint the practitioner:

℞. Iodoformi, ... ℥ij.
Ung. cetacei, ... ℥j.
Ex. conii, ... ℥iss.
Acidi carbolic, ... gtt. x.
M. Applied over the inflamed surface, which must be covered with oiled silk.

In order to remedy constitutional disturbances, which always occur with more or less intensity and gravity, the best remedies are, in the first instances, opium, arnica, coffea, carbo veg.

Opium is indicated principally in children, who frequently show a disposition to convulsions and other spasmodic affections, generally the result of fright which this accident produces in the extreme nervous susceptibility natural to this age.

Arnica is useful in all cases and ages to allay the extreme sensibility of the whole body, the general restlessness and intense pain in the seat of injury.

Coffea is necessary to promote sleep and allay nervous excitement.

Carbo veg. is peculiarly adapted to those extreme cases formerly alluded to, in which the shock is so excessive as to threaten the complete extinction of life.

When excessive reaction takes place, and there is dry burning heat of the skin with thirst, head hot and painful, face red, pulse hard, frequent, and contracted, aconite is the medicine indicated. Should suppuration take place, and the discharge be so great as to impair the constitution, it will be necessary to administer hepar sulphuris and china to combat its morbid effects. Causticum and calcarea carbonica may sometimes be indicated in such cases.

To favor the sloughing of eschars, and to promote healthy granulation and cicatrization in the most severe cases of burns, either arsenicum, nit. ac., lachesis, rhus tox., or secale cor. may be required, according to the totality of symptoms present in any given case.

If diarrhœa should supervene, arsenicum, carbo veg., phosphorus, or veratrum may be used, and for hæmorrhage, nitric acid, ferrum, hamamelis, erigeron, crocus, or diadema should be remembered.

Cicatrices.—The last indication of which it is necessary to speak relates to the formation of abnormal adherences which burns frequently produce; this is a most important point in the treatment of these injuries, because they not only result in deformity, but also impede the free motion of parts where they occur, and sometimes prevent the exercise of an important function.

In some instances, no matter how judicious the treatment, this most disagreeable and unfortunate result cannot be prevented. It is a natural consequence of the contractive force of the inodular or cicatrizing tissue. In order to avoid it, however, the process of cicatrization must be carefully and constantly watched, and so regulated that the *cicatrix may have the same extent of surface as the original skin that has been destroyed*, and in preventing it from being formed by drawing together of the edges of the surrounding skin; this may be effected, first, by the administration of appropriate medicines, when the granulations are unhealthy; second, by the proper position of the injured part; third, by the method of dressing the wound; fourth, by the use of fitting mechanical apparatus, which must vary according to presenting circumstances. Notwithstanding all these means, should we fail in preventing deformity, there is still a resource in operative surgery which may relieve the patient.

These operations consist, first, in freely dissecting the cicatrices, and re-

storing, as nearly as possible, the parts to their original position. In most instances the entire cicatrix may be cut out, leaving the wound to heal by granulation, taking care to maintain the parts in proper position while the process of repair is going on; or *dermoplasty* may be resorted to, which consists in taking away the hard inodular tissue, forming a proper flap from sound integument, and fixing it over the wound. The success attended upon these processes is variable, but there is in all of them a great tendency to the return, at all events, in a degree, of the inodular tissue and deformity.

When the process of cicatrization is accompanied by excessive inflammatory action of the surrounding edges, either ars., hepar, merc., nit. ac., phosph., ruta, or silicea will be found useful, according to the particular indications of the special case. When the granulations appear luxuriant or excessive, alum., sep., thuja, are indicated. When cicatrization is interrupted by excessive suppuration, the most appropriate remedies are asaf., caust., hepar, merc., puls., rhus, silic., or sepia. When the ulcerated surface bleeds, the remedies most indicated are: arn., ars., creas., crocus, phos. ac., or secale cor.

Paronychia—Whitlow.—A whitlow is an inflammation very much disposed to suppurate and generally productive of severe pain, commencing in the extremities of the fingers, though the toes are sometimes the seat of the disease.

By some this disease is supposed to be a variety of carbunculous inflammation depending upon constitutional derangement, while others consider it to be entirely of local origin. It is rare to find a whitlow or felon, as it is generally called, in children, and women are supposed to be more liable to it than men, although, from my own observation, I have not found that the one sex is more predisposed than the other.

Writers generally divide whitlows into four varieties: In the first and least severe, the disease commences under the cuticle near the root or side of the nail, the pus not being deepseated and soon evacuated; sometimes, however, the abscess takes place under the nail, in which case the pain is severe, and not unfrequently shoots up as far as the external condyle. The second variety is situated chiefly in the cellular tissue under the skin, and generally occurs at the very ends of the fingers. In such cases the inflammatory symptoms, especially the pain, are far more violent than in other common inflammations of not greater extent. However, though the pain be severe, it does not generally extend far from the affected part. The intensity of the sufferings and the severity of the inflammatory process are owing to the hard unyielding nature of the integument covering the hands; consequently, when the laboring classes are affected by the disease, the pain is much more pungent and deepseated than when those in the higher walks of life are attacked; for the same reason there is often great difficulty in perceiving any fluctuation after the formation of pus.

The third kind of whitlow is distinguished from the others, by the following circumstances. The pain is excruciating, there is very little swelling in the affected finger, but very much in the hand, particularly about the wrist, and sometimes even extending throughout the entire forearm; the pain is experienced along the hand and wrist to the elbow, and in the most severe cases to the shoulder; suppuration proceeds slowly, and after the formation of pus, fluctuation can only be perceived in the hand, the affected finger appearing swollen and tense. The patient is deprived of all rest, and suffers for nights and days together; considerable fever also being present, and sometimes delirium.

The disease in this variety is situated in the tendons and their sheaths,

consequently the power of moving the finger, and often the hand, is entirely lost.

In the fourth variety, the inflammation appears to attack the periosteum. The peculiarity of this form of paronychia appears to be, that however violent the pain, it seldom extends along the forearm, nor is there any external swelling of the affected finger. Suppuration is soon established, and unless the disease be checked and the matter evacuated caries or necrosis of the subjacent bones may be the result.

Whitlow generally arises from local causes, such as splinters, pricks with needles, or other sharp instruments, bruises, warmth suddenly applied to parts cold from exposure, etc. Those individuals whose occupation requires frequent immersion of the hands in warm water and other fluids are particularly liable to the disease; however, there are some cases in which it is impossible to assign any cause.

Treatment.—In the first variety of whitlow, when the disease is superficial, hepar must be used; it is also suitable for the swelling, allays the stiffness and numbness of the fingers, hastens the formation of pus, and mitigates the pain, itching, and throbbing; indeed, in the Materia Medica this medicine is spoken of as being "a specific against panaritia."

Mercurius should be administered when the pains are intolerable at night, with intense aching and burning under the finger-nail, when there is hardness of the surrounding skin and the suppurative process is slow.

Arsenicum is a valuable medicine, when the part assumes a bluish-red appearance, with intense burning pain, with stiffness and rigidity of the joints.

The pus in this form of the disease generally soon accumulates, and will evacuate itself without the aid of the knife; it is well, however, if the skin is hard and unyielding, to wrap around the affected part four or five layers of lint, and keep it constantly moist with tepid water. After the pus evacuates itself, silic. or sulph. will generally facilitate the cure.

In the second variety, the inflammation being more deeply seated, when there is tearing and burning in the affected part, and if the surrounding skin have an unhealthy appearance, with brittle and discolored nails, *silic.* is to be administered; or if after the evacuation of the matter, unhealthy fungous granulations appear, this medicine is of the utmost importance.

Sulphur is indicated, where there is coldness of the fingers, with stiffened joints, when the patient is of a psoric diathesis, or where the finger appears dead and shrivelled, with sticking and darting pains; hepar and mercurius may also be well adapted to this variety of whitlow, and should be administered if symptoms correspond.

If the affection arise from wounds, a lotion of calendula should be applied to the part. Carbo veg. or arsen. must be given, if there appears a black angry-looking sore, with burnings and tearings, and throbbing pain, and strong disposition to ulceration. There is no doubt that in many cases free incision with the bistoury should be made, as soon as the surgeon is fully convinced that pus is present, as the non-elasticity of the parts, the slow suppurative process that takes place, together with the imperfect formation of matter, all tend to increase the sufferings of the patient, and cause an extension of the disease, until more important parts are involved. If the inflammation arise from a puncture, and the patient complains of coldness and alternations of heat, ledum is recommended by M. Teste. Of course in treating any case of panaritium, if there be any extraneous matter

present, giving rise to the inflammatory process, it should be removed immediately.

In the third variety of whitlow, when there is violent burning-aching under the finger-nails, with sensation of ulceration when touching anything, or if the panaris causes a digging-burning pain, with tingling, and if there be proud flesh, *causticum* is the medicine. If there be numbness or tearing, rhus tox. may be indicated. *Sepia* will be beneficial if there is tearing under the nail, with contraction of the finger, with violent beating and stinging. These medicines allay the pains, but often it may be useful to alternate with them either hepar, merc., silic., or sulph.

It is necessary also in this variety of whitlow to have recourse to the knife; the surgeon must not be content merely to plunge a lancet into the sore, but should lay open with a bistoury the whole sheath, taking care, however, not to sever the tendon; after which, by applying a solution of calendula to the part, and inclosing the fingers in lint, the disease may be in a short period cured; if there are unhealthy granulations (proud flesh), and the cut surface shows little disposition to unite, sepia, silic. or calendula may be administered, and sometimes the unhealthy granulations will have to be slightly sprinkled with alum ust.

In the fourth variety, merc., mez., phosph. ac., silic., are chiefly to be relied on. Mez. may be given when there is intense pain. But the matter, as has been before remarked, often forms quickly; here also the knife must be called into requisition. It is useless for homœopathic physicians to decry the knife in all cases, and in every variety of whitlow; in the first, and sometimes in the second form of the disease, the proper selection and administration of medicine may produce the desired result, but in the third and fourth, when the pus has formed within the sheaths of tendons, or beneath the periosteum, incision is imperative, and he who neglects it should be held to a certain degree responsible for the future pain, and perhaps the loss of the finger to which the patient may have to submit.

In the ordinary progress of abscess, the majority of the surrounding textures are pushed aside, and the pus approaches the surface, where a point is destroyed by ulceration, and the matter evacuated. But if nature be balked in her endeavors by resisting textures, as the sheaths of ligaments and periosteum, the pressure is increased to a dangerous degree at various points, areolar tissue is broken up, muscles are detached, bone ulcerates and dies, bloodvessels perforate, joints stiffen, and are rendered useless; therefore, although medicine may relieve pain, hasten suppuration, and after the evacuation of matter, exert a controlling influence over the process of granulation and cicatrization, still the knife must be employed; it must penetrate the periosteum down to the bone.

The toughness of the integuments, and the high grade of inflammation that are present in panaritia, render the incisions very painful. It is, therefore, better before dividing the integuments, thoroughly to freeze the parts with ether or rhigolene spray, and then operate quickly with a very keen-edged knife. The surgeon must do his work thoroughly.

A whitlow may be prevented if, as soon as pain and the inflammation are perceived, the skin of an egg which has been boiled be wrapped around the affected part. At first the patient will experience aggravation of the symptoms, but if the application be allowed to remain, or perhaps applied at intervals, the affection will often be arrested. Electricity is also said to prevent and cure the disease.

Another preventive treatment, which is very efficacious, is to envelop the parts as soon as they commence to swell, with a compress saturated with the tincture of lobelia, and renew the application every two hours.

I have employed the nitric acid treatment, first recommended by Dr. Hirsch, of Prague,* but have been disappointed with it.

There is another point to which I would call attention in the treatment, viz.: the importance of cutting away with the scissors the indurated and horny epidermis which has been loosened by the violence of the inflammatory action. This much relieves the patient.

Lupus.—Dermatologists have made several classifications of lupus, some of which are mentioned in this chapter, but the most simple division for all practical purposes is into *lupus exedens*, in which the ulceration involves both the integument and the subjacent structures, and the *non exedens*, where there are extensive changes in the structure of the skin, without much consecutive ulceration; the former, no doubt, is a variety of the cancroid; the latter is known by the older authorities as the *serpiginous ulcer;* it has also received the name *rodent ulcer;* while the former variety is called *noli-me-tangere*, or the *corroding ulcer of Clark.*

The *lupus exedens* first appears in the form of a tubercle (by some dermatologists it is classified with the tuberculous diseases) on the ala of the nose; it is hard and dusky red, quite sore, the soreness sometimes extending into the nostril. After a time ulceration commences, and a scab forms. It then begins to spread with alarming rapidity, and assumes that especial type of the disease known as *vorax.*

There are several important diagnostic marks, which it is necessary to observe, and in which this disease differs from cancer.

A peculiar mark of the affection is, that it may continue for years, making the most horrible inroads upon the structures which it attacks, and yet the constitution suffers but slightly, thereby differing greatly from cancer, in which there generally is that terrible nervous irritation which often breaks down the system.

If we examine the parts closely, they are covered by a dark-brown or blackish scab, and the surrounding integument adjoining the ulceration is apparently healthy. There are two other diagnostic marks. In cancer, the surrounding parts are infiltrated and red, and are filled with cancer-cells. In lupus there is *no great redness* around the chasm, and scarcely any odor from the ulceration, which is cleanly cut. All these appearances are very different in cancer, and in syphilitic affections, or in Greek elephantiasis, for which the disorder may sometimes be mistaken. The chief characteristics are:

1st. The lack of constitutional irritation.

2d. The dark-brown or blackish crust.

3d. The healthiness of the integument up to the very margin of the sore.

4th. The absence of swelling and redness.

5th. Absence of fetor.

6th. The location of the disease.

The *lupus non-exedens* may appear on the face and chest, and spreads in a serpiginous manner, or extends to one portion of the integument while that portion first attacked is healing.

According to Professor Volkmann, of Halle, a distinguished teacher, lupus may be associated with a scrofulous taint of the system; in other words, with enlargement of the glands, and he has "had to deplore the loss of patients by tuberculosis," although it cannot be said to be a malignant scrofulosis, as classed by Bazin.

Virchow points out the relation of white swelling of the joints (tumor albus articulorum) with certain forms of lupus, although, as yet, perhaps

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* British Journal of Homœopathy, vol. xxi, p. 218.

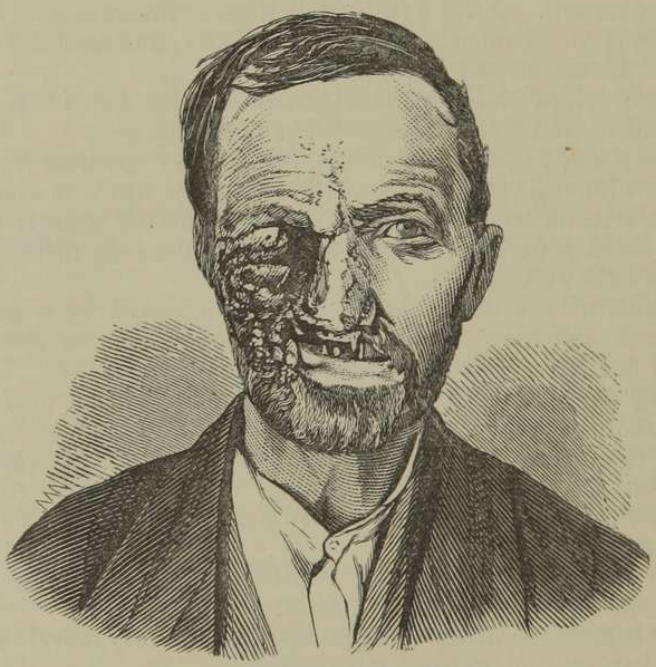
sufficient demonstration of the fact has not been collected. Lupus is separate and distinct from syphilis, and can never be classed in the same category with it.

There is a variety of this disease, known as *hypertrophic lupus*, in which parts may be covered with bluish, knobby, and warty swellings. These may ulcerate, and are frequently covered with the black crust which is so often a mark of the disease.

It is a disputed point, whether such a form of lupus may not become cancroid or develop into cancer, and some authorities have supposed that they could trace distinctly the transformation of lupus to carcinoma, and have thereby endeavored to establish the epithelial nature of the affection. This can, at present, scarcely be allowed; and the fact that lupus, even after existing for a quarter of a century, may cure itself spontaneously, is an argument against its cancerous admixture.

Lupus, therefore, may be considered in all its relations as an inflammatory process, which emanates from the connective tissue, and is found to

FIG. 110.



The Author's Case of Lupus exedens.

consist in a large amount of granulating cells, which, from pressure and infiltration of the parts, destroys the elements of the cutis.

There are other varieties mentioned by authors, all partaking more or less of the same characteristics. Thus, we find that Cazenave mentions the *lupus erythematodes*, which, like other forms of the disease, appears upon the face, as small, scarlet and slightly swollen spots, which may or may not become confluent. These points are covered by scales, which are thin, dark-colored and very closely adherent to the parts beneath them, and consist mostly of secretion from the sebaceous glands, which, from constant irritation, pour out a much increased discharge, which becomes commingled with the epidermic scales. If these layers, so formed, be removed or scooped out, the skin beneath is red, and its papillæ appear elevated, resembling warty excrescences.

Dr. Piffard* thus writes: "If we remove portions of lupous tissue, and harden, slice, and stain them with carmine, we shall find, on microscopical examination of the stained slices, very notable deviations from the appearances presented by the normal tissues. The prevailing feature in all cases is an infiltration of small round cells, resembling the colorless corpuscles of the blood. This infiltration may be simply diffuse, or diffuse with the addition of certain other cells of peculiar appearance. These are many times larger than the small round cells, are polynucleated, and on account of their size have received the name of *giant*-cells. Lastly, the small round cells, instead of being diffusely infiltrated, are collected into certain little clumps or heaps. These three principal histological types found in lupus correspond to three pretty distinctly marked clinical varieties, which differ widely in their appearance, course, and prognosis.

"In comparing the microscopical appearances with the cases from which the specimens are derived, we find: First, that the diffuse infiltration corresponds to the superficial forms of lupus, in which ulceration never occurs; second, that the infiltration associated with giant-cells occurs in the deeper forms, with ulceration and destruction of the entire thickness of the skin; and thirdly, that the 'cell-heaps' are met with in cases that also invade the deeper tissues beneath the skin. The diffuse, small, round-cell infiltration met with in superficial lupus cannot be distinguished microscopically from small-cell infiltrations in other affections, for we may find identical appearances in syphilis, and even in simple inflammation. In the deeper cutaneous lupus, characterized by the diffuse infiltration *plus* giant-cells, we again find nothing peculiar, as giant-cells are met with in many scrofulous hyperplasiæ, in syphilis, and even in normal infantile bone-marrow. The cell-heaps, however, that we find in the deeply ulcerating form are peculiar to lupus, not having been found elsewhere, so far as I am aware. From this we see that there is but a single histological appearance that can with propriety be regarded as peculiar, and this is met with in but a small minority of cases."

The illustration on preceding page (Fig. 110) represents a man who was under my treatment for a length of time in the Good Samaritan Hospital. The patient was sixty-two years of age, and the disease had existed for over a dozen years. The entire right half of his face had been devoured by the lupus. Bone, muscles, arteries, veins, and nerves disappeared under the action of the disease. The superior maxillary and turbinated bones, the lower rim of the orbit and floor of the same, the septum and ala of the nose were eaten through, leaving a distinct view of the superior maxillary and palate bones of the left side. Yet even under this terrible deformity, at times the patient was comparatively comfortable. He rode with me a considerable distance to have his photograph taken, appeared before the classes at the hospital, and gave a detailed account of his disease, its duration, and its ravages.

The medicines that have been recommended for lupus are not many, and those that have been used, have not, so far as I can learn, been productive of very much good effect. It may be that lupus exedens especially, is not a constitutional disease, or that the constitution only becomes implicated after the long duration of the local disorder. If this be so, then as we treat the chancroid, so we should deal with lupus; indeed, from the success which has attended upon this method of treatment in the hands of Volk-

* Certain Points relating to the Nature and Treatment of Lupus, by Henry G. Piffard, A.M., M.D., Albany, 1877.

mann and Dr. Piffard, such a supposition may be correct. At all events, it is certainly worth a trial.

In the case to which I have just alluded, I gave with apparent benefit for the time, a weak solution of the chloride of zinc. The patient stated that he thought the medicine benefited him, and really for a time the ravages, if they did not cease, were not nearly so rapid or successive.

I then tried acetic acid, pure, five drops in a teaspoonful of water, to be taken three times each day, and dressed the cavity with a solution of carbolic acid and glycerin.

In another case which came under my observation, I tried lycopodium, the thirtieth trituration, and from the report of Dr. West, under whose care the patient came, I learned that beneficial action was produced for the time.

Dr. Von Meyer reports a case of lupus non exedens which was cured by apis mellifica.

The local treatment of lupus is of as much import as internal medication, because like the chancroid in many instances it does not affect the constitution, and the treatment must be not only to destroy the nodules, which in reality belong to the disease, but to restore those tissues which may have been but slightly infiltrated and great watchfulness and patience must be maintained by both surgeon and patient, to procure a successful result. Relapses, which are frequent, must be guarded against, and the disease again immediately attacked when it begins to remanifest itself. The caustics which are in most common use are caustic potash and nitrate of silver, and chloride of zinc. Before, however, these can be applied with any benefit, the crusts must be soaked off from the sores by olive or cod-liver oil, and then the caustic (if it be potash or nitrate of silver, the solid stick may be used; if the chloride of zinc, equal parts of that and of flour) should be thoroughly applied; a very important consideration in the application of the zinc or potash is not to allow them to act too long, or the healthy tissues which lie beneath the disease may be eaten away also.

The lupous tissue gives way beneath the action of the caustic, and exudes, and must be wiped away, and when this action ceases, then for the present the application of the caustic must be dispensed with.

Manet's paste, which, containing arsenic, is dreadfully severe, is not much in vogue at present, that of Hebra taking its place. Prescription: Arsenicum alb., one part; cinnabar, three parts; unguentum picis liquidæ, twenty-five parts.

This may be used for three or four days after the true lupus has been mostly removed, or in the type known as the non-exedens; the tissues, which, though not ulcerated, are infiltrated, and of a bluish-red color, must be carefully washed with a solution of nitrate of silver.

Dr. Piffard's treatment, which has been very successful, consists in thoroughly scraping out as much as possible of the diseased parts, and cauterizing the entire surface and margins of the sore with the actual cautery at a white heat.

The treatment above recommended has been found useful in certain cases of lupus, but Professor Volkmann has introduced another method, which, according to his testimony, is superior to all others. The operations are very painful, and ether should be used; then the soft lupous degenerations should be scraped away with a sharp-edged knife, and the infiltrated, and hard and bluish, though non-ulcerated nodules, must be attacked with the "multiple-pointed scarification." This is performed with a very sharp-pointed small-bladed knife; hundreds or thousands of points are made closely together, about two lines deep, or deeper in the diseased part of the

skin, which frequently looks discolored after the pricking, or like chopped meat, or perfectly white, but he never saw gangrene from it. The pricked places are then covered by lint, which is closely pressed in to stop the bleeding, and left then to its spontaneous falling off. These prickings are repeated at intervals of from two to four weeks, five or even eight times. At first the knife enters easily the luxuriant tissues, interwoven by cellular granulations; after a while, it finds more and more resistance, the skin becomes tougher, and loses its abnormal swelling and redness. Professor Volkmann states that no lupus has resisted this method, and the cure, in most cases, was very rapidly accomplished, and that *many cases have been cured in less than eight weeks, after resisting for years all other treatment.*

In this connection I desire to invite attention to the Hydrocotyle Asiatica, a plant long known as an Indian remedy, and which acquired great reputation in the hands of Dr. Boileau, resident in the Mauritius. A plant in his own garden which he named Bevilaqua was ascertained to be the Hydrocotyle Asiatica, or known in America by the name of Chinchunchilly. The doctor treated fifty-seven persons with it, suffering from *lupus. In all without exception* the disease was arrested, and in a very short time.

Dr. Popeau, the successor of Dr. Boileau, treated successfully a case of Arabian elephantiasis, of three years' duration, with the same medicine.*

Veiel† highly recommends the scraping away the tissue and the application of chloracetic acid. He states that for small superficial patches a single pointing suffices.

"Larger and deeper places are best treated by boring the acid into them with a glass rod, and treating the wound after the crust falls by mild cauterization with chloride of zinc. In this way he succeeded in perfectly healing a lupus superficialis, which covered a large part of the upper arm. The acid is of great service also in destroying the projecting cicatricial cords which sometimes follow the cure of lupus, employing between the cauterization the emplastrum cinereum.

"In lupus erythematosus good results were obtained in some cases by the repeated use of an ointment of biniodide of mercury, one part to five. Scarification with subsequent cauterization with chloride of zinc also produced a cure."

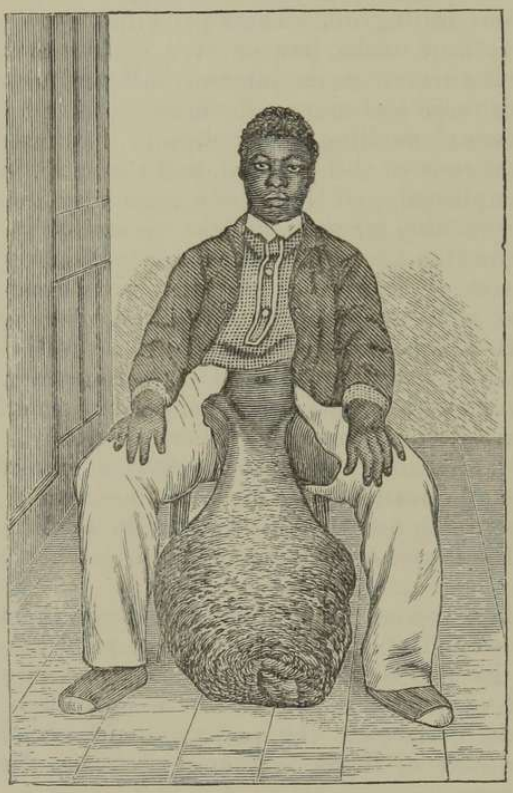
Elephantiasis Arabum.—Hypertrophy of the skin and cellular tissue, is a variety of hypertrophic tumor rarely seen in this country or in Europe, but quite prevalent in tropical regions. It is described by Paget as a "fibro-cellular cutaneous outgrowth." Some authors regard it as a variety of fibrous tumors.

In this disease the skin and cellular tissue become enormously thickened (*vide* Fig. 111); the muscles waste and pass into a state of fatty degeneration, and the bloodvessels and nerves are generally enlarged. It attacks by preference the lower extremities, but is also found in other parts of the body. Elephantiasis of the scrotum, the "pendulous sarcoma" of some authors, is quite common in the East Indies; and Gross cites a case in which this scrotal hypertrophy attained the enormous weight of 102 pounds. The accompanying figure, taken from a photograph, represents the enormous size to which the scrotum may attain. It is the well-known case of Isaac Newton. The tumor when the patient is standing measures in its long diameter, from the symphysis pubis to the preputial orifice, in a direct line, twenty-eight inches; when sitting, the tumor resting on the floor or bed,

* British Journal of Homœopathy, vol. xvi, p. 463.
† Boston Med. and Surgical Journal, Dec. 7th, 1876.

twenty-six inches. In the sitting posture the transverse diameter is twenty-two inches, and the antero-posterior seven inches. The circumference fifty-two inches, and the weight sixty pounds.

FIG. 111.



Dr. Andouit in his proving of the Hydrocotyle Asiatica, with clinical remarks thereon, relates a case of *elephantiasis of the Greeks* (*Lepra tuberculeuse d'Alibert*). After an unsatisfactory use of graphites, petrol., phosph., and arsen., he resorted to hydrocotyle[6], 25 centigrams in 125 grams of water, a teaspoonful every morning. Its administration was commenced on the 28th of January, 1856, and the patient was perfectly cured by the 31st of March.

Dr. Andouit details a case of *lupus exedens of the nose* which he treated with the same medicine. The patient commenced taking it February 14th, and on the 23d of July was cured. A description of the case and its treatment may be found on pp. 585 and 586, vol. xvi, 1858, of the *British Journal of Homœopathy*.

During the winter of 1873, a patient was brought by Dr. Moses to my clinic at the college, who had suffered for a considerable period with elephantiasis of the leg. The measurement around the calf was somewhat over twenty-eight inches, and a mole on the inner side of the leg, which was formerly about a quarter of an inch in diameter, had enormously enlarged, presenting an appearance resembling somewhat in color an encephaloid. At my suggestion she was placed under hydrocotyle, and after having used the medicine for a time, complained of burning and shooting sensations through the affected part. After a continuation of the treatment for a longer period, the limb diminished two inches in circumference. She continued under treatment for several months, with gradual diminution of the parts, but ultimately removed from the city.

Dr. J. M. Carnochan, of New York, reports three cases of elephantiasis of the leg, which were treated by ligating the femoral artery. In one of these, reported in the *New York Journal of Medicine*, for 1852, the ligature came away from the femoral on the eleventh day, with secondary hæmorrhage, for the arrest of which the external iliac was ligated by Dr. A. E. Hossack.

In 1857, Dr. Campbell, of Philadelphia, performed a similar operation, but without satisfactory result. It is a question, however, whether such surgical interference can, as a general rule, be justified.

By **Keloid** is understood a fibro-plastic growth of the integument, which is characterized by elevations varying in size from that of a pea to that of a bean, which are grouped together in grotesque forms. Sometimes this grouping is imagined to resemble a crab, hence the name keloid. This

disease may appear on any or all parts of the body. The elevations are at times the color of the surrounding skin, or they are either darker or lighter. They are quite firm, somewhat elastic, and in the majority of instances ovoid. Their number and extent of surface are often remarkable, and though they at times are very large there appears no tendency to malignant degeneration. Most writers recognize two varieties of the affection, which they denominate the true and the spurious, the latter arising from a cicatrix, from a wound or burn ; the former appearing without any previous lesion or injury. Dr. Hamilton* has known the growth to appear after excision of fatty tumors and injuries. Dr. Gross, however, declares such a division to be arbitrary, "the structure in both of the so-called varieties being perfectly identical."† The symptoms are chiefly itching and burning.

The treatment, both medical and surgical, is unsatisfactory. Excision has, in some instances, been attempted with relief, but generally the disease returns in a short time after operation. A very aggravated case of keloid, which was removed at the Pennsylvania Hospital, can be found recorded in a late volume of the *Medical and Surgical Reporter*. Several operations were performed with the écraseur.

Malignant Pustule.—This affection, termed also by the French, *charbon*, is a septic disease of the subcutaneous cellular tissue, in which a rapid tendency to gangrene is prominent. It is a disease of ancient origin, and was confounded by older writers with carbuncle. It is generated in men from an animal poison, *sui generis*, developed in cattle suffering with murrain—those persons being most frequently attacked who labor in tanyards, or are employed in removing offal. It is also frequently found in stevedores who are employed in handling hides and the horns of cattle imported from where cattle diseases have prevailed.

The parts of the body most liable to be affected are the face, hands, arms, and neck, where it first appears as a swelling, painful and hard, which, after a few days, shows a purple spot in its centre. A blister soon forms, accompanied with itching, which, in about thirty-six hours, disappears, and the part becomes dry and livid. Around this purple spot there soon forms an inflamed areola, which is covered with vesicles in size varying from a millet-seed to a grain of wheat. The surrounding structures are hard and painful to the touch ; while on the other hand, the pain may be so slight as to give rise to no inconvenience. This symptom, viz., the absence of severe pain in the disease, which is so different from other violent inflammations, might be regarded as diagnostic. There is likewise considerable œdema of the parts, especially the face, which is distorted by the swelling. During this time the constitution shows the usual signs of septicæmia; the pulse is irritable ; the patient complains of a feeling of weariness and exhaustion; there is anorexia with sleeplessness. As the disease progresses, the symptoms of gangrene become more and more apparent, and the sphacelus spreads from the centre to the circumference of the tumor ; the discharge is thin, fetid, and acrid; fainting, sweats, pinched features, and parched skin, evince plainly a rapid exhaustion of the vital powers, and the patient dies in from five to eight days from the commencement of the attack. If, however, instead of gangrenous symptoms being immediate, there is a tendency to suppuration, the prognosis may be considered more favorable. In such instances the pulse becomes less irritable, there is moderate perspiration, a

* The Principles and Practice of Surgery, 1872, p. 501.
† Gross's System of Surgery, vol. i, p. 731.

softer skin, a cleaner tongue, and the separation and casting off of the dead portions. In such cases the patients recover.

Treatment.—As soon as a person is supposed to have been inoculated with the poison, immediate destruction of the part should be the aim of the surgeon. It may be either freely removed by the knife, or by the application of the actual cautery. The sore occasioned thereby should be thoroughly cleansed with carbolic acid spray from an appropriate atomizer, and then covered with marine lint. This should be repeated every three or four hours. In the meantime a large quantity of stimulus, in the form of porter or ale, should be given, even as often as every hour or two, and the medicine most specific, *lachesis*, should be given in frequent doses. *Arsenicum* is also indicated when there is excessive restlessness.

Dr. Dunham speaks very highly of lachesis in the disease,* and has related to me a successful case in which this medicine was used with great advantage, together with stimulants. He says, in a note to me upon the subject, "I have pushed food and stimulants with the greatest zeal, preferring Dublin porter to every other form of stimulant, finding that beverage more preferred by patients. I have used in some cases, and did in the case I narrated to you, urge and compel the patient to drink at least a bottle of Dublin porter every two hours, until the pulse revived, and the restlessness subsided."

Arum triphyllum has also been suggested in the disease. I have never had a marked case under my care, and can say nothing regarding the treatment from individual experience.

Morbid Growths upon the Skin.—Many growths are developed in the skin and cellular tissue, some of which are innocent, others of a malignant character. Among the former are :

Verrucæ, Warts.—These are elevations caused by a hypertrophic condition of the papillæ, and sometimes of the subcutaneous cellular tissue. The seat of such growths is commonly the hand, less often the face, lips, and other portions of the body. They are not confined to any period of life, but are most frequent during childhood and youth. Marc relates the case of a woman whose fingers were covered with warts after an apoplectic attack. Cruveilhier informs us that M. Brunel showed him a warty band on the dorsum of the hand, assuring him that it had sprung up on the line of the stream of blood which followed the removal of one of these excrescences.

Sometimes warts appear to be contagious, at others no such origin can be assigned. It is, however, certain that some persons have a predisposition to warts, and to their reappearance after excision or removal by caustic. The growths very frequently disappear spontaneously, and many persons bear testimony of remarkable cures having been effected by "charms," "amulets," and other extraordinary means.

Treatment.—In the first place it may be emphatically declared that it is never necessary to apply either nitric acid or lunar caustic, the routine practice formerly pursued. Internal medication is the most certain means for the eradication of warts. To accomplish this end the medicines are calcarea, causticum, dulcamara, natrum mur., nit. acid., rhus tox., sepia, thuja, and sulphur.

I have often succeeded in the removal of warts by giving calcarea, 3d trituration, 2 grains every night for a week, and following it with thuja, 3d dil., 2 drops night and morning, and applying thuja in tincture to the wart at night. Should other symptoms call for other medicines they may

* *Vide* Am. Hom. Review, vol. iv, p. 110.

have to be employed, and those most likely to be adapted will be rhus, causticum, or sepia.

It may truthfully be asserted that *cures* seldom fail to follow the administration of one or other of these medicines. If the warts are pedunculated, thuja is the specific, and sometimes exercises a marvellous power.

Bed-sores are occasioned by pressure and consequent gangrene and sloughing of parts which have been long lain upon. They therefore are liable to occur from long confinement to bed. The first evidence of their approach is a redness of the integument covering a protuberance of bone, or where there has been much pressure. This redness receives the name *paratrimma*. Bed-sores are generally met with about the sacrum and along the spinal column. At their commencement, itching, burning, and pricking sensations are experienced. Sloughs of a blackish hue and fetid odor sooner or later are discharged. In some instances the bony structure becomes implicated.

Treatment.—The first consideration is to lessen the amount of pressure. This end is best attained by the use of circular air-cushions. The parts are to be carefully washed with a weak solution of arnica. Some prefer them to be sprayed with Richardson's 100th of carbolic acid. Occasionally a poultice may be applied, to hasten the separation of the slough, which being removed, the very best application is the carbolated calendula. For the bed-sore, internal medication can seldom be resorted to, the patients being already under treatment for the diseases which confine them to their beds.

Dr. Brown-Sequard's treatment of bed-sores is both successful and simple. It consists in applying sponges alternately wetted with hot and cold water, to the sores. Each sponge should be allowed to remain upon the part for about one minute, and the entire time occupied should be about ten minutes or a quarter of an hour.

Crussel, of St. Petersburg, recommended galvanism; and in 1859, Mr. Spencer Wells also advocated it. Of it Dr. Hammond writes: "During the last six years I have employed it to a great extent in the treatment of bed-sores, caused by diseases of the spinal cord, and with scarcely a failure, indeed, I may say without any failure, except in two cases, where deep sinuses had formed which could not be reached by the apparatus. A thin silver plate, no thicker than a sheet of paper, is cut to the exact size and shape of the bed-sore, a zinc plate of about the same size is connected with the silver plate by a fine silver or copper wire six or eight inches in length; the silver plate is then placed in immediate contact with the bed-sore, and the zinc plate on some part of the skin above, a piece of chamois skin soaked in vinegar intervening: this must be kept moist, or there is little or no action of the battery. Within a few hours the effect is perceptible, and in a day or two the cure is complete in a great majority of cases. In a few instances a longer time is required. I have frequently seen bed-sores three or four inches in diameter, and half an inch deep, heal entirely over in forty-eight hours. Mr. Spencer Wells states that he has often witnessed large ulcers covered with granulations within twenty-four hours, and completely filled up and cicatrization begun in forty-eight hours. During his recent visit to this country, I informed him of my experience, and he reiterated his opinion, that it was the best of all methods for treating ulcers of indolent character and bed-sores."

Ingrowing Toe-nail.—It is scarcely necessary to describe this affection, it is so well known. Those who are in the habit of wearing tight boots or pointed shoes are liable, from the pressure, preventing the nail growing in a proper direction, to suffer from the complaint. Or the cause may be,

that the soft parts are pressed up over the sides of the nail, thus giving rise to the complaint. Sometimes the cuticle may collect under the edge of the nail and cause inflammatory action. This terminates in ulceration, the matrix becomes affected, the cells lose their vitality, and the solution of continuity is constantly kept up, a process of repair also being at the same time carried on. The toe becomes excessively sensitive, and often swollen; there is a constant but scanty discharge, and the patient suffers continuously.

Treatment.—In the earlier stages, scrape away in a line from the matrix to the extremity of the nail the external layer of cells, which are never nucleated. When we reach the middle layer, in which are nuclei, there will be sensitiveness. So soon as this is noticed, desist, and cut a deep notch at the extremity of the nail. Then partially raise the ingrowing parts with the probe, and insert under them small bits of tinfoil. Direct the patient to cut a hole in the end of the boot to prevent further pressure; continue the scraping and notching for several weeks, and success will generally be the result. If, however, the stage of ulceration has been reached, and the complaint has lasted for some time, a plan which I have found very efficacious, is to shave off the cuticle on *each side* of the nail, and raise the ingrowing ends. Dress the wound with calendula and remove pressure. Dr. McDonald informs me that he has found much success in splitting the nail, withdrawing it, and then with a pair of fine scissors, curved on the flat, dissecting carefully away the entire matrix. This makes a perfect cure, and there is no likelihood of a recurrence of the trouble, as the nail is not reproduced, although a horny growth appears in its place. Dr. Talbot,* of Boston, prepares a small plate of silver, "about a quarter of an inch wide and an inch in length. The edges should be made very smooth, and slightly rounded. About one-sixteenth of an inch from one end should be turned over upon itself, making a kind of hook. This hook should then be passed down the edge of the nail until it reaches the lower corner; then, by simply bending the silver plate over the fungus and outer side to the under part of the toe and fastening it in place by a little adhesive plaster, it will have accomplished three purposes: 1. The covering of the edge of the nail so as to protect the inflamed part. 2. The raising of the nail to its proper position; and 3. By pressing down the granulations, the concealed ulcer becomes open, and the discharge therefrom is not prevented."

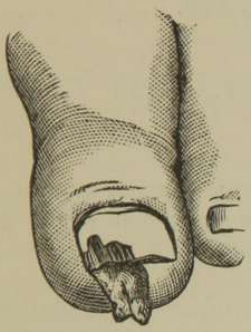
Dr. J. O'Neal† proposes, speaking from personal experience, to first drop a few drops of *liquor potassa* on the ulceration. This renders the nail more flexible and reduces the unhealthy granulations, although at first a good deal of pain is experienced by its application. Then gently raise the imbedded nail and insert under it a piece of thin *velvet cork*. It is this substance, elastic and not absorbent, which is said to constitute the superiority of the treatment.

Onychia.—This is a peculiar disorder, and one which is rare. It is said, according to Mr. T. Smith, that it is chiefly found among children under ten years of age, for among seven thousand surgical patients, only nine cases of the disease were noted, and these occurred between one year and seven. At my clinic last winter, 1878, I had a patient, a boy, about fifteen, suffering from the disease. It has generally been considered as an incurable affection, and certainly is most intractable. In the opinion of some, it is connected with hereditary syphilis, but Mr. MacCormack, who has given some attention to the subject, could not find any such connection in the cases observed by him. The ulcer is gray, ashy-looking, jagged, and irreg-

* New England Medical Gazette, Jan. 1877, p. 10.
† Medical Record, vol. xii, p. 557.

ular. The smell from comparatively so small a surface is intense. There are often red unhealthy granulations scattered over the surface of the sac and the black uneven and jagged edge of the nail projects around it. (Fig. 112.) The entire last phalanx of the affected finger is often blue and puffed, and the pain is most intense and continuous, and is generally of

Fig. 112.



Acute Onychia.

Fig. 113.

Subungual Exostosis.

a gnawing-boring character, worse at night, preventing sleep and wearing away the patient's strength. The disease continues for years, and I believe the evulsion of the nail, according to my experience, rather aggravates than ameliorates the suffering.

Treatment.—The *entire matrix* must be cut carefully away, as is recommended in the worst forms of ingrowing nail.

There is another treatment, which I think ought to be tried before resorting to this painful procedure, and which in the hands of Professor Vanzetti, of the University of Padua, has been followed with most remarkable success.

He relates twelve cases cured by the application of the nitrate of lead. The ulcer is sprinkled thoroughly with the nitrate, and after a day or two the crust that forms is removed, the sore then assumes a more healthy appearance, the pain ceases shortly, the fetor diminishes, and within a week sometimes the cure is complete.

Subungual Exostosis.—Either from pressure of the boot or injury to the last phalanx of the great toe, disease attacks the periosteum and bone, the latter enlarges, presses up the under surface of the nail, giving rise to the most intense suffering. The more it is pressed up from below, the more sensitive becomes the matrix, and in some instances the suffering is excruciating. Removal of the diseased part is sometimes beneficial, but unless the entire bone be removed at its articulation there is great probability that the disease will return. Fig. 113 gives a good representation of the affection.

CHAPTER XVIII.

INJURIES AND DISEASES OF THE MUSCLES, TENDONS, AND BURSÆ.

CONTUSIONS — THECITIS — RUPTURE OF MUSCLES AND TENDONS — MUSCULAR ATROPHY — REFLEX MUSCULAR ATROPHY — ACUTE AND CHRONIC BURSITIS — GANGLION — DUPUYTREN'S CONTRACTION.

THE muscles, with their attachments and bursæ, are all liable to injuries and diseases of more or less import—some trivial, others very severe.

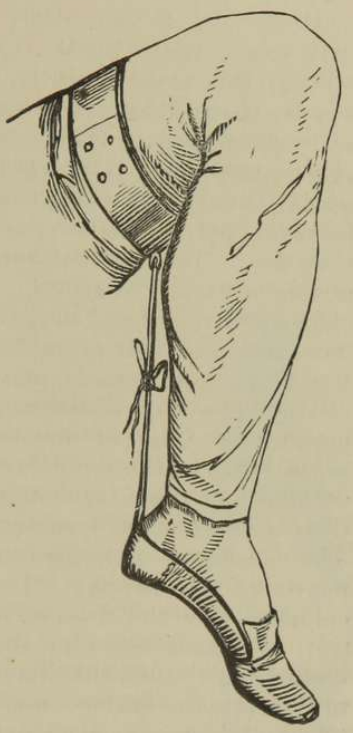
Contusions and wounds are very common, and are considered fully in the Chapters upon Contused and Lacerated Wounds. Inflammation often attacks the sheaths of tendons and gives rise to a serious disease, known as **Thecitis**, a painful affection generally located about the hands and feet, and is sometimes occasioned by a severe sprain, or by the spread of inflammatory action of surrounding parts. There is no disease which occasions more intense suffering and more serious constitutional disturbance, especially when many tendons are involved. Pain and tenderness are first noticed along the course of the affected tendons; this suffering is aggravated during the night, and as the disease progresses, becomes agonizing; the pains are burning, throbbing, and boring—the most gentle touch to the part, the slightest movement, or indeed attempts to flex the fingers or toes increasing the suffering. The pain extends the entire length of the limb, which becomes stiff, the axillary and inguinal glands being involved.

Severe constitutional disturbance follows, and I have known delirium, and even trismus, result. During the progress of the disease the patient is deprived of sleep, the appetite fails, and the extremity becomes attenuated, stiff, and immovable. In a very severe case under my care, the disease was brought on from the prick of a spicula of glass. This patient, it may be remarked, was predisposed to the affection from long and constant practice upon the piano. She experienced the most relief by placing the hand in cold water, and allowing it to remain in it night and day. Neither poultices nor other warm applications could be tolerated; incisions afforded no relief, and administration of anodynes was the only means that appeared to be instrumental in the preservation of her life.

Treatment.—In thecitis of an ordinary character, the medicines affording the greatest prospect of relief are aconite, belladonna, bryonia, rhus tox., ruta graveolens, and gelseminum. The first, especially in the earlier stages, will be serviceable. If, however, the disease does not yield, a selection must be made from among the medicines just mentioned, to the choice of which the symptoms in the *Materia Medica* will be the guide. In some instances, as in the case above related, where the excruciating pain causes delirium and symptoms of tetanus are present, the Calabar bean is much extolled, especially when hypodermically administered. Other medicines for tetanus may be found in the chapter on that subject.

Rupture of Muscles and Tendons.—Laceration of muscular fibres often occurs from violent muscular action, as is sometimes noticed in severe tetanic spasms, the rectus abdominis generally being affected in such cases. According to the researches of Sédillot, out of twenty-eight cases of ruptured muscle, thirteen took place at the junction of the tendon with the muscular fibre. There may be a simple tear involving a portion of the muscle, or it may be torn through entirely, or there may be a *compound* laceration. In such cases, more or less ecchymosis may be expected. When a tendon is torn across, it is characterized by immediate lameness. The patient falls, and is unable to resume the erect position; much pain is experienced at the seat of injury. There is generally consciousness of something having given way, accompanied with a sensation of a blow upon the part, accompanied often with an audible snapping noise, and the gap between the ends can be detected by the touch. The tendo Achillis is more frequently ruptured than any other, the biceps also sometimes suffering.

Fig. 114.



During my last term of service at the homœopathic hospital at Ward's Island, there was a man who had ruptured the tendon of the biceps. The muscular fibre had contracted at the upper third of the humerus, forming a soft fleshy tumor. A similar case is also reported by Dr. Bryant.

Treatment.—A great portion of the management of these cases consists in position and rest. Arnica may be applied in some instances, particularly when muscular fibres have been torn. Rhus and ruta are preferable when the tendons are involved. Aconite and belladonna may also be used, if the constitutional symptoms call for their administration. If the seat of the injury be the gastrocnemius muscle, or tendo Achillis, a slipper should be placed upon the foot; a belt or band secured around the lower part of the thigh, and to the heel of the slipper, a stout cord or tape should be attached; the leg is then to be flexed on the thigh, the foot is extended, and the tape made fast to the belt around the thigh. (Fig. 114.) This position must be maintained until the divided parts unite, which, as a rule, will take longer than the repair of fractured bones. When the patient commences to walk, he should use a stick or crutch, and wear a high-heeled shoe.

Muscular Atrophy.—The muscles are very likely to become atrophied from want of use, or from compression with bandages, or from paralytic affections, especially in children. In rare cases acute muscular atrophy (which is said to arise from a diseased condition of certain cells called "trophic," situated in the anterior horns of the cord) is found in the adult. A most remarkable case of this kind has been reported by Prof. H. C. Wood, Jr., of Philadelphia * During the past winter two cases of pa-

* Medical Record, December 22d, 1877.

ralysis following measles were brought to the clinic of the college, and in each the arm was the seat of the disorder, the muscles being shrunken and emaciated. I have seen the same result follow from accidental division of nerves in tenotomy. Typhoid fever and diphtheria are also factors in the production of the disorder. There is another disease, however, which is particularly noted by Mr. Lockhart Clarke,* who says: "There is another form of this malady, which is known by the name of *progressive muscular atrophy* (Cruveilhier), *atrophie musculaire graisseuse progressive* (Duchenne), and *wasting palsy*. This curious disease differs in several respects from the other atrophies. It is always chronic, but of uncertain duration, is frequently hereditary, is capricious or irregular in its invasion, prone to spread from one part to another, or become general, and thus go on to a fatal termination. The affected muscles suffer different degrees of wasting, and assume a variety of aspects. Even in the same muscle bundles in different stages of atrophy and degeneration may be found at the side of others that have retained their normal state. When the wasting is extreme in all the bundles, a long muscle may be reduced to a mere fibrous and cylindrical cord, or to a kind of tendon, and a flat muscle may be reduced in the same manner to a kind of membrane. In some instances the atrophy may be *simple*, that is, the muscular tissue may be wasted to a considerable degree without any granular or fatty degeneration; but generally one or both of these alterations of structure is found to exist to a greater or less extent. The muscle also changes and varies in color, according to the nature and degree of the atrophy. It is paler than natural; occasionally it is quite colorless, like the flesh of fish, or it may have a faint yellow or ochreous tint. Its consistence for the most part is increased in consequence of the increase in the interfibrillar connective tissue. When examined under the microscope the affected muscles may be seen to have lost, to a variable extent and degree, or even entirely, the appearance of transverse and longitudinal striation, while in a corresponding proportion the sarcous or muscular element is transformed into granules, which in some instances are too fine to be distinguished as separate particles. The granules are soluble in acetic acid. In this odd affection the granular, fatty, and waxy degenerations are found side by side."

In the treatment of muscular atrophy of course the local cause, if there be any, must be removed. The requisite attention must be given to diet and fresh air, and *massage* must be practiced regularly and persevered in steadily for a considerable time. In conjunction with this faradization must be used, and the internal administration of such medicines as may be indicated under the homœopathic law prescribed. Among these will be found arsenicum, belladonna, calcarea carb., plumbum, phosphorus, nux vomica, rhus tox., and sulphur.

Dr. J. M. Kershaw has recorded a most interesting case of this affection.†

Reflex Muscular Atrophy.—There is besides the forms already noted an atrophy arising from joint diseases and certain forms of osteitis, which is called *reflex muscular atrophy.*

The fact that nerve irritation is capable of and indeed has alone the power of producing rapid muscular atrophy, was, according to Dr. Shaffer,‡ first demonstrated by Brown-Séquard. It is very important to bear in mind this fact in the treatment of such conditions, otherwise in endeavor-

* Holmes's System of Surgery, vol iii, p. 629.

† Progressive Muscular Atrophy, by J. M. Kershaw, of St. Louis. Chicago, 1878.

‡ Reflex Muscular Contraction and Atrophy in Joint Disease, by N. M. Shaffer, M.D., Archives Clinical Surgery, vol. ii, p. 83.

ing to overcome the secondary condition, we may really aggravate the primary cause of the affection. The cause then of such a condition must be carefully sought after and relieved, if we desire a permanent cure.

Bursitis.—The bursæ are lined by a membrane, resembling the synovial in function, appearance, and disease; they are frequently the seat of inflammatory action, which in the generality of instances is of short duration, and terminates in an increased accumulation of the secreted fluid. The abnormal action may be either *acute* or *chronic*, and may take place in those bursæ situated over the patella, olecranon, inner side of the head of the tibia, the angle of the scapula, or about the carpal articulations.

When the inflammation is acute the pain is severe, and there is much swelling and fever. The affection may be distinguished from inflammation of the synovial membrane, by the superficial nature and regularity of the tumefaction. Occasionally the action terminates in suppuration; pus being effused to a greater or less amount within the cavity. The affection is frequently encountered among servants; and inflammation of the bursæ of the knee-joints is found particularly among females, who from resting upon their knees while performing household duties, irritate the bursæ; hence the term *housemaid's knee*. However, those in the higher walks of life are not exempt from the disease. In some cases chronic bursitis consists in nothing more than an enlargement of the sac; but if the disease is not arrested more extensive organic changes follow. An alteration may take place in the lining membrane of the sac, it may thicken and be interspersed with fibrous bands which pass in different directions, and finally the original sac formation is almost entirely lost and a solid tumor results, as seen in Fig. 115.

Fig. 115.

Enlarged bursa with structural changes.

Chronic enlargement of the bursa on the metatarsal joint of the great toe is also frequently met with, especially in those advanced in years, causing some deformity, and at times considerable pain; to this affection the term *bunion* is applied.

When at the elbow, it receives the name "*miner's elbow*," and when on the tuberosity of the ischium, "*weaver's bottom*."

The surgeon, however, must remember that bursæ are found in many other portions of the body, which may inflame and give rise to considerable swelling and pain, which have often been mistaken for rheumatism.

There is a bursa situated on the upper and posterior part of the calcis, another beneath the tendons of the psoas, and also beneath the deltoid and extensor muscles of the thigh. These are all *deep bursæ*, and may, under peculiar circumstances, especially if undue straining is put upon the part, inflame and give rise to both local and constitutional symptoms.

Treatment.—The medicines for inflamed bursæ are acon., bell., graph., hepar, iod., led., merc., rhus, sulph.

Sticta pulm.—This medicine has been highly lauded in the treatment of bursitis by Dr. E. C. Price, of Baltimore, who introduced its sphere of action in this class of cases to the profession, and by Dr. Hasbrouck, of Brooklyn, who brought it to my notice.* In a letter from Dr. Price, dated March 27th, 1878, he states, that he has used the sticta in twenty-five cases of acute bursitis with excellent results. The

* Homœopathic Times, vol. iii, p. 77; see also an article on Bursitis, Medical Investigator, January, 1878, p. 45.

dilution he employs is the first decimal, in water, every two hours. In the chronic variety, he states that he has "always found it perfectly useless."

Acon. and **bell.** are particularly adapted to the affection termed housemaid's knee, when the pain is excessive and the fever considerable. When there is swelling of the part and lancinating pains, these frequently arrest the affection, without the employment of other medicines. After the more violent inflammatory symptoms have been subdued, iod., ledum, or arnica, will, in many instances, remove the remaining swelling; a bandage should also be tightly bound around the joint.

Arnica is particularly useful when the swelling and pain result either from a blow or constant friction of the part.

Ledum also is recommended for such a condition, when there is considerable fever, with preponderance of the chilly stage.

Graph. may be employed when there is chronic enlargement of the bursæ, with redness of the surrounding parts, with swelling of the toes, with itching. Agaricus is very serviceable to allay the latter symptom.

Hepar. and **merc.** or **silic.**, should be used when there is tendency to suppuration. When there are shooting pains bry. or lyc. may prove serviceable.

In my experience the iodide of potash is more effectual in the treatment of chronic bursitis than any other medicine which I have employed.

The bursæ may be punctured, and the effused fluid pressed out. The instrument should be finely pointed, of good material, and should contain a groove, the sides of which should have cutting edges. Sometimes considerable pressure is required to force the instrument through the walls of the bursa; and to prevent the instrument from snapping, steady pressure should be used.

The passage of a seton through the sac has been recommended, but in my hands has not proved satisfactory. An injection of iodine also, though attended with risk, is more effectual. A better method (surgically) is to make a longitudinal incision into the bursa and paint the interior of the sac with tincture of iodine. In aggravated cases, in which the tumor is solid, the excision of the entire mass should be resorted to. There is but slight risk in the operation, and it is very effectual. A chief aim should be to procure a shoe or boot of a shape to obviate pressure upon the swelling, directly upon which should be placed a small-sized soft pad, having a hole in the centre. It is also sometimes necessary to divide subcutaneously the external lateral ligament of the metatarso-phalangeal articulation, as well as the tendon of the adductor pollicis, in order to restore the position of the toe; after which, the foot should be kept for a time upon a palmar splint.

Ganglion.—By the term ganglion is understood an adventitious bursa along the course of a tendon. Ganglia are rounded in shape and are most frequently situated about the wrist, but Gross records a case in which "two tumors of the kind, each the size of a small bird's egg, were situated upon the dorsal surface of the foot." They are sometimes formed on the scapula, tibia, or patella. These generally produce swellings, but little pain, especially when located about the back of the wrist. A sensation of weakness, however, and stiffness may be experienced. They contain a fluid of various consistency. It sometimes resembles the vitreous humor. At others, it is straw-colored and thin. Fig. 115 represents a ganglion, formed by the synovial sheath of the flexor tendon of a finger.

There is another variety of ganglion besides the localized one which has just been described, which is most difficult to treat, and is often followed by serious results, viz., the *diffuse ganglion*. In this disease one or more of the tendons are implicated, generally the flexors, the swelling is diffuse and irregular, the pain intense, and the rigidity constant when the ganglion is opened. There is a peculiar discharge consisting of numerous "melon seeds" as they are called, with a serous and synovial fluid.

Treatment.—Operative measures are the only certain ones for the destruction of ganglia. The simplest and oldest is either to rupture the cyst by forcible pressure of the thumbs, or with a smart blow with a book or some hard substance, the patient's hand being extended; or else to thrust a small tenotomy knife or cataract-needle into the sac and move it freely about, in order thoroughly to divide it, or to make many incisions into the walls of the ganglion, and thereby excite sufficient inflammation to cause the parts to adhere. Moderate pressure must then be applied and the part allowed to remain quiet for a length of time.

There are other modes of treating ganglion. Some surgeons, as Sir Henry Thompson, preferring first to apply tinct. of iodine, and continue it for six weeks; if this fails he introduces a seton, squeezing out the contents of the sac through the needle-holes. Mr. Heath punctures with a grooved needle, and afterwards applies iodine paint. Mr. Smith, of King's College, passes a single ligature of silk through the centre of the tumor, allows it to remain until suppuration takes place, when it is withdrawn.*

In the diffuse variety it is necessary to make an incision above and below the annular ligament down to the theca and apply a poultice. The hand should afterwards be placed in a splint, and after a day or two passive motion resorted to.

Sprains.—These injuries are sometimes very painful. They arise often from momentary displacement of bones, which strain or partially tear the apparatus of the joints. They are accompanied frequently with some constitutional disturbance; the affected part swells, and the synovial membrane may be involved.

A severe sprain, if neglected, is by no means a trifling matter, particularly if located about the ankle, hip, or knee, on which there is constantly more or less pressure. Often caries, especially of the ankle-joint, may result in consequence of a badly managed sprain.

The **treatment** of such injuries, consists in restoring the bones to their normal position by extension and direct pressure, and applying a solution of arnica to the part, which must also be bandaged to support the limb, and prevent recurrence of the accident, and a few doses of the same medicine of the 3d dilution administered internally.

When an individual muscle has been injured by the effect of a violent strain, Dr. Goullon remarks that rhus will more readily restore its tone and remove the pain than any other medicine. This is a truthful observation, as most practitioners of our school can testify. Rhus is particularly adapted to sprains occurring in tendinous parts with swelling and great pain. It may be used both externally and internally; the solution that is used as a lotion should be adapted to the sensitiveness of the skin of the patient. There are some individuals who are particularly susceptible to the action of the poison oak; and the surgeon should therefore exercise caution and discretion when prescribing this medicine; it possesses considerable power over the tendons of the lower extremities and the inferior maxillary bone; it is also recommended for the bad consequences of strains, and prevents liability to such accidents. This medicine has been alternated with arnica in some cases, but the indications for its use are generally sufficiently well marked to render entirely unnecessary any such alternation.

If the patient should have injured himself by lifting heavy weights, *rhus* is also an important medicine, particularly when the dorsal and cervical muscles and the vertebral column are affected, and there is headache,

* *Vide* a paper on "The Treatment of Ganglion at the London Hospitals." Braithwaite, January, 1872, p. 168.

accompanied with general bruised sensation of the whole body, pains in the back or gastric ailments. *Bryonia* should be exhibited if the pains are occasioned by the same cause, but are aggravated by motion, and the muscular system is chiefly involved.

If pain is experienced immediately after raising a heavy weight, *calc.* will prove serviceable, and may also remove the existing predisposition to such accident; it should also be remembered, when, after the injury, there is congestion of blood to the head, or there are pains, as from bruises, in the joints and small of the back, the parts being sensitive to touch.

Amm. carb. has been mentioned by some authors as useful in the variety of injury under consideration, but there have been no particular indications given. In its pathogenesis we find: sensation as if bruised in the whole body, with fatigue and weakness of the limbs; pains, as if sprained, in the joints; drawing and tension in the joints, as though the tendons were too short.

Lycop., petrol., or ruta may be applicable in some cases. Sepia is recommended for many troublesome constitutional symptoms that may supervene upon a sprain.

If an inguinal hernia should have been caused by lifting or straining the part, or if an old protrusion becomes painful, nux vom., sulph ac., cocc., or sulph. should be administered. If a prolapsus of the womb has been occasioned by such causes, nux has proved almost a specific medicine; after its exhibition bell. or sepia may be required.

If the accident occasion nausea and vomiting, veratrum or sulph. may be required, either of which may be used in alternation with arnica.

For the ill effects of making a misstep, or pressing the foot to the floor with too much violence, arn. and bry. are often sufficient; sometimes, however, con., puls., and rhus may be indicated.

Rest certainly is the most important part of the treatment, and this must be absolute, to prevent any action of the tendons implicated, or any friction between the surfaces of bones. In sprains about the ankle-joint, Dr. Lewis A. Sayre has invented an apparatus which I have found very advantageous. It is described in a paper upon sprained ankles in the *Bellevue*

FIG. 116.

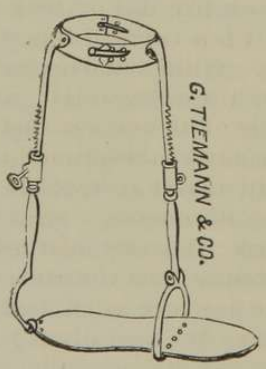
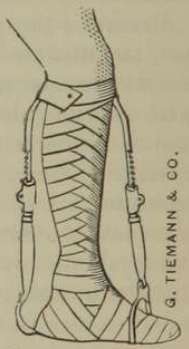


FIG. 117.

FIG. 118.



and Charity Hospital Reports, p. 111. It consists "of a firm steel or hard rubber plate made to fit the sole of the foot; at the heel is a hinge-joint, and attached to it a rod, slightly curved at the bottom, and extending up the back of the leg to near the knee. Over the instep is an arch, like the top of a stirrup, with a hinge-joint at its summit, from which springs another rod, which runs in front of the leg, of equal length with the one

behind." These rods are made with a male and female screw, or ratchet and cog, for extension, and connected at the top by a firm band of sheet iron, on one side of which is a hinge, and a lock on the other like a dog collar (Fig. 116). The instrument is applied with firm adhesive plaster, cut in strips about one inch in width, and long enough to reach from the ankle to two or three inches above the tubercle of the tibia, and placed all around the limb (Fig. 117). "The plaster is secured in position to within two or three inches of the upper extremity by a well-adjusted roller." The instrument is fixed and secured by a number of strips of adhesive plaster. A roller should be carefully applied over this plaster to prevent its slipping, and the ends of the plaster at the top of the instrument turned over the collar, which has been previously locked, just tight enough to be comfortable, and secured by a turn or two of the bandage (Fig. 118).

Contraction of the Palmar Fascia.—"Dupuytren's Contraction."—This peculiar disease consists in flexion of the fingers from contraction of the palmar fascia, generally of the first phalanx. All the fingers and the thumb may be so flexed, or one or two may be affected. There is generally a local cause for the disease, but besides this, there is also a constitutional predisposition which is rheumatic in its character. A similar affection is sometimes noted in the soles of the feet. The contraction is painless, but sensibility and motion are always greatly impaired, if not entirely lost. Operative measures are the best, and the subcutaneous ones are always to be preferred. It was formerly the custom to make large crucial incisions through the fascia, or to dissect out the contractile tissue, but the success attendant on such procedure was not equal to the severity of the operation, and the simpler and subcutaneous ones now are mostly relied on.

Dr. A. C. Post* regards "Dupuytren's contraction" as not invariably due to the contraction of the palmar fascia alone, but considers that the sheaths of the flexor tendons are sometimes involved. He removes the forced flexion by subcutaneous section of the fascia by as many punctures as needed, employs a proper splint to produce extension, and looks upon passive motion as an essential to the success of the treatment. In each of the six hands in which he has removed the deformity, he found that the power of flexing, not only the affected fingers, but those previously normal, was very much diminished. The power of flexion is very slowly regained, and sometimes never to its full extent.

Mr. William Adams† operates for Dupuytren's contraction of the palmar fascia, 1st, by subcutaneous division of all the contracted bands by the smallest tenotomy knife passed in many punctures under the skin, and cutting from above downwards; 2d, immediate extension of the contracted fingers upon an appropriate splint; 3d, removal of the bandages on the fourth day, "when the punctures will be found to be healed;" 4th, constant wearing of the extension splint for two or three weeks, and at night for three or four weeks longer; passive motion being employed every day. By this method of treatment, Mr. Adams believes that relapse will be prevented. He condemns severely the treatment by open wound.

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* Archives of Clinical Surgery, August, 1876.
† Lancet, June 9th, 1877.

CHAPTER XIX.

INJURIES AND DISEASES OF THE ARTERIES.

ARTERITIS, ADHESIVE AND DIFFUSE—ATHEROMA—EMBOLISM—ANEURISM.

Arteritis.—The arteries, like all other textures of the human body, are liable to inflammation, suppuration, and ulceration. The internal coat of the vessels is more obnoxious to the process than either of the others, as is evinced by the effusion of lymph, which is poured out in large quantity on its inner surface, in consequence of inflammation of contiguous parts, from the application of ligatures, wounds, and from the presence of tumors.

Two stages of the inflammatory process are particularly noticed; in the one there is *adhesion*, and the arteritis is limited; in the other it is *diffuse*. In the former, not only the coats of the vessel itself but the contained blood are altered and an effusion of plastic matter takes place around them, the vessel loses its resiliency and becomes fragile, and a plug or clot of decolorized fibrin is formed that blocks up the vessel, causing one variety of occlusion (embolism). In the diffuse variety of arteritis, as has already been noted, the inflammatory action is more extended, but without any plastic exudation.

Dr. Moxon* has described a peculiar disease confined to the *outer* coats of the vessel, which he calls *periangioma*. It consists in a new growth, forming a tumor on the scalp, in which ramifies enlarged vascular structures, in which the outer coat is almost exclusively affected.

Treatment.—For acute adhesive arteritis the medicines are, aconite, belladonna, gelseminum, or veratrum viride. The first is to be prescribed in the early stages of the affection, when there is some constitutional disturbance, but when the face is hot and flushed, belladonna or gelseminum are indicated. The differential indications being the congestion of the head, indicating the former; congestion of the biliary apparatus and head, the latter. If there is a rheumatic tendency, bryonia would be the appropriate medicine, or in some cases actea racemosa. The green hellebore I have never used, but from the marked action it possesses over the circulatory apparatus I should be strongly inclined to try it. Digitalis, which has been highly lauded, has not in my hands proved efficacious, in fact, it is a medicine which has often disappointed expectations in cases in which it has been apparently indicated.

For more chronic and diffuse arteritis, belladonna is, according to my experience, a very reliable medicine, but its use must be persisted in for a considerable time. Arsenicum, carbo veg., lycopodium, pulsatilla, and sepia may also be selected.

Atheroma.—By the term atheroma is to be understood the degeneration of the coats of an artery, and the formation of a soft, foreign, pappy deposit within the coats of the vessel. These deposits assume different shapes and somewhat different appearances according to their age, and generally begin near the mouth of the larger vessels. In the earliest stages, thin whitish opaque streaks line the internal membrane of the tube, making a new lining of it, and presenting a smooth and shining appearance. After

* Referred to in Holmes's System of Surgery, vol. iii, p 393.

a time a second layer of plastic material is deposited on the prior one, which becomes consolidated with the true coating of the artery, which by adhesion with the new substance, first becomes indurated, then loses its natural color, and, finally, softens. Sometimes the atheromatous deposit, from being of a yellowish color, becomes a grayish tough membrane, called by Hodgson the *steatomatous* deposit. These deposits also soften, as those already mentioned, and are converted into a cheesy mass, which is sometimes so fluid and of such peculiar color that it resembles true pus.

Atheromatous masses are often found imbedded in sacs along the course of the vessel, and may be partly or entirely washed away by the current of circulating blood. Around the point of the vessel, in which this degeneration takes place, the internal and middle coats may become closely adherent and thus prevent a further extension of the disease, while a conservative process goes on in the external coating, rendering it thicker and more dense by a deposit of plastic material. Finally, a deposit of calcareous matter may take place in the coats of the vessel, and *calcification* or *ossification* ensue, which renders the tube brittle, and gives rise to severe and sometimes fatal hæmorrhage after surgical operations.

It must be remembered, however, that though this latter process has received the name of ossification, yet no *true bone-cells* have been discovered in the calcareous mass, which consists, according to Lassaigne, of two parts of the carbonate and forty-eight parts of the phosphate of lime, to fifty parts of animal matter.

With reference to cell formation, Dr. Moxon thus writes: "I might give practically any number of cases and drawings, showing the active cell formation in cases of atheroma. This cell formation is found in the deep layer of the inner coat especially, and causes the production of little nests of cells, in which fat and lime soon accumulate. In severer cases the middle and outer coats and the deep layer of the inner coat are seen to be charged with lymph-cells in enormous numbers, crowded together, and separating the proper elastic and the muscular fibres into little patches and shreds, while both elastic and muscular fibres fall into a state of fatty degeneration."

Embolism.—By this term is understood the obstruction of an artery by some foreign substance. It may be an atheromatous patch washed into the circulation, and having lodged in a vessel near a bifurcation, a plastic deposit is formed around it, and the circulation thereby is obstructed; or after arteritis a conical plug of plastic deposit may obstruct the circulation, or a fibrous clot may pass from the heart, and, having circulated through the larger vessels, be arrested by the smaller calibre of other arteries; or a foreign body, as a needle, for example, may lodge in a vessel, affording a *nucleus* for a clot.* In the varied forms of heart disease, these clots are most likely to form, and in endocarditis and among puerperal women sudden deaths from this cause are related. Embolism may also occur after fractures, as in a case lately under my supervision.

The symptoms of an obstruction or occlusion of an artery are, first, a severe pain at the point of obstruction. The part becomes blue, swollen, and insensible, and gangrene ensues; or if the collateral circulation be established a slow returning vitality may prevent mortification. In two cases, which have lately come under my observation, one occurred in a lady of sixty, who had long been suffering from valvular disease, and who was recovering from double pneumonia; the obstructed artery was the radial, and complete mortification ensued in three or four days. An amputation was

* Such a case is reported in Holmes's System of Surgery, vol. iii, p. 403.

about to be performed, but an attack of *hemiplegia*, on the very day appointed for the operation, soon terminated her existence. The second was in a man, aged forty, suffering from abscess of the knee-joint and rheumatism. He was improving, and about to sit up, when, suddenly, a pain in the region of the heart, with difficult respiration, terminated his existence in a few hours. Embolism of the pulmonary artery was found in this case.

In gangrene, resulting from embolism, many patients die before the line of demarcation is formed, and some do not survive the process of separation.

Treatment.—In the degeneration of arteries the medicines which are especially indicated are, lycopodium, calcarea, phosphorus, graphites, silicea, and sulphur; perhaps, also, the iodide of potash. From the action of sulphuric acid upon ossific deposits it might be serviceable. The practitioner, however, should regard with particular attention the predisposing and exciting causes, whether they be constitutional or local, should note the symptoms carefully, and with the aid of the Repertory and *Materia Medica*, select the medicines best adapted to each presenting case.

In embolism, amputation is the only resort, and then is generally hazardous, as in a majority of cases, heart disease already is present. Before the operation, it is necessary that the site of the embolus be clearly ascertained, and the point of selection made some distance from the obstructed part. If a line of demarcation is formed, the surgeon should be governed by the rules laid down in the Chapter upon Gangrene.

Aneurism.—Aneurism, with its varied locality, its manner of formation, its many and extreme dangers, and the varied methods of its cure, has ever been a subject of great interest to the surgeon.

Sir Charles Bell defines aneurism as a pulsating tumor, formed of arterial blood; but Mr. Miller, with his usual preciseness, writes that by the term aneurism is understood: a pulsating tumor, composed of a cyst, which is filled with blood, partly fluid and partly coagulated, and whose cavity communicates with the arterial canal.

Aneurisms have been variously divided, viz.: External, internal, spontaneous, traumatic, true, false, circumscribed, diffused, dissecting, aneurismal varix, and aneurism by anastomosis.

External Aneurism.—This disease presents itself as a small tumor, pulsating very strongly, containing only fluid blood, of which it can be readily emptied if pressure be made near the distended artery on the cardiac side. Little pain is experienced at this time, excepting cramps, which may occur in the limb below the situation of the aneurism. In a more advanced stage, the tumor is larger, more solid, and cannot be completely emptied as in the former case, the blood being partly coagulated in the interior of the sac, which is much thickened. The circulation in the surrounding parts is retarded, and pain is experienced when pressure is made upon the tumor; the pulsation is distinct, but not so well marked as in the first period of the affection. In the third stage, the tumor is larger and more solid, pulsation is indistinct, and the sac is filled with layers of fibrinous matter, and contains but little fluid blood. There is pain and inconvenience when moving the limb, which becomes œdematous and deprived of sensation from pressure upon the nerves.

Internal aneurism occupies the cavity of the abdomen, chest, or cranium, and the diagnosis is frequently difficult.

True aneurism (Fig. 119) is that wherein the sac is composed of *all* the arterial coats, dilated at one point in the course of the vessel.

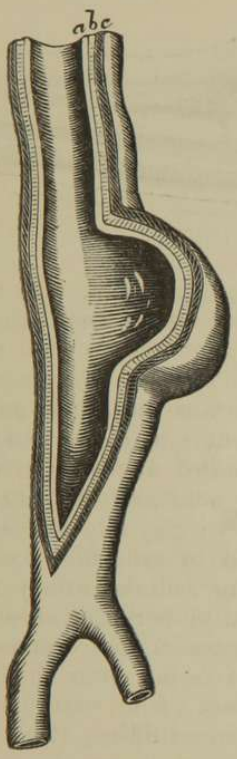
False Aneurism.—When the two internal coats have ruptured, and the tumor is formed merely of the *external* coat, the aneurism is said to be

false (Fig. 120). It may be said here that *true* aneurisms generally become *false* as they increase, and that the latter are those most frequently seen.

A **hernial aneurism** is one in which the sac is formed by the inner coat only (Fig. 121).

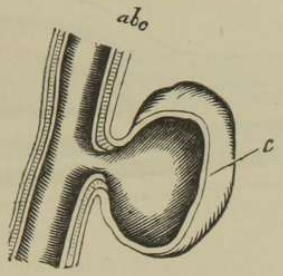
Aneurism by dilatation is most frequent in the aorta. The coats of the vessel do not give way, but are gradually and evenly distended; the integ-

FIG. 119.



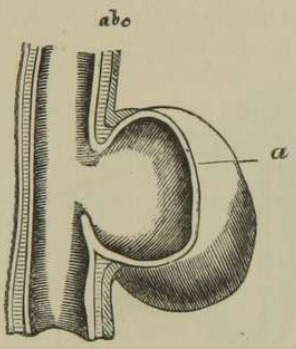
True Aneurism.

FIG. 120.



False Aneurism. Sac formed by outer coat.

FIG. 121.



Hernial Aneurism.

rity and the continuity of the tunics remaining entire, which can be distinctly traced, particularly after maceration.

The dilatation may be *cylindroid*, *fusiform*, or *sacciform*.

In the first instance the expansion is abrupt and uniform; in the second—as the derivation of the word would lead us to suppose—the enlargement is spindle-shaped; and in the third the dilatation is partial, and arises from the side of the vessel. These may all be divided into the *true* and the *false;* in the former there is a partial dilatation of *all* the coats of the vessel; in the latter, the expansion of the one and the rupture of the other.

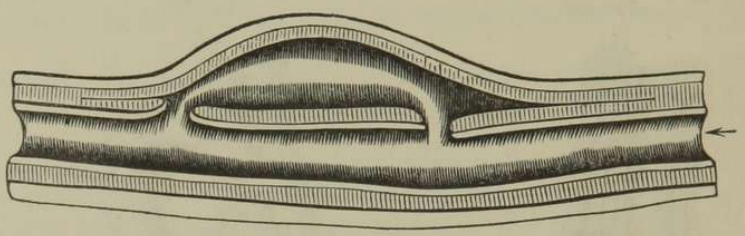
Dilatation and rupture of the arterial tunics do not occur at the same time. In the first instance the abnormal cavity is formed by dilatation, and after a time the internal and middle coats are ruptured, either by muscular exertion or ulceration. The external coat expands, and receives strength from organized fibrinous deposits, afforded by effused blood.

Aneurism by rupture generally arises from sudden muscular exertion; the internal and middle coats give way by laceration, and aneurismal formation speedily follows.

When blood passes between the tunics of an artery, separating or dissecting the one from the other, the aneurism is termed *dissecting*. In such

cases the inner coat of the artery, either from atheroma or calcification may split, and the blood force for itself a passage between the tunics; or as more frequently happens, the blood may find its way between the layers of the middle coat, it may then pass some distance along the course of the vessel, *dissecting* up the coats, and may rupture externally, *i. e.*, through the

FIG. 122

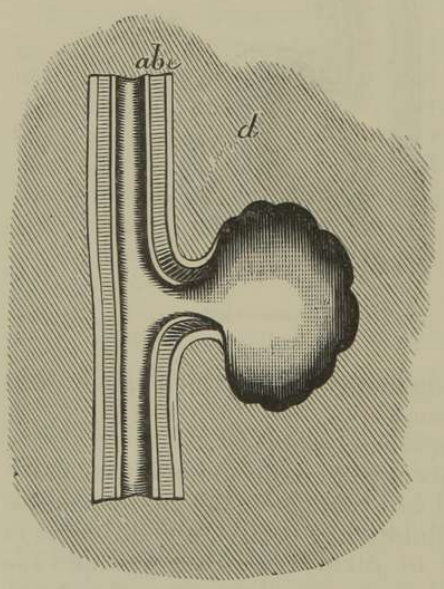


Dissecting Aneurism.

outer coat, causing death; or may find a passage back into the vessel. This happens in the aorta, and no doubt gave rise to what was formerly known as the *double aorta* (Fig. 122).

An aneurism is said to be *pedunculated* when the sac is connected with the artery by means of a narrow neck. A *limited* aneurism is one in which it is bound within the limits of a proper cyst; and *diffuse* aneurism is formed by the blood escaping from a wound in an artery into the surrounding cellular tissue. In this the cyst is not composed of any of the arterial coats, but consists entirely of tissues exterior or adjoining the vessel (Fig. 123). It may result from wounds, lacerations, or ulceration external to the vessel. *Diffuse aneurism* usually follows injuries at the bend of the arm, in which instance the vein may be stretched over the forepart of the sac; the cicatrix from the previous wound is found stretched and thin over the surface of the tumor.

FIG. 123.



Diffuse Aneurism. Cellular tissue.—Holmes.

A cirsoid aneurism is one in which the coats of a single artery become enlarged and elongated. It is often very difficult to diagnose from ordinary *aneurism by anastomosis*, wherein there is a pulsating tumor composed of enlarged and tortuous capillary bloodvessels.

Aneurismal Varix.—This affection is the consequence of a wound which has primarily implicated both an artery and a vein, leaving a communication between the vessels. It will readily be understood, that at each throbbing impulse of the arterial tube, a jet of blood is thrown into the vein, which after a time is so weakened from the repeated shocks, that the valves become obliterated, and the neighboring venous trunks enlarge. In this peculiar disorder there are two currents of blood opposing each other, one being the direct flow of the venous blood upward toward the centre of the

circulation ; the other, the jet of arterial blood thrown into the vein from the artery. The sound made by these opposing currents is peculiar. It is a "thrilling," a "whistling," or "humming," resembling that of machinery at a distance.

After the disease has existed for a time, both artery and vein lose their natural structures, their coats expand and weaken, and become more attenuated than natural ; the veins become tortuous, and often pulsate.

Treatment.—The most approved method of treatment is palliative. There is no danger, because there is no absolute obstruction of the circulation ; the veins, it is true, may undergo enlargement, but they will not rupture, and therefore a propely fitting elastic stocking is the best appliance.

An **arterio-venous aneurism,** as the name implies, is one in which the sac communicates with both the artery and the vein. In these cases, a varicose condition of the surrounding veins is a consequence, with pulsation of the venous trunks. The *bruit* is remarkable for its "whirr" or its "hum," which is more distinctly heard on the cardiac side of the tumor. In varicose aneurism, the blood passes from the artery to the sac, and from the sac into the vein. This condition is usually caused by wounds, in which imperfect compression was made. Its most frequent site, when venesection was the fashion, was at the bend of the elbow. This variety differs from the ordinary false aneurism in its free communication with the vein. The growth of the swelling is slow, and it rarely attains the size of a hen's egg, because there being but little pressure on the walls of the sac, the blood is forced into the surrounding trunks, thereby breaking the violence of the impulse.

Treatment.—Pressure, direct and prolonged, must be used in varicose aneurism, for if the disease is not checked, œdema and hæmorrhage will result. If pressure fail, resort must be had to the ligature ; and the most judicious plan is to ligate the vessel above and below the tumor, and allow the sac to remain unopened.

The **symptoms of aneurism** are, first, those belonging to the disease itself; and, second, those manifestations caused by the actual pressure of the tumor upon the surrounding parts.

In internal aneurism, the stethoscope assists the diagnosis by the conveyance of sounds to the ear, while the symptoms which are attributable to pressure on internal organs are distinctly recognized.

Shape.—The shape of an aneurismal tumor is generally ovoid ; sometimes it is round, and, in most instances, circumscribed.

Location.—We generally are much assisted in the diagnosis when the swelling can be located in the immediate vicinity of a large arterial trunk.

Pulsation.—This is one of the most conclusive evidences of aneurism, and though, in some instances, an abscess situated directly over the course of a large vessel may pulsate, yet even in such cases the throbbing tells that certainly an artery is somewhere in the vicinity, and places the practitioner upon his guard. When there exists a pulsating tumor, the motion of which can be materially lessened or made absolutely to cease by pressure above it ; and when the pulsation can be made to increase and the tumor to enlarge by the pressure below it, the evidence of aneurismal formation is sufficient for a correct diagnosis. But it must also be remembered that an aneurism may exist with but slight pulsation, and in some instances no "beating" can be recognized. The absence of this important symptom may be occasioned by the sac being completely filled with laminated fibrin. In such cases, however, by taking the tumor between the hands, and exerting for a time a gradual and uniform pressure, there will take place a dim-

inution of its size; but the pressure being withdrawn, the blood will rush again into the cavity, and the swelling regain its former outline.

The pulsation in aneurism is from within, outward.

Sounds.—The sounds revealed by auscultation vary much. In some cases there is a distinct and heavy "thud," in others a rasping, and in others a grating sound, which is especially found in true or "*tubular aneurism.*" The sounds also vary according to the position of the patient, being most distinct when the sac is moderately distended with blood. On the other hand, when the sac is overdistended and supplied by vessels with small mouths, the *bruit* may be very indistinct or wanting altogether.

These are the signs and symptoms which belong to the tumor proper, viz., shape, location, pulsation, and sound. The pressure symptoms are *pain*, which is often of a sharp, lancinating, neuralgic character, darting along a compressed nerve, or the patients suffer most intensely from prolonged aching, burning, or tearing. These sufferings are very persistent and often embitter life.

Swelling.—Œdema is one of the most common symptoms of pressure from either an aneurismal or other tumor, from obstructed venous return; if severe and prolonged, gangrene and mortification may result, and absorption of bone may also take place.

Functional Disturbance.—Hoarseness, difficult breathing, cough, faintness, spasm of the glottis, vomiting, constipation, and spasm, may also be noted as secondary symptoms of true aneurism.

Deformity may also result from the presence of aneurism. The internal organs may be very much displaced. In several cases that came under my own observation, the sternum, ribs, and vertebræ were very much misplaced from the great enlargement of the sac.

The *symptoms of diffuse* are somewhat different from those presented by the *true aneurism.* In this case, when the sac ruptures and the blood escapes into the surrounding cellular tissues, the symptoms of shock are often apparent; the coldness, faintness, sickness which result are characteristic. The parts become numb, heavy, and cold; the limb swells, and the pain is often agonizing; the tumor upon examination is larger, but *not circumscribed;* it is more flabby, and the pulsation very indistinct. After a time, this tumor may become harder from the coagulation of blood around the cellular structure, and the aneurism may again become limited, or this very coagulation may so obstruct the circulation of the part that symptoms of gangrene result. As soon as the boundary line is established the tumor again enlarges and its pulsation increases, the system becomes somewhat accustomed to the pressure of the new formation, and a collateral circulation is established.

Sometimes *suppuration* and *sloughing* result; pain, heat, swelling, and redness supervene, the wall ruptures; broken and disintegrated tissue and imperfect coagula are forced out, and finally copious and fatal hæmorrhages ensue.

The arteries which are most liable to aneurism are the aorta and the popliteal; and next to these, the subclavian, external iliac, and innominata.

When an aneurismal sac is opened, it is found to consist of several layers of various colors and different degrees of density. The internal formation consisting of a dark-red substance, partly clotted and partly fluid; the coats of the vessel being materially altered in structure. In false aneurism but little deposit is found within the walls of the sac, while the external coat is very much thickened by the constant accumulation of plastic matter which has been deposited along the sides of the vessel from the continual

"swashing" within it. These strata or lamina sometimes are numerous and thick, and bear no resemblance whatever to the coagula found in the interior of the sac, which is nothing more nor less than simple coagulation. The thicker the walls of an aneurismal tumor, the less perceptible is the sound.

Of the *causes* of aneurism very little is known. The arterial coats, from some causes, appear to undergo degeneration; there is a greater or less deposit of fat-globules in their coats, the elasticity and strength of which necessarily suffer; their contractile power is lost; they cannot sustain the frequent shocks from the heart's pulsations; they gradually enlarge and one form or another of aneurism results. Again, there is a distinct deposit of atheroma, which softens the lining membrane, and the inner and middle coats become eroded. Any disease or predisposition which has a tendency to produce these changes in the arterial tissues will, of course, favor the formation of aneurism. Arthritis, syphilis, and the abuse or prolonged use of mercurials, especially the latter, materially predispose to the disease. It is said that pulmonary consumption favors aneurism. By far the most frequent cause of aneurism, however, is mechanical injury. Strains and wounds are, in a majority of instances, the causes, and upon closely questioning a patient it will be ascertained that the first symptoms will be traced either to some violent muscular exertion, wound, or injury.

Climate also possesses a remarkable influence. Aneurism more frequently occurring in cold than warm latitudes.

Spontaneous Cure.—There is no doubt that nature always endeavors to cure an aneurism, both by the deposit of the fibrinous layers in the coats of the artery and the formation of the coagulum within the sac; she is sometimes, however, unsuccessful, but there are instances in which her efforts have succeeded. The occlusion is brought about in several ways; first, by inflammation and necessary obliteration of the tumor; from the presence of firm coagula in the mouth of the vessel supplying the sac; by an entire obliteration of the artery below the sac, and by closure of the vessel by pressure, either from the mass itself or other morbid growth.

The form of aneurism which is most favorable to the spontaneous cure is the *true sacculated;* the tubular variety or true aneurism does not admit so readily of spontaneous cure. It is the deposit of the stratified fibrin that, forming in concentric layers, gradually fills the sac and thus obliterates it.

When nature, however, is unable to accomplish the result, and medical or surgical advice has been either disregarded or proved insufficient, a *fatal* termination may certainly be expected. The sac will burst externally, or perhaps beneath the integument, thus forming a diffuse aneurism, which may result in gangrene and death; a syncope may immediately ensue; or inflammation may attack the wall of the tumor; it may open gradually or suddenly, discharging large quantities of blood; or, in other instances, patients may lose a great deal of blood from time to time after the rupture of an aneurism, and die from pressure of the tumor. This happened to the celebrated Mr. Liston, who died, not from hæmorrhage, although the sac of the aneurism was ruptured and a large coagulum was found projecting into the trachea, yet death was occasioned by the irritation and exhaustion which pressure upon the inferior laryngeal nerve produced.

Diagnosis.—From what has already been said regarding the symptoms of aneurism, it will be seen that there are many cases in which the diagnosis is readily made, whilst in other instances there is great difficulty. The fact that every pulsating tumor is not an aneurism is perplexing. Sometimes the diastolic impulse can be felt on all sides of the tumor, and even a diminution in its size takes place from pressure on the cardiac side

and no aneurism exists. Very distinguished surgeons have thus been misled. Dupuytren found a certain diastolic impulse on all sides of a malignant tumor of the foot, and Nélaton stopped the pulsation of a tumor over the femur, which proved to be a disease of the bone. Mr. Teale describes a case of large serous cyst of the neck, extending below the clavicle in the vicinity of all the large vessels, in which the pulsation was so great that both himself and several other surgeons regarded the case as one of aneurism.

Dr. Stephen Smith, of New York, mentions two cases, one in which an aneurism in the popliteal space was mistaken for a simple sarcoma, and was operated upon, the patient dying in a short time, after a most profuse loss of blood, and a second case in which a fatty tumor was diagnosed as an aneurism.

The *bruit*, the location, the course of great vessels in the vicinity of a tumor, materially assist in making a diagnosis. The character of the pain in aneurism has been, at times, mistaken for neuralgia or rheumatism. The distinction is that aneurism pain is lancinating and intermittent, with a continuous aching; at times a burning sensation. When such have long continued, and have defied the means employed for their relief, the surgeon should bestow especial attention to the bloodvessels of the vicinity.

General Treatment of Aneurism.—There are two modes of treatment, the medical and the surgical; the first embracing not only those means employed to repair the constitution, but to prevent, if possible, undue action of the bloodvessels, and even to diminish the power of the heart's action. Valsalva's method, which is well spoken of by Hodgson, Pelletan, and Erichsen, and which is certainly anomalistic, consists, first by starvation and depletion to reduce the power of the heart, and then by an abundant supply of food to promote the formation of fibrin. In addition, small bleedings were sometimes resorted to as part of the treatment, the whole of which I think should be ignored.

Rest.—Mr. Joliffe Tufnell* recommends most highly *perfect, complete, and prolonged rest.* There must be no rising up, and as little movement as possible, for weeks and months together. During this time the diet must be as follows: For breakfast, three fluid ounces cocoa or milk and two ounces of bread and butter. For dinner: three ounces of meat, either boiled or broiled, three ounces of potatoes, and four fluid ounces of light wine or water. For supper: bread and butter, nine ounces; milk or tea, two fluid ounces in a day.

The patient may be quieted with five grains of lactucarium at night, and pain subdued whenever it appears. He reports ten cases of cure.

The *medical* treatment of aneurism is of great importance, as there are medicines which have a specific power over the heart's action and the great vessels, and others which have a decided influence over the plasticity of the blood. Of these, *veratrum viride* must always be remembered. I have witnessed its beneficial effects in hæmorrhage. In a case of severe gunshot wound of the ear, in which profuse and almost uncontrollable hæmorrhage took place, veratrum viride was given, five drops every three hours until the pulse went down to fifty-five or sixty beats in the minute, and so was kept for some days. The hæmorrhage ceased. The same amount of compression was used before the use of the medicine as after, but the bleeding would invariably recur. Belladonna, aconite, digitalis, and gelseminum are all medicines which should be given regularly for a time, and then one

* Successful Treatment of Internal Aneurism. London, 1875.

of the following, viz.: calcarea, lycopodium, or sulphur; the phosphate of lime or the sulphate of soda may be required, perfect rest being enjoined.

A great deal lately has been written on the treatment of aneurism with large doses of *iodide of potash*, and remarkable results have followed its administration, Dr. Da Costa of Philadelphia, believing it, together with secale, to be the only two medicines for the disease. Drs. Clutterbutty, of Calcutta, and Balfour, of Edinburgh, are advocates of this method of treatment. The doses given were from fifteen to thirty grains of the substance. Dr. Roberts also speaks favorably of the drug.* The *actea racemosa* has been used by Dr. Von Gottschalk, and lycopodium by Dr. A. S. Ball. I have now a case of thoracic aneurism, in which the iodide of potash is being administered; as yet there is no perceptible improvement. In another very aggravated case it entirely failed.

I must, from some personal experience in the treatment of internal aneurism, state my convictions that gallic acid in half drachm doses is the most effective medicine in the cure of aneurism. In one instance a patient was brought to me from San Francisco, with an immense aneurism of the arch of the aorta. The following are my notes of the case:

Mr. P., a resident of China, was first taken with intermittent fever at a town on the Yang-Tse-Kiang River, and had it for nearly a month; he suffered a great deal of pain through his chest, and was ordered a change of climate. His disease was called "rheumatism of the heart." He then went to Shanghai, and was attended by a French physician, and improved, but the trouble began again to develop. He had great pulsation in the neck from the slightest cause, also severe neuralgia in the head, particularly on the left side. Motion became almost impossible, on account of the violence of the pulsation, which any attempt to move was sure to produce. He went four hundred miles further south, but the trouble still continued. There he was treated by an English physician, who called the disease aneurism of the heart. He was so weak that the doctor thought he would die before he could get to Japan. He then visited San Francisco, and nearly died while there. The doctor there gave him some medicine, which relieved him for a time; he thought that he was improving, and returned home. He arrived there in June, and had to leave in September. Then he came to New York, and was brought to me by Dr. White, of Harlem, and went into the hospital on the 15th of October. When I saw him he had no radial pulse; he had an enlargement on the upper side of the chest, and with a pulsation or bruit, which was very well marked, and of tremendous power. He was sleepless and restless, and suffered a great deal from neuralgia, but never lost his appetite. His digestion was good from the first. He felt so miserable that, as he expressed it, "he did not care whether he lived or died." I gave him one-half drachm of gallic acid three times a day in cinnamon water, and kept him in a recumbent position, though not continuously, for four months. His many symptoms were quieted from time to time, but the peculiar nervous phenomena were remarkable. For instance, he would lose all control of certain muscles or nerves. He would have a piece of beef on his fork, and endeavor to put it to his mouth, but suddenly would lose control of his arm, and the meat would go over his head. He did not appear to have any control over the nerves or the voluntary muscles. Before taking the acid, his hands were constantly numb, and for a number of days after he spit blood, accompanied with a great deal of phlegm, which nauseated him.

After four months' treatment all his symptoms subsided; he was able to

* British Journal of Homœopathy, vol. xxi, p. 494.

go about his usual business. He died about fourteen months after, from lobular pneumonia, in intense agony, owing to the pressure of the consolidated aneurism on the inflamed parenchyma of the lung. Before his departure from the hospital he had promised me that a post-mortem should be made, and bequeathed to me the specimen. I have it now in my collection, a perfectly consolidated sac, measuring 3½ inches in diameter and 14¼ inches in circumference. Through the centre is a channel about half the size of a healthy aorta; adhesions had taken place to the column and to the surrounding structures.

In one other case I have had a somewhat similar, though not so marked a result, while again in another there was no permanent benefit.

I was led to this treatment by perusing a paper by S. Fleet Spier,* of Brooklyn, who alternated the gallic acid with five minims of the liq. ferri subsulph.

Compression.—This method of treating aneurism is at present much in vogue, and from its safety and the success which has attended it in many instances, much may be expected of it. By referring to the Chapter on the "Means and Instruments for Arresting Hæmorrhage," several tourniquets and compressors for this purpose are mentioned, but the best kind of compression is that *made by the fingers*, and should always be selected, provided the requisite number of assistants can be obtained. It must also be recollected that the object in applying compression is not entirely and at once to obliterate the vessel, but to cause the passage of a current more slowly, and thereby favor the formation of laminated fibrin. For this reason, especially, medical means may be combined with the local, and the heart's action be materially lessened, especially by the use of veratrum viride. An objection to more forcible compression than that with the fingers is the danger of impairing the vitality of the structures. To avoid this risk also the pressure should be made *in two places;* if for popliteal aneurism, for instance, it should be applied alternately, first at Poupart's ligament, and secondly at the apex of Scarpa's space; if the aneurism be in the forearm, pressure should be made first on the radial and then on the ulnar side, thus relieving the patient of the severe pain which is occasioned by continued compression. If it be possible to combine the position of *forced flexion* with the pressure, an additional advantage will be gained. For the methods of applying flexion to arrest the circulation, the reader will refer to the Chapter on Arresting Hæmorrhage.

Pressure was first made directly upon the sac by Bourdelot, Genga, Heister, Guattani, and others; on the distal side of the tumor by Vernet and Broca, neither of which, however, are as successful as that made at the cardiac side.

The *duration of treatment* by compression varies much, as does also the immediate effect produced upon the tumor; sometimes this is immediate, the swelling becoming more solid, the bruit less marked, the pain less severe, and the pulsation ceasing rapidly.

Generally, however, the changes are more gradual. In twenty-six cases of popliteal aneurism in the London hospitals treated by compression, Mr. Hutchinson records the average time as nineteen days. Dr. Agnew, of Philadelphia, has recently reported a very interesting case of double popliteal aneurism, in which the left one, being the largest, was treated first by tourniquets and digital compression, and the right side by digital alone, conducted by trustworthy assistants, each keeping his position for about thirty minutes. For the first twenty-four hours there was considerable but

* Medical and Surgical Reporter and Medical Record.

bearable pain, occasioned by the establishment of the collateral circulation. In thirty-six hours great restlessness came on, and in forty-eight hours the suffering was so great that the instruments were abandoned and digital compression alone continued for seventeen additional hours, when all pulsation ceased. The patient was then allowed three days' rest, and the right leg was then subjected to digital compression. In seven and a half hours all pulsation ceased in the tumor, and in twenty-four hours the compression was relaxed.*

In a case of my own† the compression was kept up seventy-two hours by relays of medical students. There were six classes, each class composed of five students; each class was relieved every six hours, each student making pressure at some point in Scarpa's space for twelve minutes. Thus it will be seen that each gentleman made direct pressure on the femoral three times during his period of service. Pulsation ceased in twenty-four hours, but for the sake of security, pressure was made in the same manner from 9 o'clock in the morning until 9 o'clock at night, for three days. At that time, there was no *bruit* or pulsation, the collateral circulation was fully established, the tumor was diminished to one-half its size, being perfectly firm and circumscribed.

It is very important during this treatment that the whole limb be evenly and uniformly bandaged and closely watched lest appearance of gangrene should supervene. The statistics presented thus far, favor compression over the ligature; thus in the thirty-fourth volume of the *Medical and Surgical Transactions*, Dr. Bellingham, a strong advocate for this method, gives thirty-two cases treated by it, of which twenty-six were cured; one failed, and recourse was had to the ligature; in two, amputation was performed; two died, and one failed, the pressure being discontinued. Of one hundred and eighty-eight cases, recorded in Dr. George Norris's tables upon the ligation of arteries, one hundred and forty-two were cured, forty-six died, six were amputated; in twelve suppuration and gangrene followed; showing a proportion of deaths of one to four, and accidents one to three, while the compression exhibits a proportion of failures 1 to 5.3, and deaths 1.16.

Mr. T. Holmes reports two cases of traumatic aneurism successfully treated by *direct pressure*. One, a subclavian aneurism, was compressed by means of a rubber ball bandaged on to the tumor, and subsequently replaced by a pad, gradual consolidation taking place. The other, a femoral aneurism, was made to consolidate by means of digital pressure upon the femoral artery at the brim of the pelvis by relays of students. This compression was kept up for twenty-six consecutive hours, the *bruit* at that time having entirely disappeared, and but slight pulsation remaining, which disappeared after a few days, upon a short renewal of the pressure.‡

Manipulation.—This treatment of aneurism, introduced by Sir William Fergusson, imitates nature in the endeavor to form new clots within the sac. By manipulation, a certain amount of force being used, the clots are broken, and carried from the external wall of the aneurism and pushed into the current of the circulation, thus forming so many new centres of coagulation. Fergusson has published cases of cure by this method, and Dr. Van Buren§ thinks that most of the spontaneous cures of

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* *Vide* Medical and Surgical Reporter, Philadelphia, August 12th, 1871; also, New York Medical Record, New York, August, 1872.

† Transactions of the Hom. Med. Society of the State of New York, 1873–74, p. 141

‡ Month. Abs. of Med. Science, April, 1876; Lancet, February 12th, 1876

§ Treatment of Aneurism. Transactions of the International Medical Congress at Philadelphia, 1876, p. 565.

aneurism which have been reported have taken place in this manner; care, however, must be taken lest rupture of the sac or embolism of adjoining vessels result.

The Old Operation.—The so-called old operation, which dates back to the times of Antyllus, but which was revived by Syme, consists in arresting the blood by compression above the vessel, then opening the sac, turning out the clots, and applying a ligature above and below the sac. This operation has always been considered daring, dangerous, and difficult, but Mr. Syme, with that boldness which characterized his surgical achievements, performed the same successfully in cases of popliteal, axillary, gluteal, iliac, and carotid aneurisms. Esmarch's bandage carefully applied, would be a valuable adjunct in the performance of such an operation.

Esmarch's Bandage.—I have had no experience as yet with this method of cure, but from the many published cases it certainly would appear to be a most excellent method of treatment.

The *Lancet*, of January 30th, 1877, discusses the *modus operandi* of complete temporary pressure by means of Esmarch's bandage, stating that the blood not only coagulates in the sac, but also along the adjoining artery as far as the nearest collateral branch. The clot does not consist of laminated fibrin, thought, since the days of Hunter, to be necessary to the successful consolidation of an aneurism, but "passive, amorphous" clots, which become organized. It is not essential, therefore, to form the laminated clot, for rapidly formed clots, produced by this method, do equally well.

Mr. Tyrrell* reports a case of popliteal aneurism cured in a very short time by Esmarch's apparatus. The bandage was applied in the usual manner, and at first gave rise to pain. It was allowed to remain fifty minutes, and after its removal the tumor was found actually pulseless. For precaution, digital compression was maintained afterwards for two hours, and for the night a tourniquet was applied with moderate firmness.

Mr. Thomas Smith successfully treated a popliteal aneurism of the size of a hen's egg by means of Esmarch's bandage, and from his own case and those of Dr. Reid,† Mr. Wagstaffe, Mr. Heath, and Mr. Wright, concludes that the essential features of the successful employment of this method are that the circulation in the limb should, for a time, be completely arrested; that the aneurismal sac should be full of blood (the bandage being omitted over it), and that the circulation in the aneurism should be stopped for a sufficient time to allow the blood to coagulate. In his own case, the bandage was kept on for one hour, and an Italian tourniquet then maintained for two hours, before pulsation in the aneurism ceased. In Mr. Reid's case the pulsation ceased in fifty minutes; and in the others, one, two, and twenty-four hours respectively. He considers that it has not yet been determined how long it is prudent to exclude the blood from the entire limb by Esmarch's bandage, and when the tourniquet, more local in its effects, should be substituted for it.

The perusal of the above cases, and the opinions of the eminent gentlemen who have employed this method, are sufficient guarantee of what is to be expected in the future.

Injection into the Sac.—The treatment of aneurism by *injections of the perchloride of iron* has caused much interest among surgeons. Dr. Pravaz first introduced the practice, and it has been since used by many surgeons with

* Lancet, June 3d, 1877.

† Lancet, May 26th, 1877; Monthly Abstract of Medical Science, July, 1877.

varied success. Its failure in some instances has been attributed to the fact, that either too much or too little of the perchloride was injected; the quantity of fluid to be used not having been specified. The effect is generally the immediate formation of a clot in the sac—arrest of pulsation and finally obliteration of the trunk of the vessel.

The dangers attendant upon this practice should receive serious consideration. Fever results, and formation of pus in the artery has taken place.

Excessive injection excites acute inflammation of the sac, followed by ulceration and expulsion of the clot; the essential part of the operation consists in so managing, that there should be slow absorption of the foreign matter introduced within the tumor.

Pravaz remarked that in the case of an aneurism the size of a pigeon's egg, he would not inject more than four or five drops of the perchloride, and that he would repeat the operation, should the pulsations in the tumor not cease after a certain time.

The persulphate of iron has also been used successfully, as likewise the ergot of rye (*secale cornutum*).

Hypodermic Injection.—The following case is recorded to show what value may be placed in some instances upon hypodermic medication:

Prof. Von Langenbeck, of Berlin, reported a case to the Medical Society of Berlin on the 17th of February. The patient, a man of forty-five years of age, with strong constitution and previously healthy. Attacked in spring of 1864 with pain in right arm, which radiated from shoulder or side of the neck; was treated for rheumatism with sulphur baths. Pain increased, depriving him of sleep; the arm grew weaker. In September a pulsatory swelling on right side of the neck observed. In October the doctor traced the same to the right fossa supraclavicularis and found an aneurism the size of a pigeon's egg. A moxa of neutral chrom. potass. applied to sac, from the beginning of October until December four times, at intervals of three or four weeks. Under this treatment the symptoms improved; pain almost vanished; now and then, however, the patient observed a slight twitching of the arm, and in the beginning of January he returned to his home. From January, 1865, to the summer of 1868, he was apparently well, and pursued his former occupation. The aneurism had become smaller and caused no trouble, although it still plainly pulsated. During the summer of 1868 the patient visited Misdroy for sea-bathing, since which his condition became rapidly worse. The swelling increased, the pulsations were stronger, and the pain reappeared; the arm became weaker and sleep again deserted him, and so continued until January 1st, 1869, when the doctor made the first hypodermic injection of 0.03 gramme of ext. sec. cornut. aq. From January 6th to February 17th (and generally at intervals of three days) there was injected altogether two grammes of ergotin in doses of 0.03 to 0.18, since which the improvement has steadily gone on, the pulsation being perceptibly weaker, the circumference materially decreased, the jugular more superficial, and the fossa triangularis between the sterno-mastoidei has been restored. No constitutional effects observed from the ergot. On the occasion of the injection of 0.18 gramme the patient complained of glittering before the eyes and giddiness, but the doctor thinks it may have arisen from some other cause. The injections were made in the morning between eleven and twelve o'clock, and always under the skin covering the aneurism. Dr. Langenbeck has thus far used the watery extract of Bonjean. ℞. Ex. secale corn. aq., ℥xl; Spir. vin. rectif., Glycerin, āā ʒij.*

* U. S. Med. and Surg. Journ., Chicago, July, 1870, p. 458.

Dr. Eckel reports a case of a married woman, aged forty-six years, in which a tumor, on April 23d, 1870, was as large as an English walnut, with pains and other symptoms much the same as the foregoing, when an ice compress was ordered to be renewed every hour. Acon. and bry. that night were given. "On the 24th no change; tried lachesis. On the 25th, patient same; injected three drops of secale corn. (English preparation; it is said one drop is as strong as one grain of the powder) under the skin over the centre of the tumor; cold water continued, sleep obtained, and pain relieved. Injections repeated on April 27th and 29th, May 1st and 5th, when slight erysipelas set in and injection omitted for four days, but on the 10th, the erysipelas having entirely disappeared, the sixth injection was made. Swelling now much less, and great general improvement. On June 1st made the twelfth injection, and for the present the last. At the last four injections ten drops were used; in all, seventy-six drops of ergot, followed by no bad result. On June 6th patient ordered outdoors; she had good appetite, slept well, no pain, pulsations very faint." Dr. Eckel asks why caulophyllin could not be used in such cases, no good resulting from acon., bry., sulph., lach., or digitalis?

"On June the 14th the patient makes no complaint and can dress her own hair. The aneurism was reduced one-half."*

Galvano-puncture.—In 1832 Phillips introduced the following method of treating aneurism. It consists in the introduction of galvanic needles into the sac, applying the battery, and thereby causing coagulation. According to Drs. Beard and Rockwell the treatment requires a battery of from five to twenty cells. Insulated needles, two or three in number, and connected with the negative pole of the battery, must be thrust into the tumor, while an electrode of sponge is laid near by. Dr. A. McL. Hamilton has collected ninety cases in which the galvano-puncture was used, and gives forty-eight cures. For further information the reader is referred to the Chapter on Electrolysis.

Ligature.—The various methods of applying the ligature and the best materials employed will be found in the Chapter on Hæmorrhage, as well as explicit directions for tying the knot. At this place ligatures will be noticed only in connection with aneurism.

There are several places at which the ligature may be applied. First, *above* or on the cardiac side and close to the tumor, as was used by Anel, who placed a ligature on the brachial artery above the tumor, on the 30th of January, 1710. Since then the operation has gone by his name. In the *Hunterian method* the application of a ligature is made to the cardiac side, but further away from the sac, thereby avoiding all diseased structures, and constricting the artery at a point where all the coats are healthy; this idea, however, has been objected to very emphatically, and especially by Mr. Syme, who argued that the size of the tumor does not depend upon the state of the vessel, and therefore forms no criterion of the extent of the abnormal condition, while the formation of the clot, so far from being injurious, would rather contribute to strengthen and support it by consolidating the textures in the neighborhood. Hunter's operation was performed in December, 1785.

Brasdor's method consists in tying the vessel at the distal side of the aneurism. This process was at first ridiculed, and like many other remarkable advances in medicine was nearly abandoned in consequence of the unsuccessful terminations of the first cases. Deschamp first tied the femoral, and the patient died, the pulsation rapidly increasing after the ligature was

* U. S. Med. and Surg. Journ., July, 1870, p. 490.

applied. Allan Burns and others denounced the method as perfectly absurd. Astley Cooper, however, in 1818, convinced of the feasibility of the process, successfully applied a ligature to the distal side of a tumor of the groin. In 1825 Mr. Wardrop placed a ligature on the common carotid, and in 1826 another, which brought the operation conspicuously before the profession. This operation bears the name of Wardrop as well as that of Brasdor.

Thus there are three points *d'appui* in aneurism:

1st. Anel's method, cardiac side, close to tumor.

2d. Hunter's method, cardiac side, remote from tumor.

3d. Brasdor's or Wardrop's method, on distal side.

The old method was to ligate the trunk of the vessel above and below the aneurismal tumor, as already mentioned.

The Carbolized Catgut Ligature.—By this method the danger of secondary hæmorrhage is certainly lessened, although it is claimed by some that the animal tissue becomes soft in too short a period of time, and that secondary bleeding will result. Mr. Flemming,* who has made many experiments with this form of ligature, says "that a gradual softening of the ligature takes place from without in, the catgut breaking down and becoming infiltrated with cells, probably leucocytes. This process takes from five days to about twenty, varying with the specimen of catgut, the tissue amongst which it is situated, and the age and vitality of the animal. Last, the pultaceous mass into which it has been converted begins to metamorphose and is soon permeated with blood-channels, and ultimately may be described as a cast of catgut, in a kind of granulation-tissue, freely supplied with bloodvessels, which in many of my sections are very fully injected. If, then, we admit these conclusions, we can easily account for the different results obtained by the use of catgut in different hands." That is to say, that if there is sufficient obstruction lasting long enough to procure the formation and hardening of the clot the result will be favorable; if not, secondary hæmorrhage will result. In other words, the "sample of catgut" and the "vitality of the patient" regulate the success of the ligation.

In all these operations the ligature must *not* be drawn too tight; the object being to cause a deposit of lamellated fibrin wherewith to obstruct the vessel.

Of percutaneous ligation, acupressure, Spier's constrictor, and other methods, descriptions are contained in the Chapter upon Hæmorrhage.

The After-effects of the Ligature.—There are consequences of the ligature, either immediate or remote, which are very important; for these the surgeon must be prepared. 1st. Coldness, or heat of the part; 2d. Inflammation and suppuration; 3d. Gangrene; 4th. Shock; 5th. Shrinkage; 6th. Arrest or return of pulsation.

In the majority of instances, shortly after the ligature is applied, the parts become cold from arrest of the circulation, to counteract which the limb should be wrapped in carded cotton immediately after the operation; but instead of coldness, very often an intense degree of heat follows, which is the concomitant of inflammation. For this untoward symptom, the limb should be lightly bandaged, and a few drops of the tincture of aconite be mixed with four ounces of water, of which a tablespoonful should be taken every hour. The part should also be elevated. If, in connection with the intense heat, the swelling should increase in size, become reddish and discolored, the wall of the sac become thinner, and finally give way, there will be liberated pus, coagulated blood, and often a fetid fluid, commingled

* Lancet, May 27th, 1876.

with soft broken-down clots. This hæmorrhage may in a short time prove fatal from the amount of blood, or it may continue to discharge in small quantities for a longer period of time. If, however, suppuration and sloughing of the sac take place a considerable time after the application of the ligature, the secondary hæmorrhage does not invariably follow, the mouth of the artery having been doubtless effectually closed by a coagulum.

In *treating* such cases, the better plan is, when the evidences of suppuration are unmistakable, to open the sac, turn out the contents, and, if hæmorrhage take place, arrest it either by compression, ligating the vessel in the wound, or tying it in a healthy part above the sac. In severe cases, when there is no time to be lost, the actual cautery should be immediately and freely employed. If these means fail, there remains *amputation*, which, though a desperate alternative, may prove effectual.

If *gangrene* commence, intense pain is experienced along the entire course of the limb, which assumes a mottled appearance, the color being rather of a livid and greenish hue than the ordinary purple, with its surface covered with phlyctæna.

In such cases the condition of the patient may be regarded as almost hopeless, and nothing remains but to amputate. This, however, should not be done without due deliberation; time should be allowed to ascertain whether the disease becomes circumscribed: should such prove to be the case, the ordinary treatment for gangrene must be pursued.

Shock.—In some cases, after the ligature is applied, the system suffers very severely, and alarming symptoms supervene; the pulse becoming weak and irregular, the skin cold, the surface bluish, and delirium together with convulsive movements occur, and this may be followed by intense fever, with tendency to congestions in other parts of the body.

Shrinkage and Pulsation.—In most instances, as might be expected, the tumor lessens after the application of the ligature, and the pulsation ceases. These changes, however, may not continue, and a recurrent beating takes place, caused by the supply of blood being directed into the sac through anastomosing branches and smaller collateral channels, and this may occur at different times. If within the first thirty-six or forty-eight hours an indistinct pulsation is manifested, which continues for a short period and then gradually becomes less, the surgeon need feel no apprehension concerning the case, as it shows a good condition of the collateral circulation. If, however, after a month has elapsed, the pulsation, having ceased, should gradually return, the prognosis would be unfavorable. This recurrent pulsation is best treated by moderate pressure upon the sac.

The Introduction of Foreign Material into the Sac.—Mr. Moore was the first to introduce this method of treating aneurism. Iron wire was gradually introduced into the sac. Dr. Levis, of Philadelphia, substituted horsehair, which he passes through a hypodermic needle. He inserted twenty-four feet nine inches of horsehair into the sac of a subclavian aneurism; the pulsation ceased, the tumor became hard, and no pulse could be detected in the radial at the wrist. The man died, but it was found that there had been a rupture of the vessel previous to the operation. Mr. Bryant also has used the same method.

Of all these methods, Dr. Van Buren, in his masterly paper, read before the International Medical Congress at Philadelphia, thus speaks:

1. Tufnell's treatment of aneurism, by rest, position, and restricted diet, offers a valuable resource in thoracic and abdominal aneurisms.

2. It should always be tried in innominate, subclavian, subclavio-axillary, and iliac aneurisms, before resorting to measures attended by risk to life.

3. For aneurisms of the subclavian and iliac arteries, the Hunterian oper-

ation, with our present means of preventing secondary hæmorrhage, is not justifiable.

4. For reasons formally set forth by Holmes and Henry Lee, the "old operation" cannot properly be substituted for the Hunterian operation in these cases, but should be held in reserve for special ones.

5. It is the most safe and surgical resource in gluteal aneurism, if the circulation can be commanded by the hand *in situ*.

6. The mode of cure by embolism, aimed at in the method of manipulation, is a not unfrequent explanation of what is called spontaneous cure of aneurism.

7. The value of Esmarch's bandage in the treatment of aneurism is probably not fully estimated.

8. In view of the promising features presented by the cases of Levis and Bryant, in which horsehair was introduced into aneurismal tumors, the repetition of this operation, or the substitution for horsehair of Lister's prepared catgut or other animal substances, may be properly tried.

Special Aneurisms.—*Aneurism of the aorta* occurs either in the arch of the vessel as it passes through the thorax or in the abdominal portion. In many instances it is most difficult to diagnose, especially if the enlargement is small. In other cases the symptoms are sufficiently pronounced to obtain a more certain diagnosis. Persons whose occupations require severe bodily exertions are most obnoxious to this morbid arterial condition; atheroma and mechanical injuries are also causes. It is asserted that coach-drivers are more liable to the formation of aneurism of the aorta, owing to their position and exertions in driving. It is rarely found among the young, most frequently affecting those in the prime of life. The shape of the swelling varies somewhat, being either round, cylindrical, or spindle-shaped, giving rise, from its pressure on important organs, to a great variety of symptoms.

Symptoms.—An early manifestation of aneurism of the aorta is a dull and circumscribed sound, yielded by percussing either the anterior or posterior walls of the thorax. If the anterior wall of the vessel be affected, the sound will be recognized on the left sternal border; if the posterior wall, it will be heard on the left side of the vertebral column. When the swelling has attained considerable bulk, the eye may detect the enlargement, and the systolic concussions are well marked. As the disease progresses, the pain which, in the beginning, was not severe, increases; organs are pushed from their natural positions, the body assumes a bent attitude and inclines to one side or the other; dyspnœa takes place from stasis pulmonum; cyanosis, vertigo, headache, swelling of the neck and head, and a varicose condition of the veins are all accompaniments of the morbid changes which are taking place. If the aneurism occupy the upper part of the vessel there is a retardation of the pulse at the wrist; if the abdominal aorta be affected, a similar condition is noted in the femoral artery. Upon auscultation two murmurs will be heard,—the systolic and the diastolic—the former often accompanied by that peculiar blowing noise called the "bellows' murmur." The second sound is occasioned, in most instances, not from any peculiarity in the aneurism, but by the closing of the semilunar valves. Intercostal neuralgia is frequently present.

A most distressing symptom of the affection is the dyspnœa, the effect probably of pressure upon the trachea, or nerves, and which is materially increased by motion, causing a more powerful action of the heart. If the swelling is in the vicinity of the left bronchi, lying on that side greatly increases the difficulty of breathing, a change of position relieving the patient.

Aneurism of the thoracic aorta is at times accompanied with severe organic affection of the heart, giving rise to dropsical swellings in different parts of the body. If the aneurism is situated at the *arch* of the vessel, it is more noticeable on the right, than on the left side, and either pushes forward the sternum and ribs and rises high in the chest, or occasions severe pressure-symptoms from encroachment upon the recurrent laryngeal nerve, trachea, or bronchi. From these circumstances there is a remarkable retardation of the wrist pulse. In the aorta descendens, if the seat of the disorder is in the anterior wall of the thoracic portion, there is a pulsating tumor in front of the thorax to the left of the sternum ; in the posterior wall of the descending vessel the pulsation is found to the left of the spinal column. It occasions pain and stiffness on motion, sometimes accompanied with inflammation of the muscles and caries of the bone. In the *abdomen* the location of aneurism of the aorta is generally in the vicinity of the cœliac axis; it is either above or below the umbilicus; it does not convey a double murmur, as in the arch, but only imparts a systolic sound. The crural pulse is slower than the beats of the heart or the pulsations of the radial artery at the wrist.

The *pathological appearances* are those belonging to aneurisms generally; these have already been adverted to, viz., an altered condition of the coats of the vessel, they being laminated and fibrinous, and within the sac a bloody coagulum.

The *pressure-indications* are often very remarkable. The parietes of the enlargement may be closely adherent to the surrounding tissues; there may be degeneration of the bony structures in the vicinity, as atrophy of the ribs and sternum, caries of the vertebræ, which may have been occasioned from extension of the inflammatory process and pressure on the spine. Partial paralysis may also occur.

Treatment.—As might be supposed, the prognosis of aneurism of the aorta is unfavorable, but sometimes much may be done to alleviate the sufferings of the patient. Exertion must be avoided; the diet allowed be of the most nourishing and easily digested kind; and if the tumor is in a position where moderate pressure can be used it should be employed. I have seen cases in which a large and slightly concave shield fitted over the pulsating tumor gave great ease and support. The aorta has been ligated four times. In Sir Astley Cooper's case, the first, in 1817, the patient lived forty hours. The longest time that a patient has survived the operation is ten days.

Aneurism of the Arteria Innominata, from its position, must always be associated with serious and dangerous symptoms. Before the disease is fully developed the patients often complain of pains, apparently of a neuralgic or rheumatic character, in the neck, face, arm and shoulder. These generally are the pressure-symptoms, induced by irritation of the brachial plexus, and take the course of the cervical nerves, either upward or downward. The right arm becomes numb and cold, and motion and sensation are more or less impaired. After an indefinite period a slight globular swelling or enlargement may be perceived at the junction of the clavicle with the sternum, which may be painful, together with swelling of the side of the face and neck. This increases for a time, filling up more or less completely the bow in the front of the neck, displacing the sterno-mastoid forward, and extending outward to the shoulder. While these changes are taking place there are symptoms of cough, dyspnœa and difficult deglutition. In some instances, where no special enlargement is observed in the neck, the sternum is pushed forward. The tumor, when visible, as just mentioned, is soft and fluctuating, has pulsation and *bruit* of more or less distinctness.

The cough and dyspnœa are often very distressing, and depend either upon direct pressure upon the larynx and bronchi, or upon compression of the recurrent nerve. The prognosis is unfavorable and the treatment surgical. [The surgical anatomy and methods of applying the ligature are mentioned elsewhere.] Valentine Mott, of New York, was the first to propose and perform the operation of ligating this vessel, in a man twenty-seven years of age, May 11th, 1818. Death did not occur until the twenty-sixth day.* In 1822 Graefe repeated the operation; the patient lived sixty-eight days, and died from hæmorrhage occasioned by overexertion. In the case of Bland, secondary hæmorrhage took place on the eighteenth day, and in that of Hall on the eighth. Lizars performed the operation on the 31st day of May, 1837, and the patient died on the 21st of June. In Kuhl's case the patient died on the third day. It was reserved for America to achieve the feat of ligating successfully the innominata, which operation was performed by Dr. J. W. Smyth, of New Orleans, in 1864. It must be remembered, however, that the common carotid was also tied at the same time, and that after several hæmorrhages, on the fifty-fourth day the right vertebral was ligated. The recovery was complete.

The distal operation for aneurism of the innominata can be performed at several points: either at the subclavian or the carotid, or the ligature may be placed upon both these vessels.

Mr. Richard Barwell† relates a most interesting case, in which the aorta, innominata, subclavian, and carotid were involved in one aneurism, for which he successfully ligated the carotid and subclavian at their distal extremities. In his paper he states that six such cases have been treated with the distal ligature; of these, two proved fatal on the sixth day, one on the fifty-sixth, and one on the sixty-fifth day, and two received no benefit, but lived some weeks.

In a case of my own, in which the aneurism involved both the subclavian and carotid, I tied the subclavian at its distal extremity. Pulsation was arrested, but the patient perished from hæmorrhage from the bursting of the sac.

An aneurism of the carotid artery is sometimes difficult to diagnose. For instance, if an artery pass through glandular tumors, if there be pulsation and no diminution in the size of the tumor from pressure; for in large abscesses there may be, as already stated, a distinct pulsation.

Various other tumors occupying the triangles of the neck have been mistaken for aneurisms. Indeed, I am very well aware that hygroma are very similar in feel and pulsation to aneurismal tumors. Aneurismal varix of the carotid artery and jugular vein, being soft and evenly compressible, are accompanied with pulsation, and consequently very liable to lead to mistakes in diagnosis. If the swelling be glandular, it may be lifted from the vessel, and then it will be found to lack the pulsation of aneurism. Again, glandular swellings are more hard and nodulated than aneurismal tumors. In abscess the general symptoms, such as the pointing and fluctuation, will aid in resolving the doubt, or a hypodermic syringe in this and hygroma may determine the difficulty. In none of these cases, however, do the *swell* and *increase* of pulsation, which belong to true aneurism, occur. A well-defined tumor, soft, compressible, and pulsating, diminishing on pressure, situated on the side of the neck, in the neighborhood of the angle of the inferior maxillary bone, accompanied with shooting pain in the

* For an account of this and other interesting cases, see Mott on Aneurism. Velpeau's Operative Surgery, vol. ii, p. 255.

† American Journal of the Medical Sciences, January, 1878, p. 275.

head, buzzing in the ears, spots before the eyes, difficulty of swallowing, and sometimes of breathing, presents all the evidences of an aneurism of the carotid artery.

These are the obvious signs and symptoms, and must be well weighed before a positive opinion can be entertained. In a table of thirty-nine cases, in which the vessel was ligated for aneurism, or rather for what was mistaken for aneurism, in eight cases there were no traces of the disease, and in the others, solid tumors or cysts occupied the spaces. After ligature of the carotid, sometimes suppuration of the sac takes place, and secondary hæmorrhage follows, but the most frequent untoward occurrence is cerebral disease, occasioned by the sudden withdrawal of a large amount of arterial supply to the brain. Symptoms of this deficiency are faintness, giddiness, and even syncope, which are immediate, followed by the graver manifestations of brain diseases, terminating in paralysis, convulsions, and death. The thoracic organs likewise frequently sympathize, congestion of the lungs following the tightening of the ligature. To this peculiar affection attention has been directed by Prof. Miller. Sir Astley Cooper ligated the common carotid in 1805.

Aneurism of the Subclavian.—Aneurism of this important vessel is, in the majority of instances, occasioned by mechanical violence or muscular exertion; it occurs on the right side in the proportion of three to one, and is much more frequent in males than in females; indeed, it is asserted that to its occurring once in women it is found sixteen times in men. From a careful study of the anatomy of the three subdivisions of this vessel it will be seen that in the left side, where it is well covered by the scaleni muscles, the aneurismal tumor cannot make its appearance until it has passed these muscles; while on the right side it is most usually found at the upper part of the chest. The tumor is generally ovoid in shape, and often appears above the clavicle in the posterior triangle of the neck (*vide* surgical anatomy of the neck). When the shoulder is elevated, if the swelling has not attained great bulk, it will disappear; if larger, a part only of it will be hidden below the clavicle. Together with the tumor there are present the usual pressure-symptoms, such as pain, numbness, and weakness, with swelling of the arm and hand, and a varicose condition of the veins of the neck with œdema. A peculiar and distressing symptom is often referred to the epigastric region, which is more or less persistent, accompanied with a contractile sensation about that region, owing to the irritation of the phrenic nerve and spasmodic diaphragmatic action.

Notwithstanding, however, all the morbid exhibitions, there is always difficulty in diagnosing the existence of aneurism in the lower portion of the neck and around the clavicles, simply for the reason that the swelling of an aneurism may be remote from the place where it is really situated. Dr. Mott asserts that he has seen an aneurism of the arch of the aorta present a tumefaction *above the clavicles*, in the situation where we would naturally expect to find aneurism of the subclavians. In relation to this subject he offers the following candid and practical opinion. He says: "All surgeons whose opinions are of any value will readily excuse mistakes that are made even by those who have had the *greatest experience*, because, notwithstanding *all the light afforded by pathological investigations and stethoscopic examinations*, it will, we think, be generally admitted by the profession, that *no subject is more difficult and obscure* than that of substernal and thoracic aneurism."

In the remarks on his case, Prof. Mott writes: "Several very important facts are established by this operation—facts which no surgical operation has ever before confirmed. It proves very conclusively that the heart, the

brain, and the right arm were not in the least injured by it, or in any of their functions. In no instance did I ever view the countenance of a man with more fluctuations of hope and fear than in drawing the ligature upon this artery. To intercept suddenly one-fourth of the quantity of blood, so near to the heart, without producing some unpleasant effect, no surgeon, *a priori*, would have believed possible. I therefore drew the ligature gradually, and with my eyes fixed upon his face. I was determined to remove it instantly, if any alarming symptoms had appeared. But instead of this, when he showed no change of feature or agitation of body, my gratification was of the highest kind."

This statement is of great interest in showing by what circuitous routes the collateral circulation may be accomplished, and the idea that a sufficient supply of blood could still be afforded if further obstruction to the circulation should be offered was so forcibly impressed upon the mind of Dr. Mott, that he says: "Yet, if ever a case should present itself again, *I should tie the primitive carotid at the same time that I tied the innominata.*"

Aneurism of the Axillary Artery.—One of the first symptoms experienced by a person suffering from axillary aneurism is a sense of weight and uneasiness in the affected part, occasioned by pressure upon the brachial plexus. This uneasiness soon amounts to pain, which, as the tumor enlarges, shoots upward into the neck, downward along the arm, and into the chest, and is aggravated by movement, sneezing, or coughing. Together with these sufferings there always is experienced a sense of prickling and numbness, which at times amounts to paralysis of the hand and fingers, and is often accompanied by œdema and coldness. Slight pressure even with the tips of the fingers aggravates the pain, sometimes rendering it very intense. The tumor, in the early stages of the disease, is somewhat soft and fluctuating and distinctly pulsating; it may appear below the clavicle, or it may enlarge the anterior margin of the axillary space. There is a distinct *bruit*, and the pulsation can be controlled by direct pressure upon the subclavian. The tumor is apt to increase more rapidly in this location than in other varieties of aneurism, the loose cellular structure of the armpit offering less resistance to its growth. In rare cases, and when it is situated high up, the clavicle may be pushed forward and upward, giving rise to considerable deformity. In operating for this aneurism, the point usually selected is that which lies on the first rib beyond the scalenus anticus muscle. Should it become necessary to ligate the axillary the operation may be performed according to the directions given elsewhere.

Aneurism of the Arm, Forearm, or Hand.—Aneurisms of the arm or forearm are generally traumatic, the spontaneous variety being very rarely met with. Gross has never witnessed a case, and is not acquainted with a record of any in this country. Mr. Todd relates a case treated in University College Hospital in 1849, in which a tumor presenting all the aneurismal characteristics was discovered at the upper third of the right ulnar artery. The symptoms of traumatic or false aneurism have already been detailed in the general considerations of aneurism. The symptoms are easily recognized, and demand no further notice. Pressure may be tried before resort is had to operative measures, which, however, are chiefly to be relied upon.

Abdominal Aneurism.—In the consideration of aortic aneurism, mention was made of the enlargement of the abdominal aorta; but the iliac vessels may be the seat of the affection. There are no varieties of aneurism which require more attention in the endeavor to reach a correct diagnosis, and in the search of which there is so great a liability to be misled. In the iliac region there may be pulsating enlargements, the true nature of which may

not only perplex, but positively deceive the most experienced in the profession. An interesting case of the kind may be found on page 382, of Holmes's *System of Surgery*, in which Mr. Moore ligated the common iliac artery for a *pulsating tumor*, which proved to be "cancer deposited in a mass of glands, situated in the bifurcation of the common iliac, between the external and internal iliac arteries." This, together with other observations, has proved that many pulsating tumors of the belly may be of malignant formation, and not aneurism. A bony pulsating tumor may also strongly simulate aneurism.

Treatment.—For iliac aneurism, the pressure treatment may be used, especially if the patient is thin. It is to be applied in the manner already directed, a compressor generally being required. For the additional treatment, see Ligation of the Internal Iliac Artery.

An **inguinal aneurism** may arise either from the femoral or from the external iliac artery; when from the latter it passes upward toward the inguinal region, and often into the abdomen. There is but slight suffering, the tumor at first is small, but increases rapidly, and has a distinct *bruit* and pulsation. From its weight and pressure there are œdema of the limb, pain in the leg and thigh, and a varicose condition of the leg from obstructed return into the saphena vein. The pain in this variety of aneurism is generally experienced in the lumbar region, and extends along the crest of the ilium down to the testicle and scrotum, being caused by pressure on the branches of the ilio-lumbar nerve. If these symptoms are manifest the diagnosis generally is readily made out. If, however, the aneurism be old, and there be a deposit of plastic material within the sac, imparting a feeling of solidity to it, and likewise an absence of pulsation, then it cannot be distinguished from an encephaloid or bony tumor. No less celebrated surgeons than Mr. Stanley and Mr. Syme have entirely confounded these two diseases. From abscess it is known by the history of the case, the preceding inflammation, the constitutional manifestations appertaining to the formation of pus, and general symptoms. This diagnosis is also difficult. From hernia it may be known by the absence of cough impulse, by the history of the case, the appearance and progress of the rupture, and the ability of the patient, in many cases, to return the protruded bowel. In this variety of aneurism the iliacs must be tied (see Chapter on Ligation of Arteries) after pressure, either digital or instrumental, has been faithfully applied.

A femoral aneurism is of infrequent occurrence, but may arise in any portion of the vessel from its entrance at the thigh to its termination in the popliteal artery.

These aneurisms may be either spontaneous or traumatic. When the former, the site is the apex of Scarpa's space, and the pain felt at the inner portion of the knee owing to pressure on the saphenous and obturator nerves. There are pulsation and *bruit* in the tumor, which, however, it is to be remembered sometimes are met with in other growths. I recently removed from the thigh of a man a pendulous fatty tumor weighing five and half pounds, in which there was distinct pulsation. In such a case, if it be possible, the growth should be lifted from the artery to ascertain if, with its altered position, pulsation ceases. Abscesses also may have many symptoms in common with femoral aneurism, and therefore careful and critical inquiry into the history of the case must be instituted, to aid in the formation of a correct opinion of the nature of the disease. If compression over the femoral as it emerges from the pelvis arrest immediately the pulsation in the tumor, and the *bruit* be no longer heard, the case may be diagnosed as femoral aneurism. Again, if steady and prolonged pressure empty the sac, another important diagnostic sign is revealed.

A femoral aneurism may extend so high up in Scarpa's triangle as to pass underneath Poupart's ligament and thus simulate an inguinal aneurism; or, if the lower portion of the vessel be implicated, the swelling may extend around the lower portion of the thigh and simulate an enlargement of the popliteal artery.

Together with the symptoms which have been noted, there is œdema of the limb, with sensation of stiffness and soreness, with coldness, heaviness, and insensibility; and finally, if relief is not experienced, gangrene or hæmorrhage terminates the life of the patient. In some exceptional cases a spontaneous cure has been known to result.

Traumatic Femoral Aneurism is generally produced by a wound of that vessel, or, in some instances, by an injury to both artery and vein. The tumor at first is small, but gradually enlarges, with thrill and pulsation, causing pain, tenderness, and soreness of the parts.

Treatment.—In the treatment of femoral aneurism *compression* should always be diligently and persistently tried before operative means are resorted to, the best method of accomplishing which is by the fingers of assistants. It is important that the pressure be steady and that relays of assistants should be constantly in attendance; that the pressure be not relaxed from weariness and numbness of the hands, which always take place after a short period of exertion. Cases are recorded in which solidification of the tumor took place in about forty-six hours from continued pressure. If digital compression is not attainable, the requisite pressure may be made by one of the several artery compressors which are mentioned in the Chapter on Hæmorrhage, or by Esmarch's bandage.

If these means prove unsuccessful, the artery may be ligated in Scarpa's triangle, for aneurism in the course of the vessel, or if the tumor has pressed upward, filling that space, it may be necessary to place the ligature upon the external iliac. For the methods of performing either of these operations, the reader is referred to the chapter on the "Ligation of Arteries."

Popliteal Aneurism.—The popliteal artery is more subject to aneurism than any other vessel of the body. In 551 cases of aneurism in the tables of Crisp, 137 were popliteal. Sometimes both vessels are affected at the same time, as has been adverted to in Dr. Agnew's case.

A popliteal aneurism is generally situated in the lower half of the vessel, and is first noticed by the patient "as of something giving way." It is very probable that, from the many and sudden genuflections constantly made, the coats of this vessel become weakened and are liable to rupture or expansion.

At first there is a feeling of slight stiffness and lameness, with aching; which symptoms, however, are not persistent. Or in other cases, after the "snap," the patient is aware that the mobility of the joint is impaired, and, in a few instances, the surgeon is the first to recognize the true nature of the disease, the patient himself supposing he is suffering from a subacute rheumatic attack. With these symptoms there is a sensation of numbness along the posterior portion of the leg, with coldness of the foot. The swelling is first small, so much so, indeed, that it escapes notice; gradually, however, it enlarges, pulsates, and can be emptied by firm pressure made with the finger and thumb. When the compression is relaxed the tumor immediately reappears. As the swelling increases, the leg is bent at an obtuse angle with the thigh, and the soft parts in the vicinity of the popliteal space are pushed outward. After a time, however, from the deposit on the outside of the sac, the tumor becomes more dense, and finally quite hard, and, in such instances, the diagnosis is more obscure, as solid growths,

such as enchondroma and fibroids, sometimes appear in the ham; in these cases the general history of the case, the slowness of growth, the absence of pulsation and *bruit* will be the guiding symptoms.

A **fusiform aneurism** in the popliteal space is occasionally met with, and such a case is recorded by Mr. Spence, from whose admirable lectures I will quote. He writes: "In such cases the patient feels pain and uneasiness in the site of the aneurism, and some coldness of the limb with numbness, and a pricking sensation, from the irregular circulation, but not from pressure on the nerves, for in the early stage this kind of aneurism is just like a dilated artery. We feel the artery pulsating more distinctly than we do in the healthy limb. There is, in fact, simply a dilatation at one point of the vessel, which gradually narrows on either side of the dilatation, giving the aneurism a peculiar spindle-like shape."*

Treatment.—In the management of popliteal aneurism, pressure has, in the majority of cases, superseded the use of the knife.

Forced flexion, also, as directed in the Chapter on Hæmorrhage may be tried. If pressure be attempted it should be applied directly over the course of the femoral vessel. The following interesting case of double popliteal aneurism will show the methods of properly applied compression, as directed by Dr. D. Hayes Agnew, of Philadelphia. He says: "On the next day the compressors were applied, a relay of assistants being provided, in order that no interruption might occur, either by day or night. It was decided to attack the left one first, it being the larger. The leg was bandaged in the manner I have mentioned, and as soon as the pain became severe morphia was administered. For the first twenty-four hours there was but little difficulty in keeping him quiet, the greatest pain arising from the establishment of collateral circulation; but in thirty-six hours he became very restless, and, at the end of forty-eight, the parts were so sore and congested that it was deemed advisable to substitute digital compression. A large corps of assistants was now organized, and uninterrupted pressure was continued with the thumb, at various points in Scarpa's triangle, for seventeen additional hours, at which time all pulsation had ceased. The tumor had become hard and solid, and it was pronounced cured, a conclusion which is now strengthened by the lapse of at least ten days. During the latter part of the time stimulants, beef tea, etc., were necessary to support his system under the great strain.

"He was allowed three days for rest and recuperation, when it was decided to treat the right leg by digital pressure alone, and the result was most happy. In seven and one-half hours all pulsation ceased in the tumor." In one of my own cases, to which I have already referred when speaking of the general treatment of aneurism—the pressure was continued about seventy-two hours. Each assistant using his thumbs about twelve minutes.

If compression fail, the femoral artery must be tied.

Aneurisms of the Leg and Foot.—Sometimes false aneurisms of the leg occur, in which the hæmorrhage may prove very troublesome. A case of the kind gave me a great deal of trouble, and was finally cured by deligation of the posterior tibial artery. If the wound be in the sole of the foot, forced flexion may be tried; but if this fail, the plantar arteries may be ligated.

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* Vol. i, p. 586.

CHAPTER XX.

LIGATION OF ARTERIES.

Surgical Anatomy of the Vessels and Methods of Operating.

Before perusing the following chapter the student will find it to his advantage to study the accompanying cut (Fig. 124), as by a thorough understanding thereof the remarks upon the vessels of the head and neck will be better understood. The cut, indeed all in this chapter, are taken from the admirable atlas of Von Pitha and Billroth.

The side of the neck presents, with the boundaries we propose to specify, a quadrilateral space, which is bounded in front by a line from the chin to the centre of the manubrium of the sternum; behind by the anterior border of the trapezius muscle, above by the lower margin of the body of the maxillary, and a line extending from the angle of the jaw to the mastoid process, and below by the upper border of the clavicle.

The sterno-cleido-mastoid muscle extends diagonally across this quadrangle, dividing it into two triangles, which are called anterior and posterior; the base of the former is at the jaw, its apex at the sternum, while the base of the posterior is at the clavicle and its apex at the mastoid process of the temporal bone.

The anterior triangular space is divided into three other triangular spaces by the omo-hyoid (*m m*) and digastric muscles. These triangles are called, ascending from below upwards, *the inferior carotid triangle*, *the superior carotid triangle*, and *the submaxillary triangle.*

The inferior carotid triangle is bounded above by the anterior belly of the omo-hyoid (*m*), below by the anterior margin of the sterno-mastoid (*h*), and in front by the mesian line of the neck (*l*). Within this space the sterno-hyoid and sterno-thyroid muscles, together with the anterior border of the sterno-mastoid, conceal the lower part of the common carotid artery.

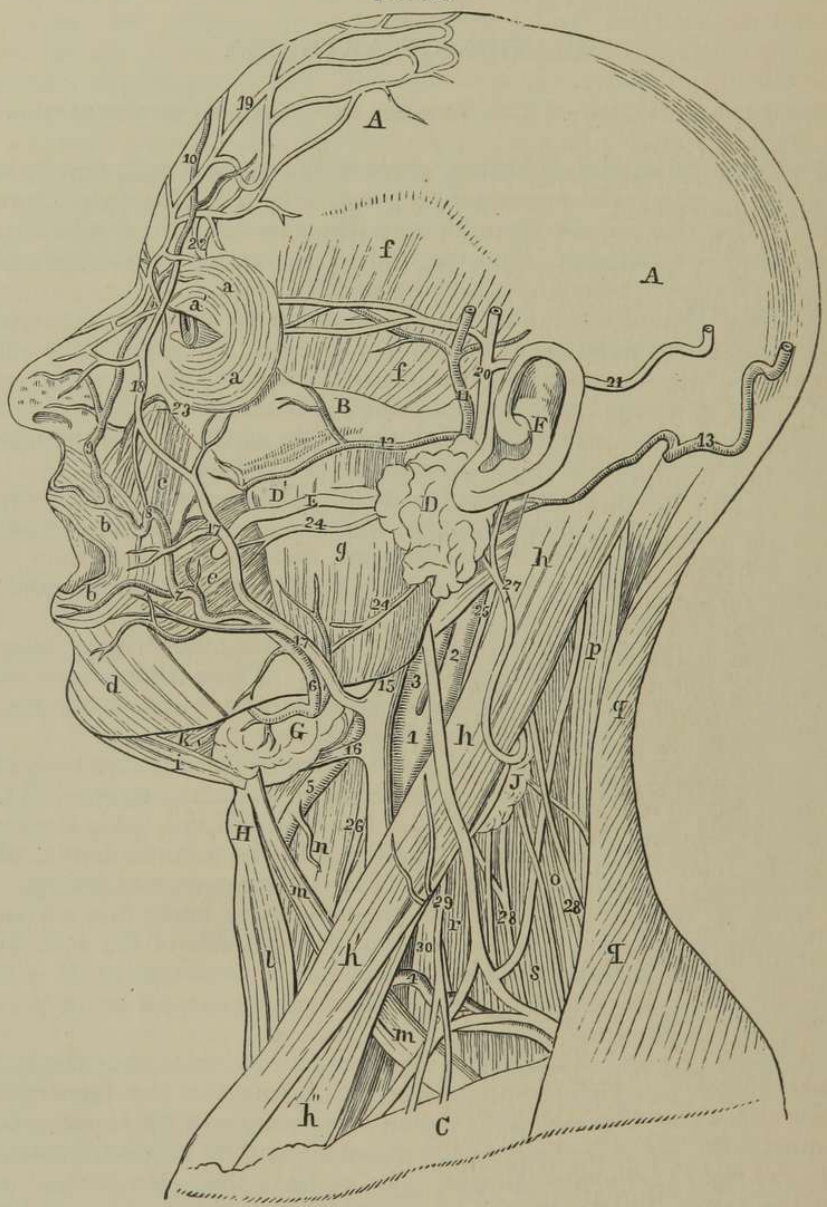
It must be remembered that the pneumogastric nerve lies within the sheath of the vessel, and that the vein on the right side of the neck lies on the outside of the artery, while in the left side it overlaps it. It is in the upper part of this space that ligation of the common carotid below the omo-hyoid muscle is practiced.

The superior carotid triangle has its apex at that point near the body of the hyoid bone, to which the aponeurotic attachment of the digastric is attached; the posterior boundary is the anterior margin of the sterno-mastoid, its superior, the posterior belly of the digastric, and its inferior, the anterior portion of the omo-hyoid. In this space we have the upper portion of the common carotid, and at the point opposite the superior margin of the thyroid cartilage the bifurcation of the vessel into the external and internal carotids. Of these vessels, which are overlapped by the margin of the sterno-mastoid, the external lies more to the front. In this space the main arteries are the facial, ascending over the body of the lower jaw; the lingual, passing forward to supply the tongue; the superior thyroid, taking its direction forward and downwards; the occipital backward, and the ascending pharyngeal upward.

The submaxillary triangle is bounded above by the margin of the lower jaw and a line drawn from its angle directly backward. The stylo-hyoid

and digastric form its posterior limits, and in front it is bounded by the mesian line of the neck. In this space are located the facial artery and the submaxillary gland, which occupy its anterior portion, while behind the

FIG. 124.



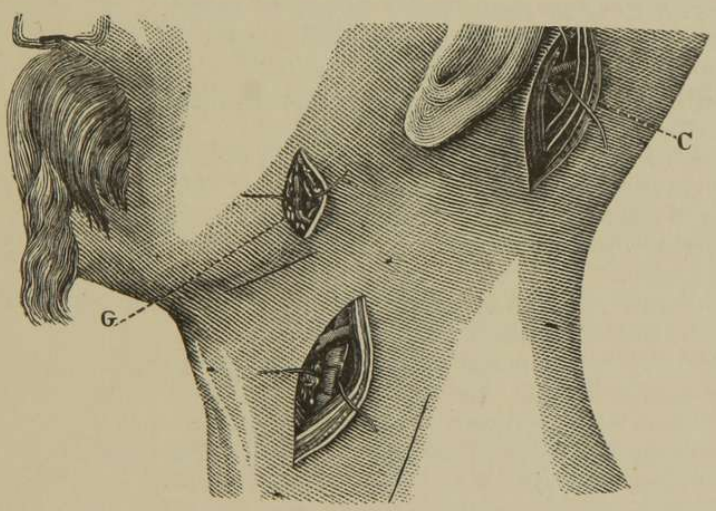
A. Pericranium. B. Zygomatic arch. C. Clavicle. D. Socia parotidea. E. Steno's duct. F. Auricle. G. Submaxillary gland. H. Larynx. I. Cervical glands. MUSCLES: a. Orbicularis oculi (external). a'. Orbicularis oculi (internal). b. Orbicularis oris. c. Levator anguli oris. d. Depressor labii inferioris. e. Buccinator. f Temporal. g. Masseter. h. Sterno-cleido-mastoid. h'. Sternal extremity of sterno-mastoid. h''. Clavicular extremity of sterno-mastoid. j. Digastric. k. Mylo-hyoid. l. Sterno-hyoid. m. Omo-hyoid. n. Sterno-thyroid. o. Levator anguli scapulæ. p. Splenius capitis. q. Trapezius. r. Scalenus anticus. s. Scalenus medius. VESSELS AND NERVES: 1. Common carotid artery. 2. Internal carotid artery. 3. External carotid artery. 4. Dorsalis scapulæ, or transversus colli. 5. Superior thyroid artery. 6. Facial, or external maxillary artery. 7. Inferior coronary artery. 8 Superior coronary artery. 9. External nasal artery. 10. Frontal artery. 11. Temporal artery. 12. Transverse facial artery. 13. Occipital artery. 14. External jugular vein. 15. Internal jugular vein. 16. Superior thyroid vein. 17. Anterior facial vein. 18. Nasal vein. 19. Frontal vein. 20. Temporal vein. 21. Occipital vein. 22. Supraorbital nerve. 23. Infraorbital nerve. 24. Branch of facial nerve. 25. Hypoglossal nerve. 26. Branch of hypoglossal nerve. 27. Auricular nerve and branches. 28. Cervical nerve. 29. Phrenic nerve. 30. Brachial plexus.

sterno-maxillary ligament the external carotid is imbedded in the parotid gland; and still deeper is the seat of the internal jugular vein, internal carotid, and pneumogastric nerve.

The posterior triangular space has its apex at the occiput, its base at the clavicle, its anterior border being the posterior margin of the sterno-mastoid, and its posterior border the anterior margin of the trapezius. This triangle is subdivided into a larger and smaller triangle by the passage of the omo-hyoid; the superior space receiving the name of the "occipital," the lower being designated the "subclavian." The latter forms almost a right-angled triangle; its anterior margin being the lower part of the posterior edge of the sterno-mastoid; its inferior, the upper portion of the clavicle, and its posterior, the anterior margin of the posterior belly of the digastric. This space varies much, or with the elevation or depression of the shoulder. The third portion of the subclavian artery curves outward and downward from the scalenus anticus muscle, passing across the upper rib to the axilla. The brachial plexus is also found in this space, and the external jugular vein passes in a vertical direction to reach the subclavian.

Ligature of the Common Carotid above the Omo-hyoid.—Fig. 125 shows the direction of incision along the border of the sterno-cleido-mastoid muscle. The artery is distinctly visible in the centre of the wound with the

Fig. 125.



ligature beneath it; at the upper angle is seen a plexus of veins belonging to the external jugular, which often has to be held aside; immediately, and in contact with the artery on the right, is the pneumogastric nerve, and still to the right the internal jugular vein—the nervous filament lying between the two. At the lower angle of the wound is seen the fibres of the omo-hyoid, above which a portion of the thyroid gland is visible. The figure (125) also shows the plan of incision for the facial, or, as it is sometimes called, the external maxillary, G.

Also the occipital artery, with the margins of the splenius capitis and sterno-mastoid muscle. The direction of the artery is well shown, C.

Instructions for Operating.—The patient must be placed as below directed for ligature of the carotid, the same instruments, and a like number of assistants being required; the incision should commence at a point on a level with the cricoid cartilage, be three inches in length and on the border of

the sterno-mastoid muscle. The integument must be held asunder by assistants using blunt hooks, and if the middle thyroid vein should be exposed it also must be thrust entirely aside. The deep fascia must now be divided upon a director below the omo-hyoid, and the sheath of the vessel found, which can be detected by the pulsation. The operator must then draw forward the sheath and open it carefully upon a director, and expose the vessel. The aneurism-needle is then to be passed round the vessel, the ligature placed in its eye by an assistant, and the needle carefully withdrawn. Before tying, be very careful not to include the descendens noni in the thread.

As the needle must be passed from without inwards, care must be taken to avoid the inferior thyroid artery.

Ligature of the Common Carotid below the Omo-hyoid.—The instruments ready for use should be, besides the inhaler or handkerchief for anæsthetics, a probe-pointed bistoury and a scalpel, two grooved directors, blunt hooks set in handles, scissors, a helix aneurism-needle, two pairs of forceps of different sizes, besides ligatures, bandage, strapping, and sponges set in handles. The patient should be placed upon the back, with the chest raised and the head thrown somewhat back, the face turned to the opposite side and the angle of the jaw facing the light.

Operation.—An assistant stands at the head of the patient and administers the anæsthetic; when the patient is perfectly unconscious, the operator makes an incision about three inches in length along the prominent border of the sterno-mastoid muscle, beginning a little above the sternum. This incision includes the integument and the platysma myoides muscle. Here a little dissection is required to separate the flaps, which must now be held aside by an assistant with blunt hooks. The cervical fascia must then be raised and nicked with the scalpel, a director introduced and upon it the layers divided. Any plexus of veins or the descendens noni must also be held out of the way by the assistant. It must also be remembered that the pneumogastric nerve lies in the sulcus between and posterior to the vein and artery.

The operator must then cautiously feel with his finger for that point where the pulsation of the artery is distinct, and when he is certain that he has found it, he raises the sheath and divides it upon a director. The aneurism-needle, without the ligature, is then gently *insinuated* beneath the vessel from without inwards, taking especial care not to include the par vagum. When the point of the needle emerges from behind the vessel, an assistant passes the ligature and sees that no shreds of membrane obstruct its withdrawal; the aneurism-needle is then carefully withdrawn and the knot firmly tied upon the vessel, leaving one end of the ligature hanging out. The assistants then unite the wound with silver sutures and straps, and the patient is then made to lie with his head in such a position that the sterno-mastoid is relaxed.

Ligature of the External Carotid.—It may be necessary in some instances to tie the external carotid, and one of two points may be selected for this purpose: 1st. Between the parotid gland and the digastric muscle; 2d. Near the origin of the vessel where it is crossed by the digastric. If the former be decided upon an incision should be made from below the ear to the great cornu of the hyoid bone; the integument and fascia are held aside by an assistant, and by separating the stylo-hyoid and digastric muscles from the parotid, the vessel is brought in sight and the ligature applied. If the point chosen be lower in the neck, the incision should extend from the angle of the jaw to the cricoid cartilage, and the other steps

of the operation conducted in the manner already described in ligating the common carotid.

Ligature of the Facial or External Maxillary Artery.—*Surgical Anatomy.*—In Fig. 125 (G) will be seen the point at which the facial artery winds around the body of the inferior maxillary bone, and is the point at which pressure is made to arrest hæmorrhage. Pressure, however, in the majority of instances, does not arrest the hæmorrhage from this vessel because of its free inosculation with its fellow of the opposite side through the coronary arteries. The point alluded to is an excellent one for performing acupressure or percutaneous ligation. It must be borne in mind *that the facial may arise with the lingual from a common trunk.* It passes over the maxillary bone at the anterior margin of the masseter muscle. The facial vein lies close on its temporal side, and it is covered, though sparsely, with branches of the facial nerve.

Operation.—Make the incision three-quarters to an inch in length in the direction represented in the figure, and having carefully dissected the integument, the vessel is easily found by its pulsation and its superficial course. The needle must be passed from without inward to exclude the vein.

If it should be necessary to apply a ligature to the *occipital* it must be remembered that it is covered by the fibres of several muscles. It is not, however, often difficult to secure.

Ligature of the Lingual Artery. — *Surgical Anatomy.*—This vessel is a branch of the external carotid, and is given off from that trunk just above the cornu of the thyroid cartilage; it then passes above the os hyoides and enters the root of the tongue between the genio-hyo-glossus and hyo-glossus muscles. The vessel is deeply seated and sometimes difficult to find.

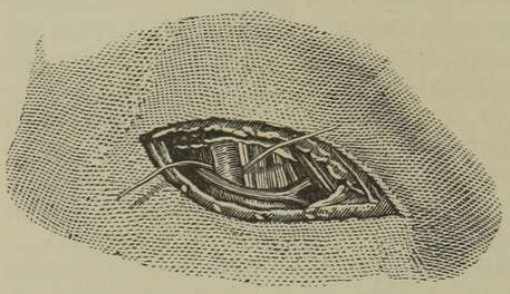
Operation.—Having elevated the shoulders and thrown back the head of the patient, an incision should be made two inches long, just above the cornu of the os hyoides, *vide* line of incision, Fig. 125; the submaxillary gland is then brought to view and held to one side. The digastric muscle must then be hooked and drawn upward, beneath which the hypoglossal nerve will be seen. The finger now introduced into the wound will detect the pulsation of the artery at a point a little below the nerve, through the fibres of the hyoglossus muscle, which overlaps it. The fibres of this muscle should be divided with great care, when the artery can be found and secured as usual.

Ligature of the Subclavian. — *Surgical Anatomy.*—This vessel passes from the thorax between the scalenus medius and the scalenus anticus muscle, and takes its course underneath the middle third of the clavicle. The last-named muscle and the tubercle of the first rib mark its internal boundary; the brachial plexus of nerves and the scalenus medius muscle bound it externally, the nearest nerve, which is about the size of the artery, lying about a quarter of an inch to its outer side. This nerve must not be mistaken for the vessel itself. The subclavian vein lies below and anterior to the artery and at the outer edge of the scalenus anticus muscle and in contact with the artery, the supra scapular, and external jugular vein. Sometimes the posterior cervical artery arises from the subclavian; and, taking its course to the trapezius, crosses the root of the neck on the outer side of the scaleni muscles, and may be directly in the course of the incision during the operation. It must also be remembered that there is sometimes considerable variation in the origin and course of the subclavian vessels on the different sides of the body. The right sometimes coming off from the innominata above the articulation of the sternum and the clavicle, but in the majority of cases, below that joint and within the thoracic cavity.

Sometimes a separate trunk is given off from the aortic arch. The left subclavian also is sometimes joined at its origin with the left carotid.

Anatomy of the Subclavian outside the Scaleni.—Fig. 126 represents the surgical anatomy of the subclavian without the scaleni. The artery is seen with the ligature beneath it; to the right the brachial plexus; to the left, the margin of the scalenus anticus. The integument, cellular tissue, and superficial fascia of the neck are seen around the incision. The deep cervical fascia passes over the artery and brachial plexus and dips under the omo-hyoid, which, on the right of the cut, passes upward. The subclavian vein lies along the lower margin of wound with the transverse scapular vein passing into it. Below this is the suprascapular artery.

Fig. 126.



The *operation* for tying the subclavian outside the scaleni muscles, which is the spot, if practicable, always preferred (*vide* figure), is performed as follows:

The patient is placed upon a table, and fully brought under anæsthetic influence. The shoulder should be depressed as much as possible, to draw down the clavicle; the integument then should be drawn down tightly over that bone, and an incision made from the anterior border of the trapezius to the posterior border of the sterno-cleido-mastoid; the different layers of muscular fibre (platysma myoides) and cervical fascia should be raised with the forceps, snipped, a director passed beneath them, and divided with a curved or straight probe-pointed bistoury. If this incision is not long enough the sterno-mastoid may be cut through, and, if more room is required, the trapezius also. The external jugular vein is now at the inner side of the wound, which must be held aside, or, if divided, the ends must be secured. The suprascapular artery must also be avoided, and the aneurism-needle passed from before backward to avoid the brachial plexus. Sometimes the tumor may be so extensive that it is impossible to pass the ligature in this situation, in which case the artery can be sought for behind the scalenus and above the first rib.

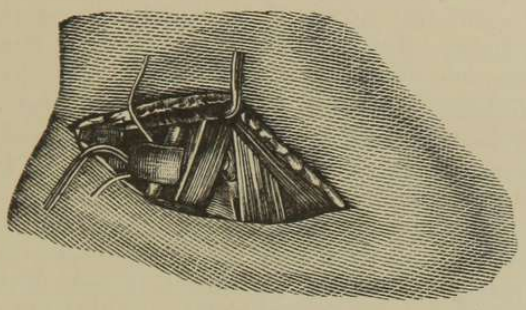
In some instances the artery is tied at the second portion of its course, but the operation is liable to many objections,—the close proximity of the phrenic nerve and internal jugular vein, the pleura and large branches (a wound of either of which might be productive of most dangerous consequences), are all most serious difficulties to be encountered, which are heightened by the occasional passage of the vessel in front of the scalenus, or sometimes both artery and vein course behind that muscle.

In rare cases it may be deemed necessary to tie the subclavian in the first part of its course.

Anatomy of First Part of Subclavian.—In the figure 127 the vessel is seen with the ligature beneath it, giving off the internal mammary below and the vertebral artery above. In the centre crossing the vessel at right angles is the phrenic nerve, next to this the scalenus anticus muscle, and still outside the broad fasciculi of the brachial plexus. The omo-hyoid is seen held up by the upper retractor, and between the curve of the vessel and the margin of the brachial plexus is the transversalis colli or dorsalis scapulæ; the internal jugular vein is seen crossing the artery and being

held aside with the hook at the lower and internal angle. On the left side the operation is almost impracticable, on account of the great depth of the vessel, the arteries which arise both above and below it, the intimate relations of the pleura, and the passage of so many important nerves.

Fig. 127.



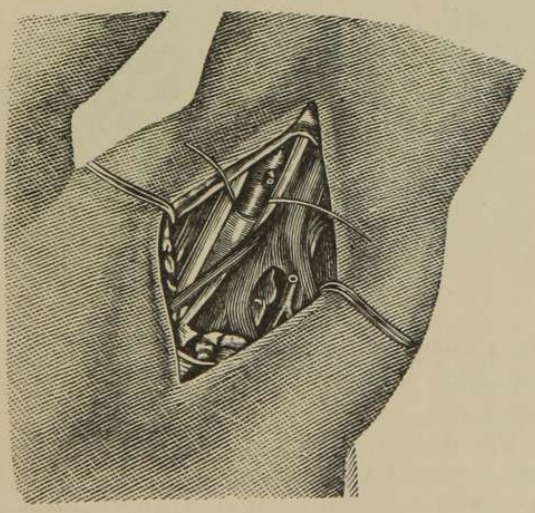
The same instruments are required as those for ligating other vessels, and the patient placed in a similar position. The neck should be put upon the stretch and an incision made three inches in length along the inner border of the sterno-mastoid muscle, terminating at the inner part of the clavicle. A second incision, at right angles with the first and running along the inner margin of the collar-bone, should now be completed, and the sternal tendon of the sterno-mastoid cut and turned aside. The smaller vessels which may now appear should be avoided and held aside with blunt hooks, and the sterno-thyroid and the sterno-hyoid muscles divided upon a director. The deep fascia is now exposed, which must be carefully separated and torn through with the nail or handle of the scalpel, when the internal jugular will come into view passing over the vessel. This must be carefully held aside, and the artery secured by passing the needle from below upward.

This artery was cut down upon, but not ligated, by Porter, Post, Ashton, Key, and Hoffman.

The vessel was first tied in 1809 by Ramsden, although Sir Astley Cooper "tried in vain to seize this vascular trunk," but tied *a nerve* in its stead; the patient perished of hæmorrhage. The first successful case was performed by Dr. Wright Post, of New York. Many of our distinguished surgeons have since performed the difficult operation with varied success.

Ligature of the Axillary Artery.—Fig. 128 *represents the Incisions and Surgical Anatomy of the Axillary Artery.* The wound is held apart by directors; the artery, partly deprived of its sheath, is seen with the ligature beneath it; to the inner side is the median nerve; still more internally is the coraco-brachialis and short head of the biceps. The median cutaneous nerve passes in proximity to the vessel and lies alongside thereof, extending from the upper angle of the wound. Next to this, on the outside, is the large axillary vein, giving off on the internal side and crossing the artery, the external thoracic vein, and externally the subscapular vein.

Fig. 128.



The lymphatic axillary glands are seen in the lower margin of the wound.

The axillary artery may be tied just *below the clavicle* or *in the armpit.*

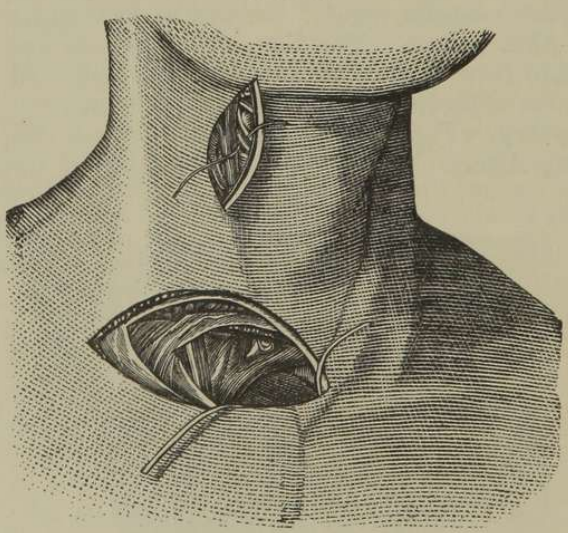
In the first of these situations difficulty is always to be apprehended from the depth and surroundings of the vessel.

Operation.—The patient is placed in a horizontal position, and the arm separated from the side with the hand abducted; an incision is made along the inferior border of the clavicle from the sternum nearly to the deltoid muscle. The next incision divides the fibres of the pectoralis major. Then the costo-coracoid membrane must be carefully separated from the parts, and the artery will be seen at the bottom of the wound. The vein lies in front of it and the brachial plexus behind. The anterior thoracic artery is also in close proximity to the vessel. It will therefore be apparent that there are many difficulties connected with the operation; a thick muscle is to be divided, the cephalic and axillary veins surround it, and it is in the bottom of a deep wound. If the case permit, it would be more advisable to apply the ligature to the third part of the subclavian.

In *the axilla* the operation is performed as follows: the patient is placed upon the bed and the arm drawn aside from the body; the surgeon then moves the humerus upward and downward to render himself perfectly conversant with the situation of the head of the bone. An incision is then made nearer the posterior than to the anterior border of the axilla, over the head of the humerus. A careful, but not very difficult dissection brings into view the areolar tissue, fascia, the median nerve, and axillary vein (*vide* Fig. 128). The elbow must now be flexed to relax the parts and the nerve held to the outer and the vein to the inner margin of the cut. The ligature is then passed around the vessel *from* the *ulnar* to the *radial* side.

Ligature of the Arteria Innominata.—Fig. 129 represents the *surgical anatomy of the arteria innominata.* The artery, large in size, is seen at the inner angle of the wound with the ligature beneath it. The inferior thyroid vein passes across it; passing upward in the centre of the cut is the margin of the scalenus anticus, with the phrenic nerve lying on its outside border. Next to this is plainly marked the fascia in which the incision has been made to expose the parts already mentioned; over this, at the upper and outer end of the wound, is the border of the omo-hyoid muscle, and next to this the superficial fascia.

FIG. 129.



Dr. Mott, of New York, was the first to tie this vessel, on the 11th of May, 1818. The patient lived twenty-six days. The operation has been repeated by several surgeons, with unfavorable results, until it was *successfully* tied by Dr. Smyth, of New Orleans.

The dangers of the operation are inflammation of the pleura and lung, and repeated profuse and secondary hæmorrhage. The operation should be performed with great care, and the surgeon attempting it should have a thorough knowledge of the parts to be divided.

The patient is to be placed supine, with the shoulders elevated, and the head drawn back. An incision is then to be made about three inches in length along the upper margin of the clavicle, beginning at the attachment of the sterno-mastoid and extending outward. A second cut next is made along the anterior border of the sterno-mastoid muscle, of about the same length and terminating where the first incision began. Dissecting up this flap brings into view the platysma myoides, which must be divided upon a director, and the same process followed with the greater part of the attachment of the sterno-mastoid close to its clavicular portion. After the division of this muscle there may be exposed a considerable amount of cellular tissue, which must be carefully removed or held aside with the retractors. The sterno-thyroid and sterno-hyoid muscles will then be exposed and must be divided. The thyroid plexus then is to be drawn aside. This brings into view the subclavian vein, and the right internal jugular, which also must be held aside. The carotid is now exposed, and it should be carefully traced down until the innominata is reached. The director is then to be curved somewhat, and the left vena innominata depressed. The pneumogastric nerve and internal jugular are drawn to the right side, and the ligature passed around the vessel as high up as possible to permit the formation of a clot between it and the aorta. The aneurism-needle must be passed from below upwards, the cardiac nerve, the trachea, and the pleural sac being avoided.

Ligature of the Superior Thyroid. — *Anatomy.*—Fig. 129 shows in the upper portion of the neck the relations of the *superior thyroid.* The vessel is seen in the middle of the incision with the ligature beneath it. Just above it is the thyroid branch of the hypoglossal nerve lying alongside of the greater cornu of the os hyoides, above which, at the upper angle of the wound, is the margin of the belly of the digastric. The large vessel passing directly upward is the superior thyroid vein, and to the outer side of the incision the superior thyroid artery.

Operation.—This vessel is secured by making an incision about three inches in length along the inner margin of the sterno-mastoid muscle. This must be pushed aside from the larynx, and after having divided the fibro-cellular lamella, the carotid, jugular vein, and omo-hyoid space are brought to view. The vessel is seen curving downward to the thyroid gland, and is secured in the usual manner.

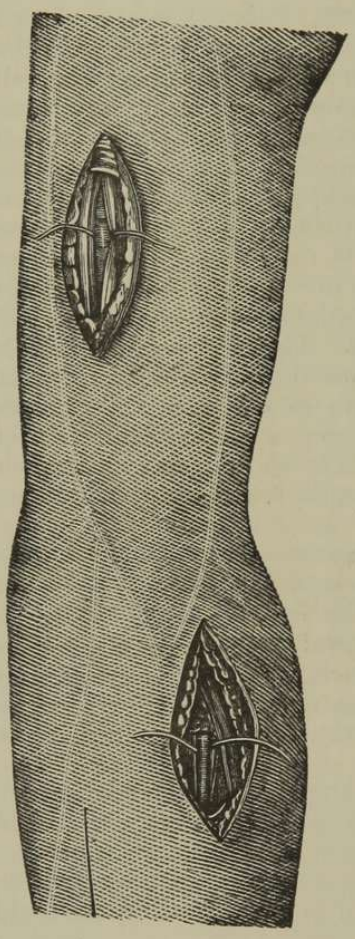
Ligature of the Brachial. — *Anatomy.*—Fig. 130 represents the regional anatomy of the brachial artery, which is seen passing directly down through the centre of the incision with the ligature beneath it. In contact with and on the outer side of the vessel is seen the median nerve ; still passing outward, in proximity with the nerve, is seen the margin of the biceps. On the inner side of the artery is the brachial vein ; still more internal is the ulnar nerve, the margin of the cut surfaces showing the integument and superficial fascia. A line drawn from the hollow of the axilla to the middle of the anterior face of the elbow joint follows directly the course of the artery.

Operation.—The operation, for the most part, is not difficult of performance, as the artery lies comparatively near the surface, its pulsations being readily felt. It can be secured at its upper, lower, or middle third, the most favorable points being either above or below the insertion of the coraco-brachialis.

In the *lower part of the arm* the vessel bears close relations with the median basilic and the median cephalic veins, the latter running parallel with the artery, being separated from the bicipital fascia. The incision should be made along the inner border of the biceps, and the fascia ex-

posed and divided upon a director, the median basilic vein having been drawn aside, and the aneurism-needle passed from without inwards.

Fig. 130.



In *the middle part of the arm*, an incision should be made along the inner margin of the biceps. The fascia should then be raised and divided upon a director. By slightly flexing the forearm upon the arm, the median nerve will be seen lying across or underneath the vessel. This must be drawn inwards while the two-headed muscle is drawn outwards. The veins must then be separated and the vessels secured. Sometimes the inferior profunda has been mistaken for the trunk of the vessel. It must be recollected that the main trunk lies nearer to the biceps.

In its upper portion the incision is made on the ulnar side of the coraco-brachialis. This incision must be cautiously made and the dissection carefully carried on, the fascia being divided upon a director to protect the basilic vein, which, in some cases, passes over this part of the artery. The internal cutaneous and the ulnar nerve are on the inner side, while the median nerve lies to the outside of the vessel. These are drawn away with the retractors, and the ligature passed from the ulnar to the radial side of the artery.

Sometimes two vessels are present; in such cases the one which is found either giving forth blood or supplying the aneurism must be tied, or both, if necessary, be included within the ligature.

Ligature of the Radial Artery. — *Anatomy.*—Same plate (Fig. 130) shows the radial artery, with the radial vein on its outer side; the supinator longus is seen at the lower end of the incision outside the artery, while the pronator radii teres lies on the inner side. The musculo-cutaneous nerve lies on the outside of the artery, and is seen traversing almost the entire length of the wound.

Operation.—The vessel may be tied in any portion of its course. In *the lower third*, an incision must be made at the margin of the flexor carpi radialis muscle, the fascia dissected up, and the vessel is found passing between the muscle mentioned and the supinator longus.

In *the middle third* the incision should be made along the inner margin of the supinator longus, and the fascia divided. In this dissection in some cases, there may be a number of veins which require to be held aside, and it must be remembered that the radial nerve lies close to the outer side of the artery, and must, therefore, be avoided.

At *the upper third* of the forearm, the ligation of the radial is with more difficulty effected, because it is overlapped by the pronator radii teres and the supinator longus muscles. The incision in this case should be three and a half to four inches in length, extending on the radial side of the forearm obliquely downwards and outwards from the bend of the elbow. The fascia

must then be divided, the venæ comites held aside, and the thread passed from the radial to the ulnar side.

Ligature of the Ulnar Artery. — *Anatomy.*—Fig. 131 represents the surgical anatomy of the ulnar artery, which is seen in the lower half of the incision with the ligature beneath it. The large mass of muscular fibres filling the upper angle of the wound are those of the superior flexors of the fingers (flexores digitorum sublimis); on the inside of the artery is the ulnar nerve, and still internal to the nerve is the flexor carpi ulnaris.

FIG. 131.

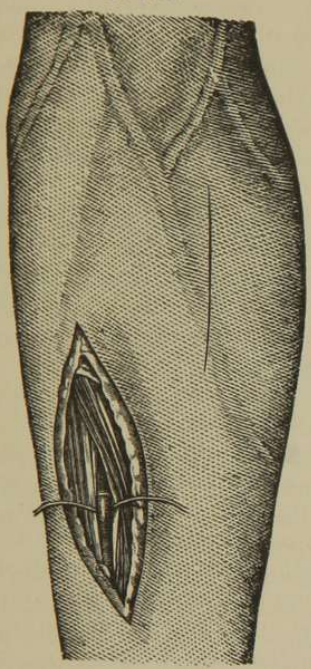
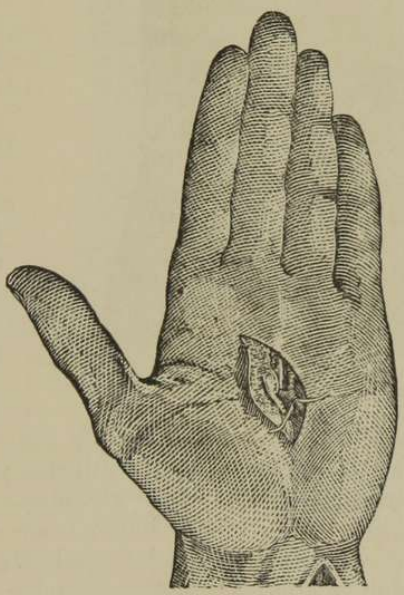


FIG. 132.



Operation.—This vessel, at its upper third, being covered by the entire thickness of the superficial flexor muscles, is not selected for the application of the ligature unless the wound be in that locality. In the middle and lower two-thirds it rests upon the flexor digitorum profundis, between the flexor carpi ulnaris and the digitorum sublimis. The incision must be made along the inner border of the carpi ulnaris and the fascia divided. The flexor carpi ulnaris and the flexor sublimis must be separated from each other; the ulnar nerve lies on the inner side of the vessel and the vein on the outer side. The ligature must be passed from the ulnar to the radial side.

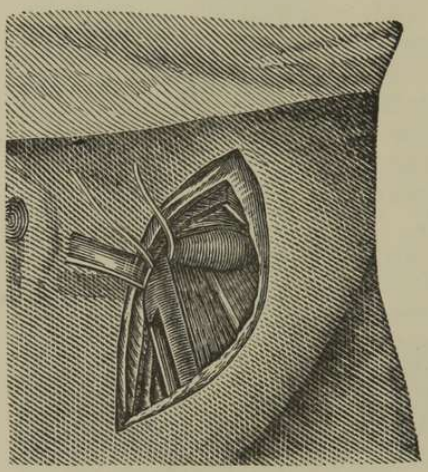
Ligature of the Superficial Palmar Arch.—*Anatomy.*—Fig. 132 represents the arcus superficialis volaris in the palm, with the curve of incision necessary. The artery is seen with the ligature underneath it. The median nerve passes just by the vessel, where it terminates in the common digital artery running outward toward the fingers. The palmar fascia is also well illustrated.

It is the continuation of the ulnar artery in the hand which is denominated the superficial palmar arch, and a ligature is required in cases of wounds or of aneurism. The incision must be made in the palm of the hand, and the fascia carefully raised; the palmar fascia must now be snipped and divided upon a director; the fibres of the palmaris brevis are

now in view, and must be caught and held aside with the retractors; the arch now comes in view, the convexity directed toward the fingers, the concavity toward the muscles of the thumb. The median nerve must be avoided as the ligature is passed.

Ligature of the Common Iliac. — *Anatomy.*—The vessel is seen (Fig. 133) passing diagonally across the centre of the wound with the ligature surrounding it just above its bifurcation. Externally is seen a large portion of the iliacus internus muscle with the anterior cutaneous nerve passing over it. Above is the peritoneum, covered successively from within outwards by the transversalis, the internal oblique and the external abdominal muscle; and these by the fascia.

FIG. 133.



Internally is seen the external iliac or crural vein, and external spermatic nerve.

Operation.—There are several incisions recommended for the application of a ligature to the common iliac artery, the choice depending upon the nature of the case, or the enlargement of the abdomen. If a line be drawn across the abdomen from the highest point of the crests of the ilia, a point a little to the left of the umbilicus would mark the commencement of the common iliac artery; and a line drawn from this point to the centre of Poupart's ligament would mark almost the direct course of the vessel itself. Now, if the surgeon have reason to select the iliac region as the place of operation, a curved incision should be made, beginning at the left of the umbilicus, sloping outward toward the anterior superior spinous process of the ilium, and extending along the upper border of Poupart's ligament to its middle. This cut should be made at least six inches in length. The abdominal muscles must then be divided in succession—external oblique, internal oblique, and transversalis; the transversalis fascia must then be raised upon the director and divided; the peritoneum now comes into view, which, together with the ureter, must be held aside, and search made for the sacro-iliac symphysis, for at this articulation the vessel can be felt and seen pulsating, accompanied by its vein. On the right side of the body the inferior vena cava, as well as the iliac veins, are in proximity to the vessel, and of course must be avoided.

If the judgment of the surgeon lead him to select the side of the abdominal wall as the site of his incision, a cut may be made five or six inches in length, about two inches above and to the left of the umbilicus, curving outward toward the lumbar region, and terminating below the anterior superior spine of the ilium.

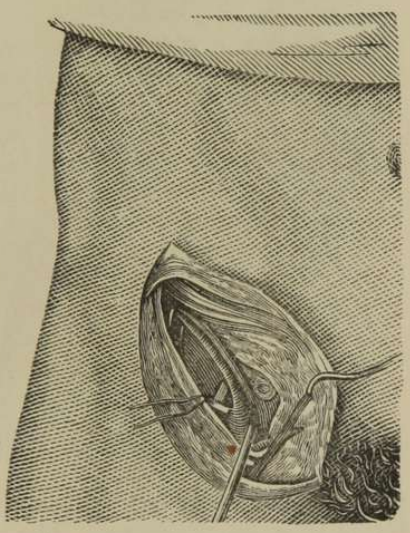
Ligature of the Internal Iliac Artery.—The internal iliac is about an inch and a half long, if directed downward and inwards to the sacro-sciatic notch, and divides into numerous branches.

Operation.—The patient having been placed in a horizontal position, the incision is made in the iliac region, as seen in the figure, and of about the same extent as required for the common iliac; the abdominal muscles having been divided and held aside, the transversalis fascia is carefully divided as before directed. The peritoneum must now be pushed inward

toward the pelvis, and at the bottom of the wound the pulsation of the internal iliac vessel will be discovered; tracing this upward, the internal iliac is found opposite the junction of the sacrum and the ilium. The vein lies to the right and the ureter and peritoneum in front of the vessel, both of which must carefully be avoided when introducing the ligature.

Ligature of the External Iliac. — *Anatomy.*—The external iliac extends from the division of the common iliac to the crural arch. Its course would be indicated by a line drawn from the left side of the umbilicus to the centre of Poupart's ligament. It has in front the peritoneum, intestines, and fascia iliaca, the spermatic vessels and lymphatic glands, the genito-crural nerve, and circumflex ilii vein. Behind it is found the external iliac vein; on the outside is the psoas magnus and fascia iliaca, and to the inner side the vas deferens and external iliac vein.

Fig. 134.



The vessel is seen toward the lower part of the wound (Fig. 134) raised upon the aneurism-needle, which is threaded. A blunt hook on the right, holding asunder the flaps, touches the point of the superficial epigastric vein, between which and the aneurism-needle is seen the external iliac vein, which is crossed obliquely at its lower part by the superficial epigastric. The circumflex ilii vein passes downward and forward to the external iliac vein, and the circumflex ilii artery passes upward from the vessel about to be ligated.

The *operation* is performed in the following manner: The patient having been placed upon his back and the foot rotated, the knife is entered at a point an inch above and to the inner side of the anterior spine of the ilium, and carried downward and outward to the outer end of Poupart's ligament, and continued parallel with it along half its course. The abdominal muscles must be divided, and the transversalis fascia also, the peritoneum separated from the iliac fascia, as mentioned in describing the ligation of the internal iliac, and at the bottom of the wound along the inner border of the psoas muscle the artery is found, with the iliac vein on its inner side, at which point the aneurism-needle should be introduced.

Ligature of the Femoral. — *Anatomy.*—Fig. 135 represents the line of incision and surgical anatomy of the femoral artery after it has passed beneath the crural arch. The vessel takes nearly a straight course downward and is seen in the middle of the cut, with the ligature beneath it. External to it is the great crural nerve, which is represented as touching the portion of the instrument which holds aside the fascia lata. Internal to the artery we find the femoral vein, and internal to it the lymphatic glands.

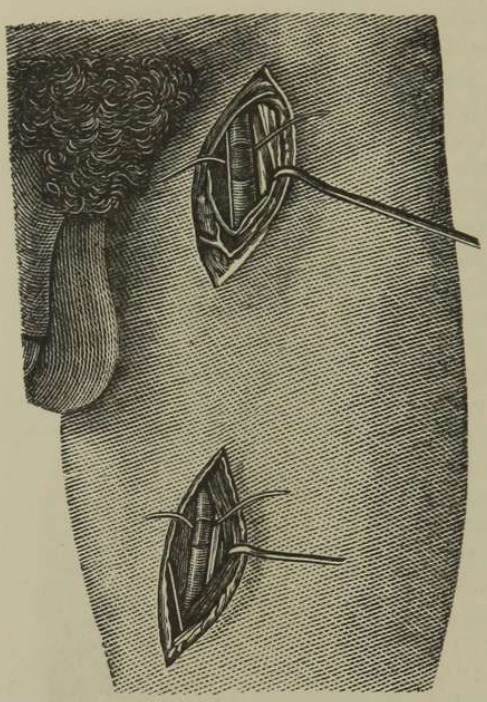
The same illustration shows the plan of incision and regional anatomy of the femoral at the lower part of its course.

The femoral artery, with ligature beneath it, passes through the centre of the wound; externally is the saphenous nerve (*cutaneus femoris internus magnus*), internally the femoral vein.

Operation.—In the upper third of its course the vessel is quite super-

ficial, and passes through Scarpa's space or triangle, which is bounded as follows: The floor is formed by the adductor longus, pectineus, psoas, and iliacus muscles. Its base, Poupart's ligament, its apex downward; its external boundary, the sartorius; its internal, the adductor longus. The artery passes through the centre, and gives off the profunda and superficial vessels.

Fig. 135.



The incision is commenced about an inch below Poupart's ligament, passing a little outward, and carried to the extent of four inches; the fascia is then dissected up, and the sheath of the vessel raised and divided carefully upon a director. The vessel now is distinctly seen with the crural nerve external and the femoral vein internal to it. These must be separated with the handle of a scalpel, or with the finger, and the needle passed from without inwards.

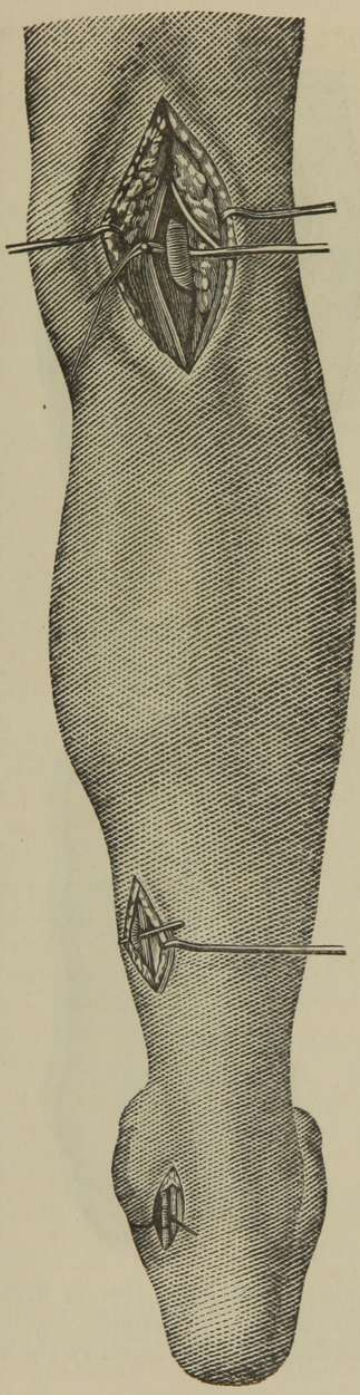
To ligate the femoral in the lower part of its course. The limb having been slightly flexed and everted, an incision is made on the inner side of the sartorius muscle, about three inches in length, extending half into the middle and half into the lower third of the thigh. The fascia is divided, and the edge of the sartorius muscle found and drawn to the outer side; underneath the muscle, and in a groove separating the vastus externus from the adductor, will be found the sheath, which is divided, exposing the artery, with the saphenous nerve externally and the femoral vein internally.

Ligature of the Popliteal Artery. — *Anatomy.*—Fig. 136 represents the course of the *popliteal* and *posterior tibial arteries and their surgical relations.* The artery is shown, being very deep, as being drawn forward by the aneurism-needle threaded; to the left the popliteal vein. External to the last-named vessel is the tibial nerve, and on each side at the lower angle of the wound, the fibres represent the heads of the gastrocnemius. The depth of adipose and cellular tissue is seen in the wound.

Operation.—The patient should be placed upon his face, and the limb extended. The surgeon stands on the outer side, and makes an incision in the centre of the ham, from three to four inches in length, dividing the integument and fascia; the limb is now slightly flexed and held in that position, while the heads of the gastrocnemius are felt for and the cellular tissue separated carefully with the finger or handle of the scalpel. This will take some time, as the vessel is deep and there is always a considerable amount of adipose tissue surrounding the parts. The veins must now be carefully separated and the needle passed. If it be necessary to secure the artery above the condyles, the incision should be extended a little higher up and made nearer to the internal border of the popliteal space, the direction of the cut being toward the intercondyloid notch. In this situation the artery also is a little deeper seated.

Ligature of the Posterior Tibial.—*Anatomy.*—Fig. 136 shows the course and position of the posterior tibial at the lower third of the leg. The vessel is drawn forward with a pin. External to it is the tibial nerve; internal, the posterior tibial vein.

Fig. 136.



In the same cut the posterior tibial artery, as it winds around the internal malleolus, is shown with the ligature beneath it. The posterior tibial vein lies external to the artery, and the tibial nerve posterior to this.

Operation.—For facility the leg should be flexed and laid upon its external side. The incision must be made from a point about an inch above and a few lines behind the malleolus, and curving forward, extend about an inch below this protuberance, thus making the convexity backward. This cut must be made with caution, as in some cases the vessel is so superficial that there is risk of its being wounded. The fascia is raised upon a director, and the vessel is found with the posterior tibial nerve external to the artery.

Below the Calf.—A straight incision three inches in length, equidistant from the inner border of the tibia and the tendo Achillis is made. The aponeurosis is raised and divided upon a director. The deep fascia is then sought for, and the posterior tibial vein and the tibial nerve must be carefully avoided. This aponeurosis is then divided upon a director and the artery secured.

In some unusual instances it may be necessary to cut down upon the artery through the calf, but in such cases a ligature placed upon the popliteal would be preferable.

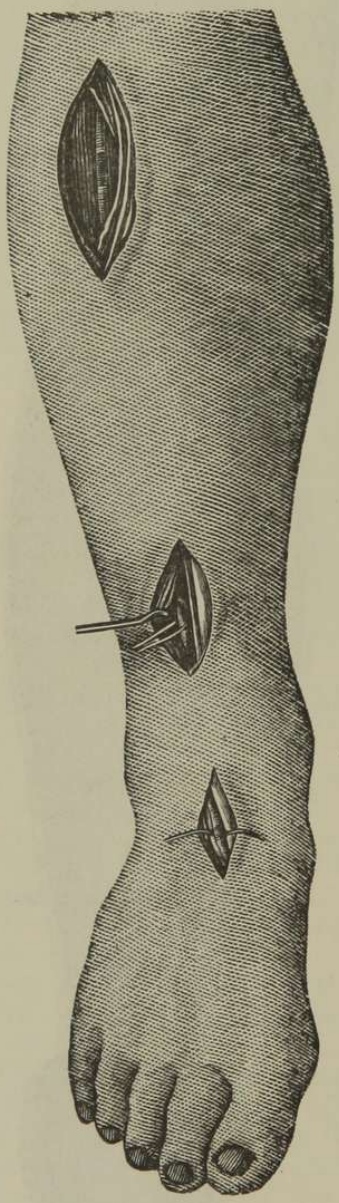
Ligature of the Anterior Tibial Artery.—*Surgical Anatomy.*—Fig. 137 shows direction of the tibialis anticus at the upper and outer part of the leg. The mass of muscular fibres at the outside of the incision belong to the extensor digitorum sublimis. At the upper part are seen the fascia and fibres of the tibialis anticus. The artery is seen passing downward through the centre of the incision with the anterior tibial vein to its inner side.

Same plate *shows relations of the anterior tibial vessel* in the lower and anterior portion of the leg. The fibres of the extensor longus pollicis are represented as being drawn aside by the hook to expose the artery beneath

it, which is seen with the ligature around it. The anterior tibial vein is seen passing down with and directly internal to the vessel. Internal to the last named is the anterior tibial nerve.

Operation.—The patient is placed upon the bed with the limb semiflexed and the foot somewhat extended, and an incision made from a point midway between the head of the fibula and the spine of the tibia, should extend three inches downward on a line which, if continued, would reach the middle of the instep. This incision should be three inches in length; the aponeurosis and fascia should be dissected up as already mentioned; then, with the finger or handle of the scalpel, separate the extensor muscle from the tibialis anticus; the artery is then seen with the anterior tibial vein on its inner side and can be secured.

Fig. 137.



In the lower part of the leg the operation for ligation may be performed at several points. The incision is made along the course of the artery as indicated by the line which has already been mentioned. The integument, fascia, and aponeurosis are divided, and the fibres of the extensor longus pollicis are exposed. This muscle must be separated from the surrounding tissues and drawn with retractors to the side; when the artery is found beneath it. On the internal side of the vessel is found the anterior tibial vein. The ligature should be passed from the inside toward the outer side.

Ligature of the Dorsalis Pedis.—*Surgical Anatomy.*—Same plate (Fig. 137) represents the *dorsalis pedis* emerging from the leg to the ankle. The artery, with the ligature underneath, is distinctly seen; internal to which is the tendon of the extensor longus pollicis; *externally*, the tibialis anticus nerve is seen. External to which are the fibres of the *extensor brevis digitorum pedis.*

Operation.—An incision should be made two inches in length, in a line carried from the middle of the instep to the first interosseous space. The integument is dissected up for a little distance; then the incision is carried down in succession between the tendons of the first two toes and until the deep fascia is reached; this is divided upon a director, and the artery is exposed at its internal side, having the tendon of the extensor longus pollicis internally, and externally the anterior tibial nerve.

CHAPTER XXI.

INJURIES AND DISEASES OF THE VEINS.

Thrombosis—Thromballosis—Coagulation in Veins—Thrombus.

By these terms are understood those manifestations and changes which occur from coagulation of the blood within the veins, and by some within the arteries also. Virchow* proposes to drop entirely the old terms, *phlebitis* and *arteritis*, and substitute the word *thrombosis*, "inasmuch," he says, "as the affection essentially consists in a real coagulation of blood, at a certain fixed point." There has been a good deal of confusion of terms in both diseases of arteries and veins, and, to prevent future misunderstanding in this volume, *thrombosis* will signify the coagulation of blood in veins, and *embolism* the formation of clots in arteries.

Thrombosis occurs, in some instances, from the spontaneous coagulation of blood fibrin, or by the formation of clots after injuries, while the method of repair is being carried on, or from slow and imperfect circulation, occasioned either by unwholesome food, pressure of tumors, or defective nutrition. The clots may increase either in the direction of the current of the blood or against it, and when they commence forming, a true phlebitis may also set in, thereby assisting the clot deposit. After the coagulum has existed for a time it slowly contracts upon itself, and is retained in its position by the firm fibrinous processes which attach themselves to the vein-wall; it may be more closely fastened to one side than the other, and the blood may thus regain a passage by flowing between the clot and the wall of the vein.

When the thrombus is so large as to entirely arrest the circulation and terminates in obliteration of the vein, there of course follows great œdema, which is of remarkable paleness, and is, in fact, white swelling. To this there is often a state of inflammation superadded, softening and disintegration of the fibrin, and a puriform substance is generated. This substance was formerly supposed to be pure pus, whereas later investigations prove it to be *puriform*.

When thrombosis affects a limb, the constitutional disturbance at first is not very severe; the face feels hot and dry, with considerable stiffness; the surface veins are found hard and corded, and when the inflammation is established its usual symptoms appear. If with these symptoms there is an injury or bruise, the diagnosis will be sufficiently clear.

The *prognosis* of thrombosis depends upon the size of the vessel affected and the magnitude of the clot; when both are large, nutrition is much interfered with, and if portions of the clots separate and are carried into the circulation, symptoms of pyæmia may supervene.

Treatment.—In the first stages of this disease, aconite is the appropriate medicine, and must be given often and in fair doses to produce a perceptible effect. When the symptoms are further advanced and evidences of suppuration appear, then hepar sulph., mercurius, cham., lycop., sulph., and lachesis are appropriate medicines. The last named has a powerful

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* Cellular Pathology, p. 233.

effect upon the disease. From the limited number of cases which I have treated I regard this medicine superior to any other. Spigelia, pulsatilla, arnica, china, hamamelis, may also prove serviceable. In the treatment of this affection there is yet much uncertainty, its true pathology having been so recently recognized; which together with the rarity of its occurrence have permitted but little therapeutical experience. I should select rhus radicans, lachesis, or hepar sulph. in addition to those medicines mentioned above.

Phlebitis. — *Inflammation of the Veins.—Phlebitis* may be either acute or chronic; the former may terminate fatally if not arrested; the latter is not dangerous, and generally affects varicose veins of the lower extremities. In *acute phlebitis* the countenance of the patient expresses anxiety and depression of spirits, there are repeated rigors, dry, brown, or blackish tongue, cadaverous skin, great prostration, pulse rapid and weak, muttering delirium, and vomiting of bile.

Consecutive abscess is said to be a characteristic termination of acute phlebitis; excessive pain may be experienced in any of the joints, which is rapidly succeeded by a copious formation of pus; purulent formation may, after this, collect in other parts of the body, especially in the lungs and liver.

Many of the symptoms formerly attributed to phlebitis are now known to originate from thrombosis; in fact, the ordinary suppurative phlebitis, says Mr. Holmes, "*is nothing more than a diffused phlegmonous inflammation*, and should be reclassed with disorders of that character," Vol. III, p. 302.

Treatment.—The treatment of acute phlebitis is somewhat difficult, which, in many instances, is owing to the disjointed character of the homœopathic Materia Medica. However, for the presenting symptoms, particularly in the first stages of the affection, when the fever is high, with a quick, full pulse, dry, furred tongue, etc., aconite should be employed.

If after a time the brain appears to participate in the disease, belladonna is indicated; but the medicine that is best adapted to inflammation of the veins is pulsatilla, which may be employed after aconite or belladonna in the first stages of the inflammatory process; but when the tongue becomes dry, brown, and cracked, when the patient is much prostrated, with burning thirst, and hot, dry skin, arsenicum is distinctly required. Carbo veg. may be prescribed for a somewhat similar group of symptoms, and perhaps would be a preferable medicine, when the action of the arterial system has been almost entirely overpowered, and venous congestion is indicated by a blue tinge of the skin over the whole surface of the body, attended with fearful anguish about the heart, and icy coldness of the surface.

If suppuration threaten, or if it has actually occurred, and the amount of purulent secretion is considerable, silicea should be administered, or the case may strongly call for hepar, merc. sol., or sulphur.

For *chronic phlebitis*, besides the medicines just mentioned, arn., cham., lyc., nux vom., spig., or zincum, may be demanded.

Hamamelis is one of the most suitable medicines for the chronic form of phlebitis, which, together with pulsatilla and lachesis, is more to be relied upon than any other medicines. The last named was efficient in the hands of Mr. Ayerst.

Lachesis.—In the fourth volume of the *American Hom. Review*, Dr. Dunham relates the following: "I have three times been called to cases of chronic ulcer of the lower extremities, probably of syphilitic origin, in which the discharge had ceased; the extremities became œdematous, and a hard slightly red swelling extending up along the course of the principal veins, together with great and sudden prostration of strength, low muttering de-

lirium, and typhoid symptoms, gave good reason for supposing that general phlebitis had occurred. In these cases a careful study of the symptoms induced me to give *lachesis;* the effect was all that could be desired, the patients rallying promptly, and all symptoms of phlebitis speedily disappearing."

Varix.—The term *varix* designates an hypertrophied condition of the veins, in which they are divided into irregular pouches, in consequence of not being able to sustain the reflex column of blood. In other cases the walls of the veins become thinner than usual, or may be unequal to their dilatation. Deepseated as well as superficial veins are frequently rendered varicose by undue muscular action, by interruption of the circulation from ligatures, by the pressure of tumors, and by the gravid uterus. The veins of the upper extremities are rarely affected with hypertrophy, while those of the lower, especially the saphenæ and their branches, are very liable to the disease. In the commencement, numerous small circumscribed swellings are observed, but after a time the venous trunks and branches appear enlarged throughout their whole extent; sometimes they are knotted or doubled upon each other, and these gyrations are particularly conspicuous in the neighborhood of the valves.

An enlargement of the veins may continue for a considerable period without giving much inconvenience to the patient; but in the generality of cases, after the veins have attained any magnitude, a sense of soreness, weight, fulness, and fatigue of the limb are experienced. The feet are cold and the veins become more prominent, corded, and swollen, particularly after exercise, or when standing. Sometimes the thin walls give way and profuse hæmorrhage results. After these varicose enlargements have continued for a time, the parts are deprived of their vitality, there is an obstruction of the absorbents, and the *varicose ulcer* is produced (*vide* page 75).

Treatment.—The opinion had long been entertained that any attempt to operate upon veins was a rash procedure and fraught with extreme peril. Experience, however, has shown that in many cases this apprehension is unfounded, and I am satisfied, from my own experience in operations for varicose veins in different portions of the body, that, with a moderate amount of care, untoward symptoms will not occur. There are different methods of obliterating varix. Those which I have found most simple and successful are with the caustic paste and by the subcutaneous method.

The first is effected as follows: Prepare equal parts of caustic potash and quick lime. Mix them together with sufficient alcohol to make a paste, and then, with a glass rod, apply the mixture to the vein. After having allowed it to remain for a few minutes, wash off the eschar with vinegar, and wait for the separation of the slough. If sufficient caustic has not been used, a second or a third application may be necessary. Sometimes as the dead portions separate, quite a hæmorrhage follows, which, however, is readily checked. This process I have repeatedly resorted to with success, as I have also the following: Place beneath the vein, about three inches apart, two hare-lip pins, twist over each of them a piece of silver wire, then introduce a narrow tenotome flatwise beneath the vessel, turn the sharp edge outward and divide the vein, taking care not to bring the edge through the integument. After a few days the pins are to be removed.

Sir Benjamin Brodie thus writes: "For this operation I have generally employed a narrow, sharp-pointed bistoury, slightly curved, with its cutting edge on the convex side. Having then ascertained the precise situation of the veins, or cluster of veins from which the distress of the patient appears principally to arise, I introduce the point of the bistoury through the skin on one side of the varix, and pass it on between the skin and the vein with

one of the flat surfaces turned forwards, and the other backwards, until it reaches the opposite side. I then turn the cutting edge of the bistoury backwards, and, in withdrawing the instrument, the division of the varix is effected. The patient experiences pain, which is occasionally severe, but which subsides in the course of a short time. There is always hæmorrhage, which will be often profuse if neglected, but which is readily stopped by moderate pressure, made by means of a compress and bandage correctly applied."

Mr. Cartwright and also Mr. Mayo apply over the course of the distended vessel the potassa cum calce, which causes sufficient inflammation to produce coagulation of the blood and occlusion of the vein.

Velpeau advocates the twisted suture alone.

Davit passed needles through the veins at right angles with transverse needles previously introduced beneath the vessels.

Others apply the galvano-puncture, and others again the injection of the perchloride of iron.

An excellent method may be found in having a pin constructed after the fashion of an ordinary diaper pin used in dressing infants; pass the sharp point behind the vein and bring down and catch upon its point the clasp, having laid a piece of linen over the integument to prevent too much abrasion.

In the treatment of superficial varices, Cazin, referring to the treatment of these cases and the avoidance of phlebitis or pyæmia, recommends the following proceeding: An incision, three centimeters long, is made parallel to the vein, and at a distance of one centimeter from it. At the two extremities of this incision two others are made transversely towards the vein, and reaching to it. This flap is dissected up, and the vein is isolated by a blunt instrument. The flap is next passed beneath the vein and replaced in its original position and fastened, the vein remaining thoroughly isolated without any ligature having been used.

Great advantage may be derived from allowing the patient to encase the limb in an elastic stocking, which is constructed especially for the treatment of varicose veins; this should be constantly worn, and at the same time medicines should be internally administered, which are chiefly *agaric.*, *ars.*, particularly when the veins are of a livid color, and attended with severe burning pains: *bell.*, when erysipelatous inflammation surrounds the varices; carbo veg., graph., lyc., puls.; the latter is perhaps the most efficacious medicine when there is considerable inflammation, excessive pain and swelling, and when the limb assumes a livid hue; *arnica* is a valuable medicine in the treatment of this affection; it is particularly useful when the patient is obliged to maintain an erect posture for a length of time, or when the veins have become diseased in consequence of wounds or blows; very beneficial results have been obtained by the exhibition of arnica and pulsatilla in alternation, a dose every night. Hamamelis virginiana has been highly recommended by Dr. Okie, of Providence, in the treatment of this affection. It has been used with beneficial effect both as an external application and as an internal medicine, and has done me good service in several cases.

Entrance of Air.—The entrance of air into veins is a most untoward accident, and has occurred many times in the practice of distinguished surgeons. The accident is so immediately followed by most alarming, if not fatal consequences, that it must always be regarded as a serious complication. The symptoms which indicate the presence of air in the veins are the sudden and peculiar gurgling noise, similar to that heard when pouring a fluid from a bottle, with sudden prostration, rapid collapse, and death. The

air probably passes into the lungs, and there arrests the circulation of both systems, and complete stoppage of respiration takes place.

Prof. Hamilton details an interesting case of this kind (in which, however, his patient was saved) in his chapter on Enlarged Lymphatic Glands of the Neck. The following are supposed to be the conditions which predispose to the entrance of air into the veins: "Incision of a large vein in the vicinity of the heart, and especially in the lower anterior portion of the neck, where these vessels experience a reflex pulsation. Canalization of a vein, in consequence of a thickening of its coats from morbid deposits, or in consequence of fibrinous infiltrations into the adjacent tissues, or owing to its being more or less imbedded in a solid tumor, either of which circumstances converts the vessel into a rigid incollapsing attachment of the outer wall of the vein to the base of the tumor, so that in lifting the latter the two walls of the vein become drawn asunder and collapse is prevented, when the blood escapes. Traction made upon the outer wall of the vein by the forceps, or by tension of the overlying structures, or a deep inspiration made at the moment of dividing the vessel may accomplish the same result."*

It is only necessary carefully to read the above causes of this serious accident to prevent its occurrence, and if it should transpire, arrest of hæmorrhage by immediate compression and rapid artificial respiration are all that can be done.

Wounds of the Veins.—The veins are frequently wounded during the performance of operations, but the hæmorrhage can generally be arrested by properly applied pressure; in some instances, however (though the proceeding, if possible, should be avoided), ligatures become absolutely necessary.

In such instances, the threads may be applied at both ends, and as a general rule, without danger. If possible, however, the ordinary acupressure pins, if introduced beneath the vein, and allowed to remain for a few hours, will prove efficacious and safe.

Phlebolithes.—Loose calculi are sometimes found in veins, to which the term phlebolithes is given; these peculiar formations are found growing to the inner coats of the vein, are oval in shape, and attached by a narrow pedicle. There are many conjectures concerning their formation, the most plausible being that they are the transformations of inspissated coagulæ. They appear to move from place to place in the circulation, the pedicle having broken from its attachment to the inner coat by the force of the stream of blood. They are composed almost entirely of protein material and phosphate of lime.

CHAPTER XXII.

DISEASES OF THE CAPILLARIES.

ERECTILE TUMORS—NÆVUS—TELANGIECTASIS.

THE erectile tumor of arteries occurs most frequently in the submucous and subcutaneous cellular tissue about the head, face, and neck; but may also exist in nearly every part of the body, and has even been found in bones. It is soft, compressible, of a slightly higher temperature than sur-

* Hamilton's Principles and Practice of Surgery, p. 189.

rounding parts, pulsates synchronously with the beats of the heart, and has a peculiar *bruit*, which is sometimes loud and harsh, at other times "soft and cooing." This peculiar *bruit*, the distance of the tumor from any large artery, and its less forcible pulsation, will serve to distinguish it from aneurism. It varies in color according to situation; when deeply imbedded in subcellular tissue, the tumor presents a bluish appearance, but when situated on the surface it is generally of a vivid scarlet.

Capillary nævi are flat, slightly elevated, and of a red or purplish hue; they are usually small, and occur most frequently on the head, face, neck, and arms. The contained blood may be arterial or venous, or a mixture of the two.

As a general rule, these growths do not attain a size much larger than an egg. Fig. 138, taken from a photograph, represents a case of my own, in which the growth had attained the size of half an ordinary melon, and for which I ligated the common carotid below the omo-hyoid, after failure by other means. At first the tumor diminished one-half, then remained stationary for a time, and then disappeared.

Fig. 138.

The author's case of nævus, in which the common carotid was ligated below the omo-hyoid.

In the *Transactions of the Medical Society of the State of New York*, for 1870, is an interesting paper by Dr. George H. Hubbard, entitled, "The Big Nævus." The growth measured twelve inches in its long diameter and eight in its transverse, "and extended from the second dorsal vertebra nearly to the crest of the ilium."

The tumor was ligated in mass with needles a foot in length, armed with whip-cord; during the sloughing period it was constantly soaked with a solution of the sulphate of iron. In six weeks the man went to his work. In three months more there only remained an unhealed surface the size of half a dollar, but shortly after, an abscess formed beneath the latissimus dorsi, which never healed, and finally caused the death of the patient.

Treatment.—It may be laid down as a general rule, that the treatment of these cases must be purely surgical.

When the nævus consists of a simple red spot, it may be cured by vaccination, or by application of collodion with pressure. When situated over a bone, the tumor may be treated by compression with pads of ivory or other hard substances. External application of nitric acid, setons, and the passage of one or more silk threads soaked in some caustic solution, have also been recommended. Some surgeons prefer nitrate of silver or the actual cautery. Injections of persulphate or perchloride of iron, sulphate of zinc, lactate of iron, matico, tannin, and other astringents, may prove useful.

Dr. John Pattison treats nævi by injection of persulphate of iron, followed by enucleation in the manner described under cystic tumors. Gross speaks highly of the topical application of "Vienna paste." Sometimes small nævi may be cured by breaking up their substance subcutaneously with a cataract-needle or tenotome and applying pressure. Puncture with red-hot needles or acupressure pins has been advised by Dr. Valentine Mott.

Dr. Hamilton has succeeded in removing superficial nævi in the neighborhood of the eyelids, where eversion of the lid must have followed removal of the integument, by dissecting up the skin covering the nævus, cutting away the subcutaneous areolar tissue, and then replacing the flap.

Perhaps the best method of treating nævi is by electrolysis or galvano-puncture. Many successful cases are upon record treated by these methods. The student may refer to Dr. Butler's chapter on this subject for a full description of the method, with illustrative cases.

Division of the soft parts around the tumor is recommended by Mr. Lawrence. Fergusson treats small nævi by passing a pin beneath them, and then compressing the tumors between the pin and a loop of wire, as in the third method of acupressure.

For tumors composed of dilated veins, subcutaneous incision and continued bandaging is excellent.

Nævi may also be treated by the following methods of ligature:

1. Pass two pins or needles beneath the nævus, at right angles with each other; then throw a ligature behind them, and tie it tightly. The pins should be introduced and brought out at least one-eighth of an inch from the margins of the tumor.

2. Dr. Barton's method is similar to the above, with the exception that the ligature is first passed behind the pins, and then carried over the top of the tumor.

3. Pass beneath the tumor a needle threaded with a double ligature, and tie the ends so as to strangle each half of the nævus separately.

4. Liston's method: Pass two needles threaded with double ligatures, cut each noose and tie the contiguous ends of the ligatures. By drawing the last knot very firmly, all the other nooses are tightened and the knots dragged toward the centre. When the tumor is entirely subcutaneous, and the surgeon desires to avoid an unseemly scar, the skin may be divided by a crucial incision and the flaps turned down before passing the needles.

5. Erichsen's method: Take a strong whipcord three feet in length, stained one-half black, the other half white; thread a long needle upon the middle of this cord. Then commencing at about one-quarter of an inch from the end of the tumor, pass the needle several times beneath the nævus. The loops should be three-quarters of an inch apart, and the last one be brought out through the healthy tissue beyond the tumor. (Fig. 139.) "Thus we have double loops—one white and one black—on each side. Cut the white loops on one side and the black on the other; then tie firmly the white threads on one side and the black on the other,"* and the nævus is effectually strangulated.

6. Fergusson's method: "A double thread is thrust transversely beneath the centre of the tumor and divided in the middle. Next, one end of the thread is passed through the eye of a long needle (the eye near the point), and having been brought one-fourth around the circumference of the tumor, is thrust transversely through its base. Then it is to be disengaged from the eye of the needle, and the other thread to be put into the eye and to be carried back with it. Lastly, the adjoining ends of the two threads are to be tied tightly, so that each of the two threads shall include an 8-shaped portion of the tumor; after two or three days the ligatures should be tightened or fresh ones applied."†

7. Mr. Curling has proposed subcutaneous ligation, which may be performed in the following manner: A needle threaded with a stout ligature is passed beneath the middle of the tumor, then the needle is withdrawn and the ligature divided into two threads. "One end being passed through the eye of the needle, is thrust into the second wound, and carried semi-circularly round under the skin and brought out at the first wound, where

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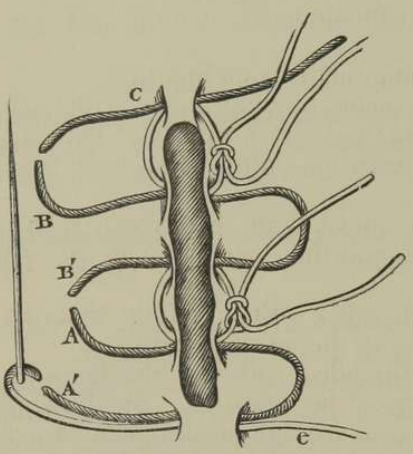
* Gross's Surgery, vol. i, p. 787.

† Druitt's Surgery, p. 315.

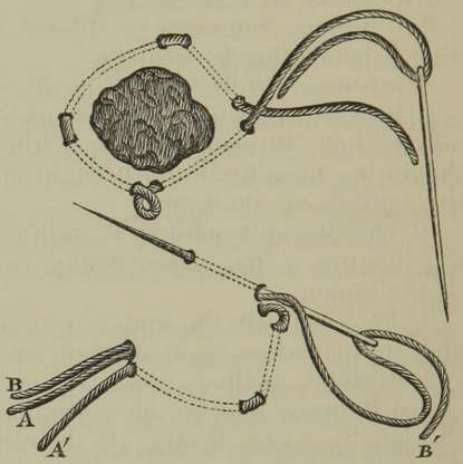
it is seized and held firmly whilst the needle is withdrawn. One end of the other thread, being in like manner put into the needle, is thrust in, and carried round under the skin, on the right side, and brought out as the first. The operation is completed by tying the ends very tightly, so as to strangle the half of the base of the tumor, encircled by each respectively.

Fig. 139.



Ligature for strangulating a large nævus. The white loops are divided on one side, and the black on the other, and the corresponding ends (A A', B B') tied together. The terminal strings C C may be either tied or withdrawn, as the surgeon thinks best.

Fig. 140.



Subcutaneous ligature of nævus. The upper figure shows a single ligature carried round the tumor. The lower (in which no tumor is depicted) shows a double string carried below the centre of the base, then divided into two, A A' B B' and each of the two carried subcutaneously round half of the nævus, and then tied.

The ends are to be left and fastened with plaster, so that they may be tightened if requisite and drawn out, as the base of the tumor perishes by ulceration."*

8. Mr. Startin proposes to pass the ligatures subcutaneously, attach them to rubber rings, and make traction upon the tumor by means of tapes tied to the rings.

When the nævus is not situated in the vicinity of any large artery, it may be excised by carefully dissecting it from the cellular tissue. Great care must be observed not to puncture the tumor during the operation, for this accident is always followed by profuse and obstinate hæmorrhage.

For large vascular nævi Dr. William Gibson, of Philadelphia, has recommended partial incision, which is performed in the following manner: One-half of the tumor is dissected up, the bleeding vessels secured, and lint interposed between the raw edges to prevent union; then, after a few days' interval, the operation is repeated, and the tumor completely excised. Very large nævi may require three or four operations.

When the tumor is inaccessible to knife or ligature it has been proposed to ligate the nutrient arteries. This is often successful when the tumor is situated in a non-vascular part, but ligation of the carotid for nævi of the head and face often fails on account of extensive collateral circulation. Amputation is even sometimes necessary in nævi of the limbs.

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* Druitt's Surgery, p. 116.

CHAPTER XXIII.

The Nervous System after Injuries and Operations.

SHOCK.

Symptoms of Shock — Temperature During — Secondary Shock — Treatment—Tetanus—Wounds of the Nerves.

After surgical operations of magnitude, where there has been a large amount of tissue removed, or excessive hæmorrhage; when the patient has been a long time under anæsthetic influence; when a large quantity of fluid, either serum or pus, has escaped, or where closed cavities have been opened, there is always a greater or less degree of nervous prostration, which is denominated "*shock.*" The nervous system has a powerful influence over the action of the heart and vessels, and death has been known to result without any assignable cause, excepting that which can be attributable to the nervous system. I recollect an instance of this kind. I was present at the post-mortem examination of a young lady, who had been unwell for a few days, but who on the evening before her death, had been enjoying the society of her friends, and accompanied them to the street door of her residence at their departure. On retiring for the night she took, by the direction of her physician, a dose of the 200th potency of rhus. In the morning she was discovered dead in her bed. The coroner was called to investigate the matter. A most thorough post-mortem examination was made, every organ in the body carefully and minutely inspected, the fluid from the ventricles of the brain, the stomach and bladder, examined by professional chemists, but no cause whatever could be discovered for her demise. Many other similar cases are upon record. With a knowledge of these facts, it is evident that sudden and severe impressions upon the nervous system sometimes produce such a decided action upon the circulatory apparatus that symptoms of the gravest character, nay, death itself, may be the consequence. The symptoms of shock or collapse once having been witnessed can never be misapprehended. The lips are blanched, a deadly pallor overspreads the face, the skin is cold and clammy, drops of cold perspiration appear upon the forehead, a dull leaden hue overspreads the face, the extremities are cold, the nose is pinched, sometimes the nostrils are dilated, the eye partially glazed and slightly turned in the socket, with a drooping lid. The pulse is fluttering and tremulous, and the heart is feeble and irregular in its action. In fact, the symptoms resemble those often seen in cholera, as the patient sinks into collapse, or in cases where fatal hæmorrhage is stealing away vitality. As reaction takes place the pulse loses its "whirring" beat, the motion of the heart, though feeble, becomes much more regular and a little "rounder," and as the blood begins to flow into the larger capillaries, an increased temperature and decreased pallor results, the eye becomes more natural in expression, and warmth gradually diffuses itself over the surface. With these symptoms of returning life there are generally long-drawn respirations, and the patient becomes rather restless. These symptoms may continue until the unmistakable presence of increased action show that *fever* has commenced, a condition which must be as carefully

watched; for if the action is excessive, and flushed face, intense thirst, delirium, jactitation of muscles, insomnia, and other well-marked indications of a high degree of nervous irritability succeed, the prognosis is unfavorable, and hiccup, convulsions, coma, and death may ensue.

It is well, also, to bear in mind that these symptoms often vary very much in intensity and duration, and require the utmost care and watchfulness of the surgeon. Some patients may never fully recover from the effects of a severe shock, though they may be able to perform imperfectly the usual duties of life.

The temperature of the body in health ranges from 97.3° to 99.5°, and the variation therefrom, in surgical cases, has been shown to be of considerable import in assisting to diagnose the extent of the injury. The spot at which the temperature is best ascertained is in the axilla, and the instrument, which should be indexed, ought to remain there about ten minutes. Thermometers made for this purpose and contained in portable cases, can be procured at the instrument makers.

In an interesting essay on this subject by W. W. Wagstaffe, F.R.C.S.E., published in St. Thomas's Hospital Reports, are several tables which show the fall of temperature in the fatal and non-fatal cases. In eighteen cases of operations, embracing ovariotomy, hip-joint amputation, herniotomy, and the removal of tumors, the difference in the fall of temperature in the fatal and non-fatal cases was as follows: Non-fatal, mean fall, 0.3°; in the fatal, 3.70°. From this it is inferred that, if there be no especial cause for shock before an operation, the thermometer should not fall more than 1°; and if it is more than this, an unfavorable prognosis may be anticipated in proportion to the downward tendency.

The following table, taken from the article in question, shows the fall of temperature in certain forms of surgical injury:

	NOT FATAL. A mean fall.	FATAL.
A. Burns and scalds,	0.1°	3.5°
Severe fractures,	1 6°	2.1°
Operations (without undue hæmorrhage),	0.3°	3.0°
B. Concussion of brain,	1.2°	6 1°
Injury to spinal cord,	——	5.6°
C. Visceral injury (extravasation into peritoneum),	3 3°	3.8°
D. Hæmorrhage,	——	2.2°

The employment of the thermometer is, therefore, found to be a useful adjunct in forming a prognosis, both before and after surgical operations and injuries.

In some constitutions there is another condition produced by accidents and operations, which is not nearly of so acute a character as that already described, and which is termed by some surgical writers *Secondary Shock*. In these cases the patient appears to rally, and reaction to be somewhat established. In these instances there are no particular symptoms, excepting, perhaps, occasional weakness; the pulse is moderately good, and the mind active; yet the countenance becomes dejected, the skin sallow, the functions of different organs impaired, and although nature makes strenuous efforts to react, the shock has been too great for the system to withstand, and the patient ultimately succumbs.

Different temperaments suffer in different degrees from the effects of shock; this is especially noticeable in gunshot wounds and railway accidents, where many individuals are affected with different degrees of collapse. No doubt, in these cases, the suddenness of the injury, combined with a certain degree of mental excitement, assist in producing the collapse.

Mental emotions, weakly constitution, debauchery, and excess of any kind, or advanced years, are all predisposing causes of shock, and must be taken carefully into the consideration of each particular case.

Prof. Von Nussbaum remarks, that many deaths after injuries and operations, attributed to shock, are really the result of other causes. He believes that, in cases of rapid absorption of septic peritoneal contents, death is caused by septicæmic collapse. Then there is the sudden death of old people after a day or two's satisfactory progress, death resulting from the hæmorrhage caused by the operation, although its effects are not apparent until the final collapse takes place. The sudden fatality, after severe railway accidents and their consequent amputations, he attributes to "fat-embolism," showing itself in dyspnœa, œdema of the lung, and death. Then, too, death often results from sudden and extensive cooling of the abdominal viscera, the abstraction of heat having been found by Wegner "to be a competent fatal agent." To sum up, the conditions apt to be confounded with shock are, "septicæmia, senile anæmia, fat-embolism, in crushings of bones, and abdominal cooling."*

Treatment.—The first object of attention in the treatment of shock is to ascertain the condition of the heart, and whether its action is altogether suspended. If it be, and there is reason to suppose the organ has for some time ceased performing its function, little can be done; but even in such cases, however, it is well that *electricity* be applied, together with frictions to the extremities. Artificial respiration should also be resorted to. For ordinary cases of severe shock there are homœopathic medicines which are of the greatest possible service. Of these, camphor, veratrum, arsenicum, and china are, as far as my own experience goes, the best, and the surgeon will scarcely be called upon to use any others. Camphor, when demanded, should be given in one or two drop doses every ten or fifteen minutes when the body is cold and clammy, and when the shock is sudden. With the internal administration of this medicine, frictions to the extremities and warm applications are to be perseveringly tried, and if improvement does not supervene, then veratrum is the medicine *par excellence*. The pathogenesis of this extraordinary medicine, its great value in diseases which are liable to terminate in collapse, and its great reliability and uniformity of action, render it of signal service in these affections. It is especially called for when, in connection with other symptoms, there is nausea and vomiting.

Arsenicum is indicated if there be a dry skin, with thirst and much restlessness. **China** may be given when there has been profuse hæmorrhage, or when at the time there is some internal bleeding going on. My experience is limited to the means just mentioned. With camphor, veratrum, arsenicum, china, and the auxiliary treatment pointed out, shock and collapse are generally manageable. After an operation or injury, when there is great restlessness and prostration, with sighing respiration, a cup of coffee administered by the mouth and an injection of the same, *per rectum*, may afford relief. If symptoms of coma supervene, opium will be indicated, and will be of service, and as reaction takes place, acon., bella , gelseminum are required. With these medicines faithfully given and persevered in, a good result may be expected. Other drugs have proved very highly efficacious, among which is the hypericum perfoliatum recommended by Dr. T. L. Brown, of Binghamton, and noticed in Prof. Franklin's Surgery. Prof. John C. Morgan† adds the following medicines to the list:

Capsicum, calamus (especially after profuse hæmorrhage), cuprum, nux moschata,

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* London Medical Record, May 15, 1877, Monthly Abstract of Medical Science, July, 1877.

† Franklin's Science and Art of Surgery, vol. i, p. 618; and Transactions of American Institute of Homœopathy for 1869, p. 112.

aconite, arnica, strontiana, chloroform, digitalis, nux vomica, ammonium-causticum, carbo vegetabilis, mercurius, natrum muriaticum, and phosphorus.

Stimulants.—The question here arises, and it is an important one, as to the propriety of administering stimulants in the condition of which we are speaking. I have employed them often and with benefit, and again have observed that no satisfactory result followed their administration. I am, however, convinced that the habit of pouring down brandy or whisky, *ad libitum*, cannot be too emphatically denounced. I am disposed to believe that in the majority of cases, if reliance is placed in the medicines, that the patients will do as well, probably better, without stimulants. If the surgeon considers it expedient to use them, brandy is the best because more prompt. It should be given in tablespoonful doses, of a mixture of equal parts of the best cognac and water. The effects of each dose must be carefully watched, and only repeated when the effects of the preceding one are subsiding.

Atropia.—Dr. Jno. T. Hodgen, of St. Louis, recommends very highly the hypodermic use of $\frac{1}{60}$th to $\frac{1}{30}$th of a grain of atropin in collapse. His first experiments were made in 1866 and 1867, during the cholera epidemic, and were published in the *St. Louis Medical and Surgical Journal*, for November, 1866. He states from that time to the present, a period of twelve years, he has employed it in many cases of collapse; among them, in that arising from strangulation of the intestines. Within the past year Dr. Weber has recommended Belladonna for the same purposes.* This medicine demands a thorough trial in cases of genuine shock as well as in those of collapse.

Tetanus.—This disease is well known and is frequently the result of injuries, and so intractable is the affection under any method of treatment, that its occurrence is always regarded by the practitioner as unfortunate in the extreme; and although the influence that homœopathy possesses over this, as well as over many dangerous surgical diseases, modifies in some degree the danger of the affection, still, until the light of further investigation be brought to bear upon it, the surgeon cannot otherwise than entertain for it a doubtful prognosis.

Tetanus is characterized by a permanent spasm of the muscles of a portion, or nearly the whole of the body, rendering it stiff and straight. When the spasm presents itself in the muscles of the neck, throat, and jaws, the terms *trismus* or *lockjaw* designates such a condition. When the muscles of the back are affected, the word *opisthotonos* expresses the affection, while *emprosthotonos* denotes an exactly opposite condition, the body being bent forwards. *Pleurosthotonos* is the term used when the muscles of the side of the body are affected with tetanic spasm.

The disease may be either *traumatic* or *idiopathic;* the latter often arises without any assignable cause, and is usually chronic; the former, being acute, follows upon a wound, or other injury, is much more dangerous and of more frequent occurrence. The spinal system is the seat of the disease; there is an "excitable state of the spinal cord and medulla oblongata, not involving the ganglia of special sense. This may be the result of causes altogether internal, as in the idiopathic form of the disease, in which the condition exactly resembles that which may be artificially induced by the administration of strychnine, or by its application to the cord. Or it may be first occasioned by some local irritation, as that of a lacerated wound; the irritation of the injured nerve being propagated to the nervous centres, and establishing the excitable state in them. When the complaint has once established itself, the removal of the original cause of irritation (as by the amputation of the injured limb), is seldom of any avail, since the

* Philadelphia Medical Times, February 2d, 1878.

slightest impressions upon almost any part of the body are sufficient to excite the tetanic spasm."

The brain only becomes affected in the last stage of the disease, when the delirium and stupor supervene that are present before death.

Dr. Cullen writes: "In this disease the head is seldom affected with delirium or even confusion of thought, till the last stage of it, when, by the repeated shocks of a violent distemper, every function of the system is greatly disordered."

The spasm, in the generality of instances, approaches in the most insidious manner; if trismus is about to commence there is slight difficulty in swallowing, and the patient cannot open his mouth to the usual width, there is also hardness of the muscles about the neck and throat; the spasm increases, the mouth becomes distorted, the pulse quick and irregular, the teeth clenched, and the temporal and masseter muscles become hard and bulging; the face is distorted by the spasmodic action; the corrugatores supercilii act upon the eyebrows and draw them into angles; the forehead is wrinkled, the nostrils dilate, and the angles of the mouth are drawn backward. The orbicularis oris binds the lips firmly on the teeth, which, however, are now always more or less seen, and sometimes wholly disclosed. The expression is indicative of much suffering, and is quite peculiar to the disease; it may indeed be said to be pathognomonic.

Hitherto the only muscles that have been affected are the voluntary, but at this stage of the disease the involuntary also become attacked; the first affected is the diaphragm, and consequently breathing is performed with difficulty; the other muscles of the system soon participate, until the whole body becomes fixed and rigid. The arms are the last affected, but the fingers may retain their motive power to the last. The bowels are constipated, and there is difficulty in passing urine, occasioned by the spasm of the muscles of the perineum and neck of the bladder.

The disease is more common in hot than in temperate climates, and children and adults are more liable to be attacked than youth or aged individuals. At certain seasons of the year, portions of Long Island appear especially obnoxious to the development of the disease. It arises most frequently from wounds, etc., inflicted in tendinous parts that are well supplied with nerves, but it has been occasioned by mere bruises or blows. It also has followed an injury done to the nerves, as when torn in wounds or ligated together with an artery.

The size of the wound is of no consequence, in regard to its influence upon tetanus, as severe incised, lacerated, or contused wounds may heal without its accession, while the disease may appear from a slight puncture or mere scratch.

The duration of time between the infliction of a wound and the accession of tetanus varies. The case which illustrates the shortest period on record, between infliction and invasion, is that related by Prof. Robison, of Edinburgh, in which a negro expired in fifteen minutes after having torn his thumb with a broken china plate.*

If three weeks elapse, the patient may generally be considered safe.

Treatment.—The remedies that are adapted, and those that have been most successfully used in tetanus, are acon., ang., arn., ars., bella., camph., cham., cic. vir., cupr. met., hyos., ipecac., ignat., lauro., nux vom., opium, rhus tox., secal. cor., stram., verat.

Aconite is useful, and has been successfully employed in "trismus, with frequent alternation of redness and paleness of the face, and distortion of the eyes." It is

* Rees's Cyclopædia, article Tetanus.

also to be administered for opisthotonos, the upper and lower limbs drawn in; the hand and thumb being clenched; also, when the lower limbs are constantly drawn close to each other, the eyes turned upwards, and the face covered with a cold sweat.

Arnica may be employed in cases of tetanus arising from wounds; although the cases in which it has proved most efficacious are those in which it was employed after the use of some other medicine. In a case of trismus, with opisthotonos, arising from a wound in the leg, after the violence of the disease had been abated by mercurius, the cure was completed by two doses of arnica 12. Arnica should also be applied to the wounded surface, in water, as well as administered internally, or the treatment may be commenced from the first with this medicine, if the symptoms correspond: short panting breathing, jerks and shocks, as if produced by electricity, tremor of the limbs.

Angustura.—Trismus with convulsions of the muscles of the back, twitchings in the top of the shoulder, oppression and spasms of the chest.

Arsenicum must be used when the tetanic spasms are accompanied with frightful concussion of the limbs; when the patient lies as a dead person, extremely pale, but warm, with hands clenched, which are turned to and fro; when the arms are slowly drawn up and down, mouth much distorted, and breathing imperceptible; also, when there is stiffness of the limbs, particularly of the knees and feet.

Belladonna is adapted to many of the symptoms of tonic spasms; to these belong partial spasms; shivering and trembling of limbs; spasmodic, constrictive sensations in the epigastrium, which are accompanied by shortness of breath, and an anxious, distressing feeling in the breast; drawing and stiffness in the neck and spine; spasmodic contractions in the tongue; yawning and vertigo; painful stiffness of the muscles of mastication, accompanied with convulsions in all the limbs and chilliness; contortion of the eyes, extension of the extremities, violent distortion of all the muscles, opisthotonos; pleurosthotonos, especially to the left side; paroxysms of stiffness and immobility of all the limbs, or of a single limb only, aggravated by the least contact. Trismus, with painful constriction and narrowness of the fauces, oppression of the chest, labored irregular breathing, delirium, and stupor. When belladonna is adapted to trismus, especially in the cases of infants, the following symptoms must be present: Sudden starting and drawing together of the body and limbs; slight twitching motions; strabismus; inability to swallow, and finally severe spasms; anxious, spasmodic respiration; dilated pupils; motionless staring eyes; involuntary discharges of fæces.

Camphora.—For tetanic spasms, loss of consciousness; limbs extended and fixed, head bent sideways, lower jaw rigid and wide open, lips drawn inwards, unceasing distortion of the muscles of the face, coldness all over the body, oppressed, anxious, panting breathing—trismus. **Cicuta virosa** is a valuable remedy in tetanus, particularly when the disease presents itself in the form of trismus, at the same time there being general tetanic rigidity. The cases that are on record in which this medicine has proved serviceable, have all originated in immediate irritation of the brain and spinal marrow, from injuries inflicted upon the head or along the spinal column. The drug is indicated when there is deadly paleness of the face, with coldness, grinding of the teeth, foam at the mouth, and inability to swallow; opisthotonos. Tonic spasms of the cervical muscles, cramps, stiffness of the whole body, with coldness, or with curvature of the limbs, which cannot be straightened; paleness and yellowness of the face.

Cuprum met.—Under this medicine we find the following symptoms: Paleness of the face, spasmodic contractions of the jaw, foam at the mouth, vomiting, jerking of the limbs, with distortion; opisthotonos, with the limbs spread out to the sides and the mouth open; rigidity of the limbs and trunk; jaws closed, with loss of consciousness, redness of the eyes, ptyalism, and frequent micturition.

Cham. should be used if there are twitchings of the eyes and eyelids; convulsive jerkings of the facial muscles, the lips being drawn downward; foam at the mouth, and concussion of the limbs.

Ignatia, when there is trismus or opisthotonos, occasioned by fright or chagrin. In a case of opisthotonos, in which the head was drawn powerfully back by tonic spasms, the countenance livid, pupils dilated, respiration and deglutition of fluids difficult; ignatia effected a cure.

Ipecac. must be employed when there is a contractive sensation in the throat and chest, either in opisthotonos or emprosthotonos, when there are convulsive twitchings of the lower limbs and feet, together with chilliness and stiffness of the body, with spasmodic jerkings of the arms towards each other; nausea, vomiting, and distorted muscles of the face.

Hyos. is indicated by staring, distorted eyes, spasmodic closure of the lids, bluish

face, clenching of the teeth. In trismus, when the patient is conscious. Foam at the mouth, constriction of the throat, twisting of the neck to one side, with rigidity of the hands; contortions, and spasmodic curvings of the body.

Laurocerasus has the following symptoms, which indicate its use in tetanus: Hippocratic countenance, disposition to clench the jaws, spasmodic constriction of the larynx, staring eyes, foam at the mouth, stiffness of the neck, and twitchings about the head.

Nux vomica is indicated when there are continued tetanic convulsions, alternating with violent concussion of the whole body; violent convulsions of the whole body, with extreme rigidity of the limbs; when the muscles of the chest are affected, occasioning dyspnœa; frightful spasms of the whole body every three or six minutes, with opisthotonos; drawing in of the muscles of the chest, distorted eyes, and redness of the face; spasmodic attacks, merely from touching the hand; alternate opisthotonos and trismus; frightful convulsions, particularly opisthotonos, returning and abating several times in one minute, with full consciousness; violent convulsions, lasting from one to two minutes; all the muscles becoming suddenly stiff; jaws clenched; frequent and irregular pulse and profuse sweat; tetanic spasms excited by the least contact.

Opium may be used when there are jerkings of the facial muscles, distortion of the mouth; trismus, with irregular, difficult respiration; spasmodic trembling of the limbs, with foam at the mouth; tetanic spasms, with opisthotonos and rigidity of the whole body, the trunk being curved in the form of an arch.

Rhus tox. must be exhibited when there is rigidity, as from contraction of the tendons; tingling and twitching of the limbs; opisthotonos, with great languor; contraction of the fingers, oppression of the chest; pale, sickly countenance. It is also very suitable when the disease arises from injuries inflicted in ligamentous parts.

Secale cor.—This medicine is adapted to the following symptoms: Humming and roaring in the ears; Hippocratic countenance; trismus, the mouth being spasmodically distorted; trembling and rigidity of the limbs, which cannot be overcome; opisthotonos and emprosthotonos, with cold sweat during the paroxysms, subsultus tendinum; rapid sinking of strength; the thumbs are clenched, with violent contraction of the fingers; grinding of the teeth, vomiting, oppression of chest.

Stramonium should be thought of when, during the interval between the paroxysms, the eyes of the patient glisten and sparkle, or when the convulsions appear, there is grinding of the teeth, muttering; oppression at chest; violent motion of the limbs, with stretching and trembling of the hands, clenching of the thumbs.

Veratrum.—Pale, Hippocratic countenance; trismus; grinding of the teeth; spasmodic constriction of the œsophagus, with contracted pupils. There is also spasmodic constriction of the palms of the hands and soles of the feet; twitching of the eyes; the paroxysms are preceded by anguish or despair, the patient being beside himself.

With reference to other treatment of this most distressing malady I may remark that, throughout the medical periodicals, numerous cases are recorded as cured by the exhibition of chloral hydrate.

From a late experience of my own, I am disposed to regard it as a most valuable medicine. The case was one in which I had resected the head and upper portion of the humerus for caries, resulting from a gunshot wound of the axilla, of sixteen years' duration. The operation was difficult, prolonged, and bloody, on account of extensive bony adhesions to the body of the scapula. For ten days after the operation everything progressed well. On the eleventh day, a slight stiffness in the nape of the neck, with some rigidity of the temporo-maxillary articulation, indicated what was to come. Severe tetanus followed; trismus and opisthotonos, with profuse sweating resulted. The spasms were most violent in character, a draft of air, the contact of the spoon to the lips, or movement about the room, producing them. Almost all the medicines recorded above were tried without avail. Chloral hydrate, in ten-grain doses, was given, and immediate relief was experienced. This medicine, with opium first decimal, finally cured the patient. The recovery was slow; at one time, during convalescence, the patient was covered with herpes circinatus; this dis-

appearing, strangury resulted, and for a long time flushes, with sudden perspiration, depression of mind, and bed-sores, complicated the case, which was under continued supervision for over three months. Upon referring to current medical literature, more cases are reported as successfully treated by chloral than by any other one medicine. A proving of this substance is now being made, from which more reliable data may be afforded. It may be used hypodermically in 5-grain doses.

Dr. Chapard,* in *Thèse de Paris*, from a review of eighty cases of tetanus, concludes that chloral, administered by enema or draught, offers the best hope of saving the patient's life. Enemata are made by adding the solution of chloral to milk into which the yolk of an egg has been stirred.

In a case that came under my observation the calabar bean was used hypodermically with amelioration of the symptoms, especially the spasms of the muscles of deglutition. The formula was:

℞. Alcoholic extract Calabar bean (English), . . grs. vij.
Alcohol dilute, ... ℥j.
M.

Of this eight drops were injected every three hours.

Atropin in $\frac{1}{10}$ grain doses, hypodermically, is also much commended.

M. Demarquay has lately reported two cases of traumatic tetanus treated by intramuscular injections of morphine. The hypodermic syringe was introduced first into the masseters, and afterwards into any of the muscles most affected.

Dr. Kella recommends *curare* (the arrow-poison of the Indians, which antidotes strychnine and removes spasms) as a remedy of great service in tetanus.†

For an interesting paper on the action of extract of nux vomica, compared with that of the curare, condensed from Mr. E. Brown-Séquard's *Journal de la Physiologie*, the student is referred to the *United States Journal of Homœopathy*, vol. i, p. 10.

A very remarkable cure of trismus is recorded in the *Medical Independent*, vol. i, No. 3: A soldier having lockjaw from a wound in the foot, was given over to die. An officer cut a piece of tobacco, about three inches square, put it into a pan of boiling water, and, having thus softened it, flattened it out and placed it over the epigastrium. In five minutes deadly pallor ensued with twitchings, and the jaws completely relaxed.

Dr. Bompart‡ attributes the cure of a case of tetanus to four grams daily of jaborandi (powdered leaves in infusion), given from January 23d to March 3d. At the same time, clysters of eggs, broth, wine, black coffee, and the *elixir alimentaire de Ducro*, were administered. The jaborandi produced very abundant salivation.

Kalmia latifolia is also reported to have cured tetanus.

Nerve-stretching.—This new method will be alluded to further on in this chapter.§

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* Monthly Abstract of Medical Science, May, 1877. London Med. Record, March 15th, 1877.

† United States Journal of Homœopathy, vol. ii, p. 547.

‡ Monthly Abstract of Medical Science, June, 1876; London Medical Record, April 15, 1876.

§ Dr. Paul Vogt (Monthly Abstract of Medical Science, March, 1877), in a case of traumatic tetanus supervening upon an injury to the right hand, and in which there was tenderness of the brachial plexus, completely and immediately

Amputation of the affected part has been employed in some cases with varying results.

Wounds of the Nerves.—The nerves are frequently wounded by cuts, stabs, and in the performance of surgical operations; but they, after a time, are repaired by intervening tissue, through which the nerve-power appears to be conducted. If a nerve is merely pricked, the symptoms for a moment are quite severe; the sensation is sharp and darting, with tingling and numbness below the part injured. With rest, however, these symptoms generally pass away. If a nerve be entirely divided, there is loss of motion and of sensation in the part which it supplies, with coldness and paleness of the surface, and if the nerve-force is not restored, permanent paralysis results.

In the subcutaneous division of tendons a nerve is sometimes divided, as happened to me lately while operating for anchylosis of the knee. In dividing the tendon of the biceps the peroneal nerve, which lies in close proximity, was cut through. This was followed by immediate paralysis of the abductors and extensors of the foot, which continued for two months, after which motion was entirely regained. Sometimes after a division of nerve-substance, especially if the gap be wide between the severed ends, the parts connect by an enlarged or button-like formation of the extremities; these are excessively painful and occasion great suffering; in such cases a redivision has been necessary, and indeed a reamputation may be the only means of relief.

Prof. Willard Parker, of New York, has described a condition of the nervous system which he calls *concussion of the nerves*. The first symptoms after the injury are paralysis, then reaction, followed by inflammation, and the patient is left weak or miserable for a considerable time.

Treatment.—For an injured nerve rest is essential; the part should be elevated and enveloped in cotton-wool or batting. Twice during the day, frictions made with towels, dipped in a mixture of salt and whisky, should be used; and if symptoms of reaction do not appear, a current of electricity should be passed through the part. If this treatment does not relieve, in ordinary cases, a few doses of aconite will be serviceable. If after puncture of a nerve there should be swelling, together with sprained sensation of the joints, accompanied with excruciating pains, *hypericum* is very useful.

Moschus, for cold feeling along the spine, with paralytic feeling of the injured parts, and excessive nervousness.

Ignatia, for numbness and pain, with tendency to spasmodic jerkings and sleeplessness, with sinking at the pit of the stomach.

Camphor, when there has been great concussion of the nerves, with symptoms of shock, coldness, and when symptoms of tetanus threaten.

Verat. alb., when after the injury the pains are maddening, with cold sweat, constriction of the larynx, with stiffness of the parts and trembling.

Strychnia.—Numbness and tingling of the parts, with great tendency to paralysis. Prostration, pains in the back, and gastric derangement.

Other medicines are: Calabar bean, tabacum, hyoscyamus, secale, cocculus, zincum.

Nerve-stretching.—This peculiar method of treating certain affections of the nervous system, as tetanus, neuralgia, and epilepsy, was introduced to the profession in 1872. Since then many experiments have been made, some of them being remarkably successful. Dr. Paul Vogt, Professor of Surgery in the University of Gnefswald, has written a systematic treatise upon

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cured the patient, although he had opisthotonos and clonic spasms, by exposing the plexus at the anterior border of the trapezius, vigorously pulling the nerves centripetally and centrifugally, and freely dividing nerve-sheaths, which were red.

the subject, in which he gives the experiences of Billroth, Von Nussbaum, Palmbau, Peterson, and himself. These surgeons performed the varied operations for different diseases. Thus Billroth laid bare and stretched the sciatic, for spasm of the leg. Von Nussbaum, for intense neuralgia, with spasmodic contraction and loss of sensation in the muscles of the arm, exposed and stretched the brachial plexus. Others have cured paralysis, reflex epilepsy, neuralgia, and traumatic tetanus. In the last-named disease the brachial plexus was stretched, the injury being at the hand, in one instance; in another, the tibial was exposed and stretched, the injury being at the foot. In both cases a cure was effected.

Of this peculiar method *Callender* thus writes:*

"I hope that this note may lead to a further trial of this method of treatment. The operation is not a severe one. The nerve is exposed and is stretched, when freed from its surroundings, by traction with an ordinary vulsellum, from its central connections. No harm is likely to be sustained as a consequence. There is now abundant evidence, in the cases reported by Billroth, Nussbaum, and myself, of the tolerance with which nerves submit to forcible stretching, so far as the after-performance of their functions is concerned. In view of the unsatisfactory results of the treatment of traumatic tetanus, as at present conducted, there is full justification for the performance of the operation as, at least, a last resource, although I should myself advocate its trial, as in the case under the care of M. Verneuil, as soon as the signs of the disease are distinctly recognized."

The following is a description of the method of performing the operation:†

"The actual accomplishment of such an operation appears very simple, and yet from a study of all the published details it is clear that final success depends very much on attention to small matters, which sometimes are apt to be forgotten. The operation may be divided into three stages: 1. Laying bare the nerve within its sheath. 2. Drawing forwards and stretching the nerve. 3. Reposition and application of dressings. The first act of the operation is a most important one. In the case of traumatic tetanus, before reported, some important changes were found, not only in the nerve itself, but also in the surroundings of its sheath; in all such cases *it is recommended directly to free the nerve-sheath* on all sides as far as one can reach; stretching then accomplishes the rest. The second act of the operation may be performed either manually or instrumentally. For the drawing forward of the nerve one naturally uses a blunt hook, or an elevator, or for a small nerve an ordinary aneurism-needle. The actual stretching is best accomplished by passing the forefinger, appropriately curved, beneath the nerve, and using it in conjunction with the thumb. By this means we secure as much force as is necessary, provided we place the limb in a suitable position. Were a hook used for the stretching, there would be a danger of locally injuring the nerve itself, which is not possible when the finger is used. In the case of small nerves, it would be impossible to pass the finger beneath them, and hence a thin elastic band may be substituted. In this way an *elastic* traction can be exercised without the risk of bruising or otherwise injuring the nerve itself. The last part of the operation consists of the dressing. If the stretched nerve does not recede when the limb is placed back in its normal position, or if the part operated on is one (the face) in which these movements would be impossible, the operator

* Lancet, April 22, 1876.

† Medical Times and Gazette, September 15, 1877, also Monthly Abstract of the Medical Sciences, November, 1877.

must gently tuck in the nerve into its bed. A small bit of drainage-tube is to be placed at the bottom of the wound, which may then be appropriately closed by a few sutures. Lister's dressing and spray ought to be used in these cases, as rapid union and a small scar must be tried for."

Neuralgia is a Greek term, compounded of *Νευρον*, a nerve, and *αλγος*, pain: a generic term, for a number of certain diseases, distinguished by very acute pain, following the course of a nerve through its trunk and ramifications. The principal neuralgias are known as: 1. Ischias nervosa digitalis. In this variety the pain extends from where the nerve passes under the inner condyle, to the back of the hand and to its cubital edge. 2. Neuralgia dentalis, odontalgia nervosa. 3. Neuralgia facial, neuralgia faciei, trismus dolorificus, tic douloureux, dolor faciei, prosopalgia, dolor faciei Fothergilli. 4. Neuralgia femoro-poplitæa, sciatica, coxalgia, neuralgia ischiadica, ischias nervosa; this latter is characterized by pain following the great sciatic nerve, from the ischiatic notch to the ham, and along the posterior surface of the leg to the sole of the foot. 5. Ischias nervosa antica; the pain in this variety commences in the groin, extends along the forepart of the thigh, and passes down on the inner side of the leg to the inner ankle and back of the foot.

Neuralgia also attacks the liver, uterus, vagina, spleen, the plantar nerves, the heart, and other parts of the body. These affections are obstinate in character and are the most painful of all diseases.

Some nerves are more disposed to the disease than others, especially the three grand divisions of the fifth, and the facial portion of the seventh pair, although this has been denied, upon the supposed discoveries of Sir Charles Bell and Shaw.

The pains vary in character, though always violent in the extreme, occurring either suddenly or gradually, with a feeling of numbness, itching or heat, or preceded by numbness or coldness. Neuralgic pains, at times, resemble electric sparks passing through the nerves. When the neuralgic attack is at its acmé, the part feels as though burning needles were thrust into it; after a while the intensity of the pain diminishes and is followed by numbness, or great sensibility of the part to touch, or sometimes a feeling as though it had received a blow. When the affected part feels cold, no actual diminution of temperature is ascertained, nor is there any evidence of inflammation or congestion; muscles to which the affected nerves pass are sometimes agitated with slight contractions, not reaching to that degree, however, to which the term of spasm could be applied. These contractions continuing, produce involuntary catchings, called by the French *tics*, whence the term tic douloureux. When the nerves affected supply secreting organs, morbid and increased secretion takes place. The severity of the pain may irritate the vascular system to increased action, which does not, however, indicate inflammation. Affected organs decrease in bulk, and are observed to become paler. In long-continued cases of great severity the system severely suffers.

A neuralgic affection may continue from days to years. When pains in a nerve are produced by *pressure* upon it, as for instance by a tumor, with the removal of which the neuralgia disappears, such neuralgias are termed *false*.

Prosopalgia, or tic douloureux, is most apt to attack females, one attack predisposing to others. Neuralgias attack neither very young nor old persons; the period of life most obnoxious to the disease is between the thirtieth and the sixtieth years. Exciting causes are moist, cold winds, the slightest exposure to either being sufficient to bring on a very severe attack. The causes, however, are generally obscure; mechanical injuries are included

among the number. When the predisposition to the disease is strong, the attacks are induced by the slightest corporeal or mental disturbance. Malaria has been assigned as a cause, the periodical character of the affection strengthening such an opinion. Sometimes great regularity is observed in the returns of the paroxysms, the type being quotidian; this periodicity most generally takes place in recent cases; when the affection becomes chronic, the intervals between the attacks are of very different duration. The superficial or subcutaneous nerves are those most frequently attacked, and this is explained by the fact of their greater exposure. The shades and varieties of pain experienced in this disease, it would be impossible to enumerate. Among them, however, of a prominent kind, are: tearing, tugging, darting, piercing, plunging, dragging, jerking, excruciating, sharp, sudden, pricking, lancinating, burning, cutting, lacerating, stabbing; sometimes radiating through the entire ramifications of a nerve, at others passing along a few of its branches only. The pains also extend in different directions: outwards, inwards, backwards, upwards, or downwards. The pains are, at times, also gnawing, pressing, heavy, dull, obtuse, boring, like the pressure of a dull instrument.

Sometimes, as has already been noticed, the attacks come on suddenly; at others, they are preceded by rigors, heat, perspiration, and an abundant secretion of clear, pale urine. During the paroxysm, the surrounding parts are very sensitive to touch, and a characteristic circumstance, in many cases, is that the slightest touch will produce an agony of suffering, while firmer pressure not only occasions less pain, but will sometimes afford much relief; at times much general soreness is left after the paroxysm, and in general the bloodvessels in the vicinity of the affected part are swollen.

Sometimes the paroxysm is composed of a series of transitory shocks of darting pain, with short intervals of respite from suffering. In general, much pain is felt during the entire paroxysm, with frequent darting pains, so severe as to produce loss of consciousness or delirium. A paroxysm may continue a few minutes, or may last for days, weeks, or even months, with only at times a few seconds' relief from pain. The intervals between the attacks may be of hours, weeks, or months' continuance. In recent cases there is a complete intermission of pain; in chronic cases the patient always feels some uneasiness.

Dissections afford no assistance in the elucidation of the disease. Inflamed conditions of the nervous tissues, either of the nerve itself, or a thickening of the neurilemma, the fine transparent membrane which envelops the nerves, when found, are only effects of the disease. Its cause has been supposed to be an inflammation of the periosteum of the bones, over which the affected nerves are distributed. Morbid alterations will not explain the periodical nature of the affection. The short, quick paroxysms, the absence of all signs of inflammation or swelling; the pain following the course of the nerves; the periodicity of the affection; its diminishing, rather than increasing, from *firm* pressure, are diagnostic signs of sufficient precision to prevent its being confounded with other affections.

The disease seldom terminates fatally; it has been alleged that apoplexy and insanity have followed it, but such results are certainly very unusual, and Dr. Quinn suggests them as the effects of the treatment (*allopathic*), rather than of the disease. Neuralgias, when acute, although more violent, are more easily cured than when chronic. Neuralgias have been noticed when epidemic fevers prevail, and also as attacking more individuals at certain seasons. The disease most frequently attacks the face—prosopalgia, tic douloureux, neuralgia facialis, dolor faciei—the pains fol-

lowing the course of the different branches of nerves of one side of the face; for both sides of the face to be attacked at the same time is a very unusual occurrence, if indeed it ever takes place; the pains, however, after subsiding in one side may attack the other, and this often happens. If the supraorbital branch be affected, the pains are felt in the supra-orbital foramen, from which they shoot to the eyebrows and eyelids.

Treatment.—A great variety of medicines have been employed in the treatment of the varied forms of neuralgia. Among these are: aconite, belladonna, china, arsenic, calc. carb., veratrum, colocynthis, spigelia, mezereum, stannum, lycopodium, phosphorus, staphisagria, platina, rhus t., bryonia, conium, digitalis, aurum, verbascum, sepia, cannabis, ignatia, nux vomica, pulsatilla, chamomilla, and many others. The names of these medicines are given that their proper pathogeneses may be studied.

Neurotomy.—When remedial measures have failed neurotomy is to be remembered. There are two methods of performing this operation: one is by making a subcutaneous puncture, or a small incision in the immediate track of the nerve, down to the bone; the other is by a careful and minute dissection to lay bare the nerve and cut away a portion of it, from half to an inch in length. Dr. Carnochan, of New York, has made some remarkable dissections and removal of nerves for this disease.

CHAPTER XXIV.

DISEASES OF THE LYMPHATICS.

LYMPHANGITIS—ANGEIOLEUCITIS—ADENITIS—LYMPHADENOMA—LYMPHOMA.

THE various diseases of the lymphatic system are not as a rule, idiopathic, being rather secondary to some other disorder. The pathology also of these affections is not well understood, although it is an established fact, that inflammation, suppuration, calcification, and finally obliteration of the coats of the vessels, and even of the thoracic duct occasionally occurs.

Lymphangitis is generally occasioned by some poisonous substances, which may have their points of origin either on the surface or within the body, being taken up and circulating through the lymphatic vessels. It frequently follows certain varieties of punctured wounds, as in such, septic matters are not so liable to be washed away by the blood, the discharges and the dressings, as in the more open varieties of wounds. The disease also may arise from the presence of cold abscesses, from diseases of the connective tissue about the uterus, especially in puerperal women.

The symptoms belonging to this disease have in part been mentioned in the Chapter upon Poisoned Wounds. The first manifestation usually noticed is a severe rigor, followed by fever, thirst, and restlessness, then the appearance of faint red lines, which either take a direct course, or appear to anastomose with each other. The focus of the disease is generally much swollen, on account of the accumulation of lymph, which cannot be removed by the diseased vessels. The pain varies in severity, according to the number of the vessels involved and their depth; the deeper the duct from the surface the

more severe the pain. Some of the diagnostic marks between *lymphangitis* and inflammation of the veins consist in the facts, that the red lines alluded to are much larger and more tender in phlebitis; that they run in the direction of the lymphatics and not of the veins in lymphangitis, and that the area of tenderness is much less in the latter.

Another diagnostic fact is this, that, as Mr. Holmes * says: "The inflammation ceases at the nearest gland. This is a fact abundantly exemplified both in the simple and in the specific inflammation of the absorbents. The known situations of the superficial glands are those toward which inflamed absorbents may be traced, and at which their inflammation culminates to its highest degree of severity, and is almost invariably extinguished. The gland appears to arrest the free progress of the acrid lymph, itself becoming inflamed."

During this time there is continuous fever, the pulse beating 130, and a temperature sometimes as high as 104°, but rarely higher. I have mostly found it range from 102° to 103°, and keep pretty much at these figures through the extent of the disease. The corresponding glands are always more or less affected (adenitis); they become hard, painful and enlarged, and finally, as already noted, may suppurate. The inflammatory process often extends into the surrounding connective tissue, which may also suppurate, or this process may take place in the vessels themselves.

If this latter result is to be favorable, the diseased lymphatics are but partially obliterated, and the glands gradually resume their normal condition, though it is not by any means uncommon for them to remain œdematous for a long period of time after the original disease has passed away.

If, however, the suppuration continue, the symptoms of a more dangerous disease are developed. From the obstructed lymph return, the parts become permanently œdematous, and sclerosis and hypertrophy of the connective tissue results, and here and there are found indurated tumors of transformed tissue. It is considered by some that elephantiasis is the result of lymphangitis. When the ducts are completely plugged by diseased lymph, occasioned by the inflammatory process, then we have a *thrombosis of the lymphatics.* This form of the disease is often met with in the uterus, and is due in the majority of instances to some injury to the inner surface of the organ; the lymphatics are found filled with viscid, purulent, or dark-colored matter. When the *thoracic duct* is the seat of the inflammation, which fortunately is a rare occurrence, especially in the idiopathic form, the most grave complications are to be expected. It appears that this duct is not prone either to thrombosis or stenosis, for in three hundred post-mortem examinations, made by Andral, the duct was found perfectly normal in two hundred and ninety-five. The symptoms as observed by Worms, appear to be rigors, very high fever, rapid rise in temperature, swelling of the left arm, with intense agony extending down to the fingers, pyæmia, jaundice and death.

Neoplasms.—In cancer and tuberculosis, the glands and lymphatics become sooner or later involved; degenerate cells, cancer-juice, and other debris are soon taken up by the vessels and are carried on in the lymph-ducts, until they either adhere to the coats of the tubes themselves or are stopped short at a gland, whereat indeed many such accumulations may be present. Here the seeds are sown that soon take root and develop neoplasms of different formations. Neoplasms also, may *originate* in the lymphatic system, at least such is the assertion of Klebs, Rindfleisch and others. One thing, however, is certain, that the glands themselves often become

* System of Surgery, vol. iii, p. 331.

chronically indurated, and the diseases known as lymphoma or lymphadenoma, is a variety of adenitis accompanied with lymphangitis.

Lymphadenoma, Lymphoma, Lympho-sarcoma, are terms used to designate a peculiar hypertrophy of the lymphatic glands, which has been so accurately described by Dr. Hodgkin, in the *Medico-Chirurgical Transactions* for 1832, that it is now named "HODGKIN'S DISEASE." Wilks calls the disease *lymphatic anæmia*, Cassy, *general hypertrophy* of the *lymphatic* glands, and Wünderlich, *multiple lymph adenoma*. The cervical glands are those most generally affected, but the axillary are also not unfrequently attacked, as may be other of the glandular tissues. The disease does not depend on zymotic influences, and bears in many respects a resemblance to phthisis. In some cases it may be caused by traumatism. The glands gradually enlarge, with their connective tissue, and these appearances may result from a bruise or a strain, or may appear without any appreciable cause. A small swelling may be the first indication of the disease. Acute pain, neuralgic in its character, accompanies the growth, or may appear in the locality before the tumor is noticed. The tumor at first appears movable, but grows rapidly without seriously inconveniencing the patient. A peculiar and frequent accompaniment of the disease is leucocythæmia, the white blood-corpuscles being always in excess, and often in enormous quantities. There is also the usual *bruit de souffle* which accompanies the condition. A single gland may be thus affected, or as is more frequently the case, several become seats of the disorder, and finally tumors in the lungs, liver and cellular tissue are developed. Lymphadenoma is not always accompanied by leucocythæmia, as is noted by Mr. Haward, and offers a better opportunity for treatment when uncomplicated. M. Jaccoud concludes, that this disease is occasioned by a twofold condition of the blood. In the one the red globules are much reduced; in the other, this condition coexists with a vast increase in the leucocytes. According to this view the anatomical constitution is different in each variety. He is of opinion that in the latter cases, viz., where there is a great increase in the amount of the white blood-corpuscles, the new growth is altogether expanded in the cellular elements, but when both conditions noted above are combined, the capsule of the glands and the connective tissue are much thickened. At present, operative interference is scarcely considered justifiable, as most of the cases reported have proved fatal.*

Mr. Warrington Haward† presented at the Clinical Society of London, the following interesting case of lymphadenoma. "The patient, a child of four years, had on the left side of the neck an immense mass of enlarged glands, extending from the ear above, to the clavicle below, and from the spine behind, to the trachea in front. The glands were elastic, and moderately firm, and not adherent to the skin. There was no evidence of disease in any other part of the body, and the number of the white globules in the blood was not increased. There was a family history of phthisis on the mother's side. The child was pale and rather thin; the growth was of a year's duration, and commenced soon after an attack of small-pox. As the disease of the glands appeared to be confined to those visible in the neck, it was determined to remove these, in the hope that the general infection might thus be prevented or delayed. As the removal of the disease involved the dissection of the whole of one side of the neck, it was effected in two operations. At the first, the affected glands were removed from the

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* *Vide* Medical Times and Gazette, January 27, 1877.

† Medical Times and Gazette, December 25, 1875. Reported also in the Monthly Abstract of the Medical Sciences.

anterior triangle of the neck; at the second, from the posterior triangle. The child recovered well from the operation, and soon gained flesh and color to a remarkable extent. Subsequently, however, the disease returned in the upper part of the left anterior triangle of the neck, and tumors afterwards appeared in the axilla and groin. The child died, pale and emaciated, and post-mortem adenoid growths were found in the abdominal viscera in addition to the enlargement of the glands. No recurrence occurred in the posterior triangle of the neck, and it was thought that possibly some diseased glands might have been left in the upper part of the anterior triangle, where the growth first reappeared."

M. Trelat (in the *Lancet*, April 14, 1877,)* mentions two cases of removal of lymphadenomata, attended in each case with similar growths in other parts of the body. In both these cases there was a recurrence of the growth and a fatal issue, and lymphomatous growths were found in the vertebræ, sternum, spleen and liver. It is held that there are forms of lymphadenoma which are malignant, and others which are not, but the definite histological criteria for determining between the two varieties is not pointed out. The conclusion drawn from these cases is that the removal of these tumors is not advisable when there is any suspicion of visceral implication.

Lymphatic Fistula.—In some cases of lymphangitis, a fistula forms and opens upon some portion of the body, from which the secretion is poured out. Such may also result from a wound, or it may arise from a varicose condition of the lymphatic vessels. It is said that elephantiasis of the extremities is a frequent accompaniment of these fistulæ, and that their most frequent site is the groin and the scrotum.

In the treatment of lymphangitis, the first indication, if the disorder is of local origin, is to remove, if possible, the exciting cause. The application of the cautery, chloride of zinc, or lunar caustic to the wound, the constant application of poultices, in the admixture of which antiseptics have been freely used, and withal, great attention to cleanliness and fresh air, are important items. The system must then be nourished with appropriate diet and judicious stimulation. I say judicious, because it is much the custom in such cases to pour into the stomach all kinds of drinks, at all kinds of unseasonable hours, without regard to the condition of the patient, or the digestive apparatus. There are some individuals who bear with favorable results an incredible amount of stimulants, and there are others with whom even small quantities will disagree. These cases must be duly discriminated. Internally, either the second decimal dilution of nitric acid, or the first decimal dilution of carbolic acid, prepared with glycerin or arsenicum in the third trituration, will be found the appropriate medicines. Again, china, lachesis, or carbo vegetabilis may be indicated.

In the idiopathic variety (by which I mean those cases occurring without appreciable local causes), aconite and belladonna in the earlier stages, and mercurius jodatus or soluble mercury may be of service. When there is chronic enlargement of the glands, conium, baryta carb., or sulph., should be remembered. When the tendency to œdema is great, the two medicines which in the majority of cases will produce the best results are arsenic and apis mel. I believe that these remedial agents will often shorten the duration of the disease.

Phosphorus, and the carbonates and phosphates of lime, with ferrum jod. or ferrum met., with the occasional use, as symptoms may indicate, of lycopodium and silicea, may prove successful Dr. Lilienthal has suggested to

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* American Journal of Medical Sciences, July, 1877, page 256.

me the use of hecla lava in this disease, especially where there is cervical adenitis.

For lymphatic fistula little can be done: care with reference to position, the judicious application of straps, the careful application of an astringent or caustic (not an injection), with internal medication as symptoms may present, is all that can be done in such cases.

CHAPTER XXV.

INJURIES AND DISEASES OF THE BONES.

Periostitis — Osteitis, Suppuration and Sclerosis — Osteo-Myelitis — Caries — Scrofula and Syphilis in Bone — Necrosis — Mollities Ossium and Rachitis — Fragilitas Ossium — Atrophy of Bone — Tumors, Innocent and Malignant.

Inflammatory action effects changes in the osseous as well as in other parts of animal structure.

The bones pass through the different stages of inflammation, suppuration, ulceration, and death; and are subject to peculiar deviations from healthy formation, owing to their chemical composition.

To effect a cure of diseases of the bones, the causes upon which such affections depend must be removed; a want of such knowledge often induces the most distinguished surgeons to employ severe methods of treatment, which rather aggravate these affections than produce upon them a beneficial effect. By the administration of proper medicines the constitution of the patient can be improved, and the disease more successfully treated. The dilution of the medicine and the repetition of the dose, are of paramount importance. Experience teaches that the exhibition of dynamizations, to the 30th, is more speedily followed by beneficial effects than when the lower potencies are employed; the system by the latter being excited to a reaction prejudicial to favorable results, whilst the frequent repetition of medicines often disturbs their curative action, and thereby retards recovery.

I have for years used with surprising efficacy medicines triturated to the 30th potency, by Dr. Henry M. Smith, of this city, and have been much gratified by their action, especially in bone diseases.

"We are often at a loss to determine," writes Dr. Jeanes,* "which of the remedies that are indicated by the morbid condition, or its particular development, as caries, hyperostosis, etc., is the appropriate remedy for the individual case. The circumstances which can guide in the choice of the remedy, are the temperament, the disposition, the character of antecedent diseases, and the treatment to which they have been subjected, and the nature of the exciting cause of the existing disease of the bone. The symptoms which indicate the remedies are those of the disease of the bone, viz., the appearances, the pains, and other manifestations which accompany it, and the symptoms which affect the whole system, or particular parts of it,

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* Homœopathic Practice of Medicine.

other than those immediately implicated by the disease of the bone. But most of the latter, which may be termed the general symptoms, namely, hectic, loss of appetite, emaciation, debility, etc., are often merely the result of the local irritation."

It is also of some importance for the practitioner to become acquainted with the manner in which any antecedent disease may have been treated, as all such circumstances tend to aid in the selection of appropriate remedial agents.

Periostitis.—Periosteum is the name given to the strong white fibrous membrane that closely envelops bones, excepting such of them as are covered with cartilage. This membrane is connected externally to adjacent cellular substance, and therefore indirectly with muscular tissue; the inner surface adheres closely to the bone by means of short strong fibres, which enter the numberless foramina on the surface of ossific structure.

Although fibrous tissues are not as liable to be attacked by inflammation as other textures of the body, still, when such abnormal action is found, the sufferings of the patient are often exceedingly severe; and if the inflammatory process be considerable or acute, it is seldom limited to the tissue originally affected, but extends to all the surrounding parts.

Great pain is the usual attendant upon this disease, whether acute or chronic, and when in the former variety, if the inflammation has extended to the bone, the sufferings of the patient are excruciating. This increase of suffering may be readily accounted for, if we remember that the inflammatory process progresses with greater rapidity in tissues which are secondarily involved, consequently there is a greater amount of exudation, which, being confined by the external membrane, tends greatly to increase the pain.

The swelling in periostitis is small, compared to the violence of the inflammatory action; this may also be explained in the same manner alluded to when speaking of the unusual degree of pain that is present in the disease, viz., the confinement of the exudation. All the symptoms are aggravated at night.

The constitutional symptoms are well marked in periostitis. If the disease be acute there is a high degree of inflammatory fever; if chronic, the system is gradually undermined by the continued loss of sleep, caused by the severe nocturnal sufferings. Emaciation, loss of appetite and spirits, and hectic, often supervene, rendering the patient extremely miserable.

In the acute form of the affection the membrane is softer and loosened from its connection with the subjacent bone; in the chronic variety it becomes more dense, and adheres with unnatural firmness.

When inflammation does not become fully established, or in other words, if active congestion be only present, fibrin is exuded, and the swelling is termed a *node*, which, when arising from syphilis, is denominated the *venereal*, when complicated with the results of large doses of mercury, the *mercurial*, or the two causes may be combined, giving rise to the *mercurio-syphilitic* node.

If inflammation proceed a step further, and the bone becomes involved, a purulent formation (abscess in the bone) is the result, which, not being able to approach the surface, from the strength and non-ulcerative property of the periosteum, extends laterally, denuding the bone of its membrane.

The same process may be present in ossific structure, as has been heretofore related concerning inflammation occurring in other textures; the inflammatory process having established suppuration, gradual molecular disintegration (ulceration) of the bone may ensue, and if this be not restrained, necrosis may take place.

Sometimes, in the acute form of this disease, these terminations may become apparent in a short time after inflammation has developed itself; if chronic, weeks and months may elapse before caries or necrosis is established, but the patient will exhibit unmistakable signs of severe constitutional irritation.

There is a variety of periostitis, known as *secondary*, in which the membrane has not been primarily affected, but has become so from contiguous sympathy; the bone, or spinal marrow, being primarily the seat of the inflammatory action. In this disease the symptoms are even more severe than in the ordinary variety, and the constitution is more profoundly affected.

Some of the differential marks of diagnosis between periostitis and endostitis (ostitis) are thus clearly pointed out by Mr. Bryant:*

"In *periostitis*, when suppuration is about to take place, external evidence will appear in the form of increased swelling, tenderness, and redness of the skin; œdema of the tissues covering in the node and fluctuation will be present. In *endostitis* terminating in abscess there will be a great aggravation of all local pain, with constitutional disturbance, and often rigors; œdema of the soft parts over the bone and external evidence of inflammation will rarely appear, and then only when the abscess is making its way through the periosteum externally (*vide* Abscess in Bone).

"When *periostitis* ends in necrosis it is only of the shell of bone beneath the inflamed node (peripheral necrosis). When *endostitis* ends in necrosis it is usually of a greater or less mass occupying the centre of the bone (central necrosis); sometimes the whole shaft or articular extremity dies.

"In *periosteal* necrosis the dead bone rests exposed, and when covered in it is by soft parts alone, no new bone surrounding it.

"In *endosteal* necrosis the dead bone or sequestrum is more or less completely surrounded by new bone—a new periosteal formation. When this is incomplete, it is a fair proof that the periosteum has been involved.

"In necrosis of a long bone the result of periostitis, and endostitis by extension, the hope of a new bone being formed is a forlorn one; whilst in the necrosis of endostitis there is every hope of a complete restoration of the bone taking place, through its periosteal covering, on the removal of the dead portion or sequestrum.

"In the *necrosis of the skull*, which is always periosteal, no new bone is formed, the bone-forming membrane, the periosteum, having been destroyed. When following an injury to the skull it is preceded by 'the puffy tumor of Pott.' In syphilis it follows a suppurating node."

Treatment.—The medicines that are of service in periostitis are, aur., calc., carb. an., caust., kali c., lyc., merc., mez., nit. ac., ruta, rhododen., staphis. and sulph., or croc., fluor. ac., magnes. c., natr. mur., petrol., pulsat., silic.

Aurum should be prescribed when the periostitis has arisen from, or is complicated with, a mercurio-syphilitic dyscrasia; it is suitable for the nightly aggravation of the pains, and also to nodes. This medicine possesses considerable power over inflammations of the membrane covering the bones of the nose and palate, and may, if timely exhibited, prevent caries, necrosis, or exostosis; it may likewise be used when the nasal bones and the superior maxillary are sensitive to touch, when there is cramplike tearing in the metacarpal bones, with swelling of the same; when there are nodes on the inferior extremities, with stinging and burning; also when the patient is of a scrofulous diathesis.

Calcarea carb. is adapted to a scrofulous habit, and is especially suited to children who, though they appear tolerably healthy, are extremely weak, with bloated, dis-

* Practice of Surgery, p. 806.

tended abdomen, uneasiness of the whole body, with trembling, languor, and emaciation.

Kali carb. is curative when there are aching and tearing pains; if the parts around the knee-joint are affected, or when there is stiffness and tension of the part, with throbbing and beating, tearing on the inner side of the foot and sole, tearing in the tarsal joints, etc.; when the patient dreads the open air, easily takes cold, loses his appetite, is affected with feverish chills and diarrhœa.

Lycopodium possesses a special influence on the periosteum and bones; it is recommended for periostitis and osteitis with nightly pains, even when occasioned by the abuse of mercury. It may also be used when there are drawing pains in the bones of the arms as far as the fingers, nightly bone-pain in the elbow, pains in the tibia when touching the part; all the limbs are painful when touched or pressed. The pains are mostly drawing, tearing, and pricking, sensation in the bones as though they contained no marrow.

Mercurius.—This medicine should always be remembered in periostitis, and in nodes, as it exercises considerable influence on the periosteum and bones. It should, however, never be administered when the patient has been previously subjected to the action of the drug in massive doses. The diseases of the bones and periosteum that so frequently are encountered by the homœopathic practitioner, when treating secondary syphilis, in very many instances result from the injudicious administration of mercurial preparations by old-school physicians when treating the primary disorder. It is recommended for nightly bone-pains, inflammation of the periosteum, characterized by stinging, boring, and gnawing pains, becoming intolerable at night; redness and swelling of the soft parts covering the bones; sticking, cramp-like pains in the muscles or periosteum; boring pains along the tibia, and aching in the bones.

Manganum aceticum has been highly extolled for periostitis.

Mezereum.—This is a highly serviceable medicine, and should be administered when there are nightly pains in the bones; periostitis of the tibia consequent upon ulcers of the leg, the parts being covered with a brown dry skin and surrounded by reddish-blue spots, with violent burning pains caused by the slightest pressure; swollen periosteum; the pain is so violent that it is impossible to place the foot on the ground; nightly aggravation of the pains, with cramp in the calves; violent tearing in the left ulna, or in the forearm and elbow; pain in the periosteum of the right olecranon, which is much aggravated by pressure; violent pain in the tibia after midnight, as if bruised, or as if the periosteum would be torn off, with chilliness passing rapidly through the whole body, and continual violent thirst; dull darting in the middle of the tibia or in the periosteum covering that bone.

Nit. acid has been used with success in periostitis and diseases of the bones, and especially when the inflammation is chronic; when there is tearing in the bones of the limbs, pain in the periosteum of the os calcis, drawing pain in the periosteum of all the bones, pain in all the limbs, apparently in the bones, mercurial pains.

Ruta should be employed when the pain resembles that caused by a bruise, aggravated by the slightest touch; it is also recommended for contusions and injuries of the bones and periosteum; bone-pains with burning and gnawing in the periosteum, which increase during rest, relieved by motion, and are worse in damp and cold weather.

Rhododendron.—Tearing pain in the right tibia; sharp pains in the left tibia, commencing in the knee, as if in the periosteum; boring, beating pain in the right tibia; tearing, as if in the periosteum, in the right arm, only when at rest. Almost all the sufferings reappear, or are aggravated, at the approach of rough weather.

Staphisagria and sulph. have also symptoms that may be present in periostitis, but for the precise indications of these, as well as the other medicines before mentioned, the student must refer to the repertory and symptomen codex.

By the administration of some of these medicines the disease may be arrested before the inflammatory process has reached the suppurative stage; at all events, many of the most distressing symptoms of the patient certainly will be alleviated, thus rendering him comparatively comfortable.

But when pus has formed and collected beneath the periosteum, the matter must be evacuated, and that as speedily as possible, or caries and necrosis may be the result of delay. If the operation of dividing the

periosteum be performed, as soon as the surgeon has satisfactory reason to believe that matter is present, simple ulceration only may have taken place, and as soon as the pressure occasioned by the pus is removed, the reproductive process will in all probability complete the cure in a short time. But although this practice is eminently beneficial in acute abscess of the bone, it must never be employed unless the signs of suppuration are sufficiently obvious to render it certain that pus is accumulating rapidly and in quantity between bone and periosteum. Cod-liver oil (*ol. jec. ase.*) has been employed by many practitioners with excellent results, when there exists a scrofulous taint.

Inflammation of Bone—Osteitis.—In the early stages of inflammation of bone, it is difficult to diagnose whether the abnormal action is affecting the periosteum, the bone, or the medulla; after a time, however, the uniformity of the swelling will indicate that the bone-substance is diseased, thus differing from the enlargement which has just been described under the head of the periostitis. Dr. Markoe* classifies the different varieties of the inflammatory process as affecting the osseous system, first, as those attended with organization of exuded products; second, those in which the exudation ends in suppuration; third, ulceration or caries; and fourth, necrosis. It has been maintained by some authors that the true bone-cells are never primarily affected, the first accession of the disease being in the marrow. There are not, however, sufficient grounds for this belief, for although the bones, especially in their compact structure, are not very largely supplied with bloodvessels, yet there is certainly sufficient blood to carry on nutrition, and in some the nutrient arteries are of considerable size. From these facts there is no reason why inflammation should not attack the bones, although, perhaps, not as frequently as other structures of the body. The cancellated structure is of course more obnoxious to inflammation than the compact. Osteitis may be acute or chronic, and the disease may begin in the marrow and extend to the bone, or *vice versa*. The *acute* variety is not so frequently met with as the *chronic*, and, in the majority of instances, I think we find that osteitis partakes more of the subacute variety of the inflammatory process.

The symptoms of the disease resemble much those of periostitis; the pains are severe, sometimes excruciating, and are, in the majority of instances, worse at night. They are boring, throbbing, and burning. The patient will complain of the peculiar "deepseated" nature of his sufferings. Movement aggravates the pain, and atmospheric changes are peculiarly noted. In fair, bright weather the sufferings are less, but the patient can predict a change to dampness and rain, by a peculiar increase of suffering, before any evidences of an approaching storm are apparent. It will be readily understood that a short season of such severe pain may induce constitutional symptoms. Fever, especially at night, is present; exhaustion, loss of appetite, fretfulness, emaciation, and hectic often supervene, especially when the sufferings have been prolonged. Important structural changes also take place in the bones affected with inflammation. The Haversian canals enlarge, as we find the bloodvessels in other tissues; there is an increase in the density of the bone, and often also of the periosteum; thus having a close resemblance to the hardness and increased size of the soft parts in the earlier stages of inflammatory action. As the disease progresses the density gives place to a more softened structure, although the parts still are enlarged and laminated. The bony structure, in part,

* A Treatise on Diseases of the Bones, by Thomas D. Markoe, New York, 1872, p. 19.

may disappear, leaving pores throughout the surface, and the bone-cells are filled with a sero-sanguinolent fluid. Thus the enlargement which takes place in osteitis may be occasioned first by an increase of density, and second, by softening from metamorphosis of the structural elements of the bone.

Many constitutional causes give rise to inflammation of bone, as syphilis, scrofula, scurvy, rheumatism, gout, or mercurial poisoning, as well as those injuries which are known to produce the disease. Exposure to damp weather or to cold are very often exciting causes of the affection.

Resolution may occur in osteitis as well as in other tissues affected by inflammation; and when such result obtains, the bone generally remains enlarged, if not permanently, certainly for a considerable time.

Treatment.—The medicines which have been found most serviceable in this disease are asaf., bell., calc., calc. phosph., merc., mez., nit. acid, phosph. acid, staphis., sulph., kali hydriod., symphytum.

Belladonna.—Especially in the earlier stages, when the pains are throbbing and pulsating; when the parts are tense and hot; when there is shining redness over the diseased bones, and symptoms of congestion to the head.

Calc. carb.—When the patients are of a scrofulous habit, and troubled with acidity of stomach and sour taste in the mouth; when there is considerable swelling, which latter partakes of the nature of the dense variety already mentioned. It is more especially adapted to the chronic variety, and when there is considerable emaciation.

Calc. phosph.—This medicine is especially serviceable after fractures, when there appears to be an excess of inflammatory action, and the parts are not proceeding to ossification

Merc. sol. has a powerful influence over inflammation of the osseous system. The pains are very severe, resembling those of fracture There is profuse sweat, tearing and flying pains. It is strongly indicated if the periosteum becomes involved, likewise in soft swelling of the bone; also when there is great sensitiveness to air, and more than ordinary aggravation of the sufferings at night.

Mezereum.—This medicine is not so much used in bone disease as it should be. Daphne has a specific influence over the bones of the leg, and those which are but thinly covered with integument. It has nightly pains and swelling of the bones.

Phosph acid.—Sensation as though the bone were scraped with a knife, pains deep in the bones, great prostration, and profuse nightsweats.

Staphisagria.—When the pains are shooting or tearing and lancinating, when the bones of the face are affected with boring pains.

Hydriodate of potash is very useful in those cases of syphilitic osteitis where the bones are enlarged and hard, and when the patients have been mercurialized. Nit acid and aurum are also applicable to such cases.

Symphytum is said to be useful in osteitis occurring after fractures.

Suppuration and Sclerosis in Bone.—If the inflammatory process has not been arrested, the next step is the gradual softening of structure and the formation of pus. In speaking of abscess (page 58) the acute or circumscribed, and the diffuse variety as occurring in the soft parts, are mentioned. The formations of pus are similar in the osseous system; a true abscess often forms in bone, as well as purulent infiltration. According to Dr. Markoe, the abscess (properly so called, not including purulent formations of caries and necrosis), may occur in three situations: "1. In the cancellous structure. 2. In the medulla. 3. Between the periosteum and the bone."

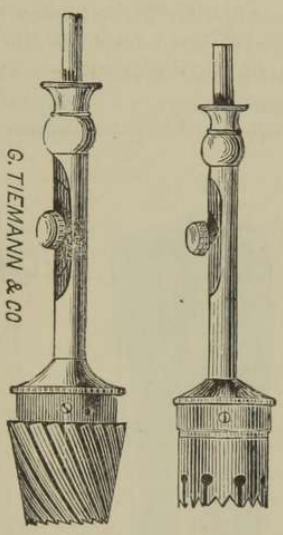
Wherever the abscess forms, the pains are those of inflammation united with the constitutional manifestations indicative of the formation of pus in other parts of the body. The pains are agonizing, worse at night, and sometimes of an intermittent character, the patient being at times comparatively free from suffering. The integument covering the diseased bone is

very sensitive to the touch, is œdematous, and pits upon pressure. The constitutional symptoms are severe, and hectic fever is not an uncommon occurrence.

In many instances it is difficult to diagnose true abscess in bone from other inflammations, but the deepseated character of the pain, the chronic nature of the suffering, the aggravation of the symptoms at night, and the previous history of the case, must be the guides in these cases.

In some instances, however, after the pus has been imperfectly evacuated, the inflammation continues, though not so acute, and the pus burrows here and there, forming sinuses, which are difficult to heal, and are often followed by disastrous consequences to the bony structure in the vicinity. This disease is termed the *chronic sinuous abscess;* or, when the patient is of better constitution, the inflammatory products within the bone become partially organized, and the bone expands, developing the disease known as *sclerosis in bone.*

Fig. 141.



Treatment.—The medicines which have been mentioned in the preceding section must be employed for the inflammation, and hepar, merc., silicea and sulphur be used according to symptoms. But when the pus is formed, the sooner it is evacuated the better. This may be done as follows: A semicircular flap is raised over the swelling, and the periosteum carefully raised with an instrument made for the purpose. A trephine (Fig. 141) is then applied, the pin pushed down, and the bone sawn through. If the matter is reached, it will generally exude; if not, the surgeon must try again. In some instances several openings may be necessary. If there is but a small collection of pus, an instrument, as shown in Fig. 142, devised by the late Dr. Charles A. Pope, of St. Louis, may be used. In other cases again there may be

Fig. 142.

such an amount of deposit, and that very hard and firm, that a trephine with an auger-handle, but with a small cutting crown, will be the most serviceable instrument.

Osteo-myelitis.—There is a peculiar inflammation of the cancellated or medullary structure of bone almost exclusively of traumatic origin, and occurring in crowded hospitals, or in ill-ventilated apartments, which has received the name of "osteo-myelitis." It must not, however, be understood that the marrow and medullary canal are alone affected; the abnormal action also extends to the compact structure and the periosteal surface of the bone. Dr. Lidell, who has given a good deal of attention to this peculiar variety of osteitis, especially in connection with military surgery, makes several divisions of the disease: first, carnification; second, suppuration; third, mortification of the medullary matter. The disease also may be acute or chronic, diffuse or circumscribed.

When a patient is about to be attacked with the disease, a chill is gener-

ally the precursor, which is followed by fever and most severe and agonizing pains, much aggravated at night, especially by the warmth of the bed. The pain is very peculiar; the patient knows that it is in the bone; it is deepseated, and so violent that the sensation is that of the bones being broken off. Together with these symptoms, œdema of the parts, with sensitiveness, ensue; the swelling at first is *circumscribed*, which latter fact is of especial import in the diagnosis of the affection. The fever, after a few days, assumes a typhoid type; the system appears to be profoundly affected; delirium supervenes, of a low muttering character; there is great prostration and profuse nightsweats. While the constitution is showing such marked signs of disturbance, the wound also changes its appearance, the discharges become unhealthy, are either ichorous, or sanious, or flocculent. In some cases there may be a great diminution in the quantity, granulations which had been healthy become bluish or fungoid, the process of granulation is arrested, and there appears to be a tendency to sloughing and gangrene. Suppuration then follows; the whole bone-tissue becomes involved. The accompanying cuts will show the extent to which the bones

FIG. 143. FIG. 144. FIG. 145.

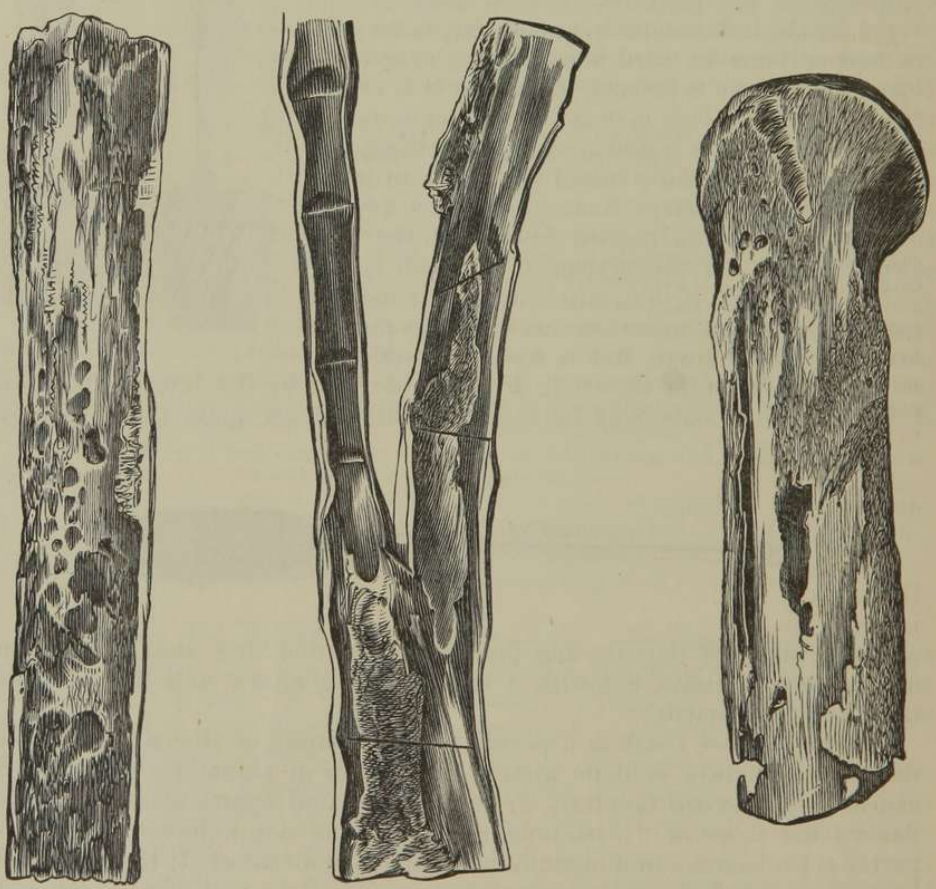


Fig. 143.—Osteo-myelitis of the femur.—From a drawing in the Museum of St. George's Hospital.
Fig. 144.—Inflammation of the femoral vein from the same case.
Fig. 145.—Upper portion of humerus amputated for necrosis after osteo-myelitis. The necrosis does not extend into the tuberosities, neck, or head of the bone, which, however, are expanded by inflammation (osteo-porosis).—After Longmore, in Med.-Chir. Trans., vol. xlviii.—(Holmes.)

and even the bloodvessels become affected. Very often symptoms of severe septicæmia are present. During the latter process the marrow becomes

softened, and oozes from the bone, mixed with a thin ill-looking pus, and accompanied with most severe constitutional symptoms.

Idiopathic Symmetrical Osteo-myelitis.—There are certain cases of osteo-myelitis which are very acute in their character, and present no traumatism or other local assignable cause in their history. The epiphyses or the extremities of the bones are likely to be affected, and from thence the entire shaft may become diseased. The disease being "symmetrical," and affecting several joints at once with œdema, sensitiveness, and redness, and being accompanied by fever, is likely to be mistaken for acute rheumatism. A case of this variety of osteo-myelitis is recorded by Dr. Charles Carey.*

Treatment.—In the outset of the treatment of this malady arnica is a medicine which, internally administered, will often produce excellent results. The medicines are chiefly phosphoric acid, staphis., lachesis, arsen., merc. corr. sub., kali iod., aurum, nit. acid.

Phosph. acid.—When there are profuse and debilitating nightsweats, with pains of a neuralgic character, shooting, darting, or tearing. When the patient is of a scrofulous habit, and when the bones of the legs and feet are especially involved.

Lachesis.—When the swelling is blue or bluish-black, and there is a tendency to gangrene and mortification (third variety of the classification of Lidell).

Arsenicum.—When the symptoms are of a very low grade; when there is much restlessness, thirst, and delirium; when symptoms of pyæmia or ichorrhæmia present, and the pus is sanious and offensive, with blueness of surface, coldness of skin, and thirst.

Nit. acid may be employed in cases in which mercury has been previously administered in large doses, and when the osseous system appears to suffer much from a thorough impregnation of this drug; also when there is present a syphilitic dyscrasia.

Merc. corr. sub.—The bichloride of mercury acts better in this form of bone disease than any other mercurial with which I am acquainted. It is especially indicated for bone-pains with swelling and tenseness of the parts, when the disease runs a very rapid course, and when there exists no previous mercurial taint in the system. Other medicines are calc., sulph., silic., graph., iod., lycop., kali bich., phosph., baryta carb., and mang. With regard to local treatment, which is sometimes necessary to allay very severe sufferings, cold applications are very efficacious. When pus has formed, it must be evacuated by the trephine, and free incisions into the surrounding structures are often necessary to relieve tension and evacuate fluids. As a last resort, amputation may have to be performed, and even this affords no guarantee that the existing state of the system will not predispose to an outbreak of the disorder in the stump.

Caries—Ulceration of Bone.—The term caries is used to denote a peculiar ulceration of bone in which reparation is rarely effected by nature, and is with difficulty obtained by the most skilfully applied artificial means; or, according to Mr. Miller,† a breach of continuity of bone of altogether a peculiar kind; of itself very difficult to cure, yet not in any degree partaking of truly malignant action.

On this subject Dr. Markoe writes: "Without attempting, therefore, to define caries, I will content myself with describing it as a disease of the cancellous structure of bone, characterized by a chronic or subacute inflammation terminating in suppuration, which is partly infiltrated and partly collected into abscesses, the cavities of which abscesses, after they have discharged their contents, have a tendency to ulceration, whereby sometimes extensive destruction of bone-tissue results."‡

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* Medical Record, vol. xiii, p. 109.

† Principles of Surgery, p. 435

‡ A Treatise on Diseases of the Bones, by Thomas M. Markoe, M.D., New York, 1872, p. 94.

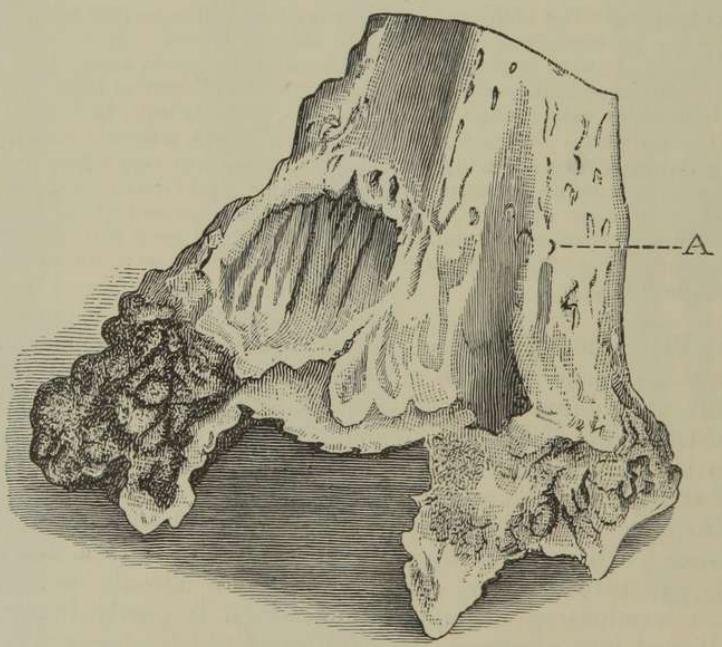
Every portion of the osseous system is liable to be attacked with caries; but it has been observed that those bones that partake most of the cancellated structure are more frequently the seat of the disease than those of a more firm and compact conformation; thus the vertebræ, the bones of the carpus and tarsus, the sternum, and the extremities of the long bones, are the most frequent seat of this disease. For similar reason the ossific structure in young persons is more subject to it than those of advanced years.

Surgeons of the olden time confounded caries with necrosis, the latter being termed by them dry caries; others have considered it the same as necrosis. These suppositions appear the more strange when we consider that *caries* was described by Galen as being somewhat analogous to ulceration of the soft parts.*

It has been previously remarked that ossific matter, when attacked by inflammation, becomes acutely sensitive, hence, in the commencement of this disease, in which the inflammatory process is always present, the patient often suffers considerable pain; so great in the generality of instances as to prevent the enjoyment of repose for weeks and months together. The affected part is considerably swollen, but the enlargement is seldom so general or so great as is present in the diseased condition of the ligaments and other apparatus of the joints, although affections of the bursæ, ligaments, or synovial membrane may in time extend to the adjacent bones, and breach of continuity be the consequence.

In caries, the affected portion appears neither to possess vital action enough to enable it to repair the solution of continuity, nor is the diseased

FIG. 146.



Caries of the lower extremity of Humerus after resection. Author's collection. A, showing commencement of ulceration.

mass sufficiently deprived of vitality to be thrown off by the surrounding tissues. When the affected parts have remained a considerable time in this inactive state, the surrounding vessels become somewhat excited, and the

* See Cooper's Surgical Dictionary, vol. i, p. 820.

surface of the bone in the vicinity is studded with small points of new osseous formation; these new deposits, however, are not limited to the affected bone, but may be traced to those with which it is articulated. The soft parts surrounding the diseased mass are commonly more or less thickened, and rendered exceedingly dense by effusion of lymph into the cellular tissue, which sometimes becomes of a cartilaginous hardness. As the ulceration proceeds, a cavity forms in the bone, with soft spongy margins, with an unequal bottom, deep at one portion and completely shallow in another (*vide* Fig. 146); the substance of the bone may crumble easily, or the part may be covered with pale and unhealthy granulations; often a loose, fungous growth sprouts from the interstices formed on the surface of the diseased bone, bleeding readily at the slightest touch; from the decaying structure also a thin, fetid, and corrosive ichor is discharged, in many instances through a sinus which has been formed in the soft parts; these symptoms, however, as well as the tendency in the accompanying ulcer or sinus to produce large fungous granulations, are more constantly met with in necrosis than caries, for the latter disease has been known to exist for a considerable length of time unattended with any outward sore, abscess, or sinus.

A *superficial* caries may be ascertained without much difficulty, and when the affected bone is deepseated it may be discovered by the use of the probe; for if the disease exist, the surgeon can often readily detect the inequalities of surface, and, owing to the spongy character of the diseased part, the instrument can readily be made to penetrate the substance of the bone; in some instances, however, when there exists the unhealthy granulations already mentioned, a moderate degree of force is required; the latter fact, if remembered, may prevent in some instances an incorrect diagnosis.

There are some bones which may be diseased, and which, from their situation, do not admit of the use of a probe; in such cases the diagnosis may be more difficult; however, if a fistula, from which a fetid, corrosive, and dark-colored matter is discharged, be found leading directly from the surface of a bone, and if the surrounding part be at the same time turgid and indurated, there is every reason to suppose the existence of caries.

"If a person," writes Boyer,* "affected with certain constitutional disease, feel deepseated or acute pains in any of his bones, and if the pained part swell and become the seat of an abscess, from which a purulent matter of a bad quality flows, there is reason to believe that the bone affected with pain is carious. Inert abscesses are attended with nearly the same symptoms, with this difference, that they are not preceded by pain. Caries occasioned by syphilis affects most commonly the tibia, os frontis, ossa nasi, ossa palati, and sternum. Whenever, therefore, any of these bones become carious, whilst the person labors under syphilis, there is just ground for concluding that the caries is a symptom of the venereal affection."

Caries may be divided into three varieties, *simple, scrofulous*, and *tubercular*. The simple form is such as has been described, the scrofulous variety is dependent on a constitution affected with scrofula, and in tubercular, the disease is accompanied by deposit of tubercle in the loose texture of the bone.

The causes of caries are various. It may arise from disease of the soft parts—ulcers, etc.—having extended to the bone, or constitutional taint may be the remote, and recent injury the proximate cause, but probably

* See The Lectures of Boyer upon Diseases of the Bones, arranged by Richerand, translated by Farrell, and edited by Joseph Hartshorne, M.D., p. 167.

the disease most frequently arises from *scrofula*, *syphilis*, or *abuse of mercury*.

Scrofula in Bone—Scrofulous Ulceration of Bones.—As will be imagined, this condition is characterized by the deposition of tubercular matter, or of a very low grade of inflammatory action. In the earlier stages the bone becomes soft, and an oily material is found deposited in its substance. At a later period a soft worm-eaten and foully-smelling ulceration is discovered. After a period the entire periosteum is destroyed or else thickened. The cancelli and the lacunæ are filled with an exudation. Dr. Black* finds that there is in tuberculous bone always fatty degeneration; that the lime salts are diminished and the soluble salts are increased. The peculiar appearance of a whitish, œdematous, indolent swelling, characteristic of scrofula, is found around the ulcer. There is not much pain nor much swelling. When the bone is examined, *pits* or *round holes*, with sharp edges, and filled with a cheesy deposit, are found. These peculiar pits are regarded as characteristic.

Syphilis in Bone.—When the bones are affected with the tertiary forms of syphilis, the appearances presented at first are those of *a node*, which has already been described. If the disease is not arrested in this stage, the ulceration attacks the bones in one of the two varieties of syphilic ulceration, viz., the *annular ulcer* or the *tubercular ulcer*. In the former there is a round depression, generally found in the cranium, with a depression around the margins like a trench, which marks the outset of the ulcerating process, while in the latter form a syphilitic tubercle first appears, which finally ulcerates, and penetrates deeply into the bone; indeed, in some instances, the entire thickness of the bone may be eaten through.

Treatment.—Much vigilance should be exercised with a view to prevent the occurrence of this morbid condition; therefore, if there be ulcers and abscesses in the soft parts which appear to have a tendency to involve the bones, they must be carefully watched and judiciously treated.† If simple suppuration occur as a consequence of diseased periosteum, the medicines before mentioned for periostitis should be administered in accordance with the presenting symptoms.

By careful watching, the formation of matter may be averted; but to accomplish such desirable result, the treatment must be commenced early. When there is merely an *inflammation of the bone*, with slight swelling, redness of the integument, and extreme sensibility to touch, bryonia and pulsatilla are recommended; the latter being more adapted to the disease when it occurs in persons of a phlegmatic temperament, with mild disposition, apathy, etc.; the former deserving preference if the patient be of a dry, meagre habit, with bilious or nervous temperament. Mercurius is an important medicine for *osteitis* as well as periostitis, and by its administration the inflammatory action occurring in the bone may be checked before other untoward symptoms present themselves. The indications for the administration of this medicine, as well as others, have been mentioned in the previous section. If inflammation of the bone is chronic, the following medicines may be resorted to, according to the correspondence of symptoms in each individual case: asaf., calc., phosph., phosph. ac., silic., staphis., and sulph. When the affection has arisen from the abuse of mercury, and the disease is accompanied with mercurial or mercurio-syphilitic symptoms, aurum, hepar, or nitric acid may be used. If from a blow or bruise, osteitis threaten, arn., calen., ruta, or symphytum may be employed; but when

* Pathology of Tuberculous Bone, ed. 1859, p. 32.

† See Abscess, p. 56. Ulcers, p. 71.

there is considerable erysipelatous redness around the wounded part, bella. may be used, and in some cases in alternation with arnica.

My friend Dr. Holcomb says of asafœtida in this connection: "I have twice verified the value of this remedy in scrofulous caries of the bones. I used the 12th dilution. It is singular that a remedy whose principal applications are for the most fugitive and sympathetic disturbances of the nervous system, should extend its curative power to the most deeply seated and chronic organic lesions. My opinion is that we know almost nothing about this 'devil's dung,' as the Persians call it, and that it is well worth a thorough study."

Other medicines that have been serviceable in the treatment of caries are baryta, carb. veg., dulc., fluor. ac., lyc., mang., mez., staphis.

If a patient affected with caries apply for relief, the first duty of the physician must be, if possible, to remove the causes which have either proximately, remotely, or both, given rise to the disease.

The paucity of symptoms recorded in our Materia Medica belonging to caries, make it difficult to select appropriate medicines for each case. The medicines mentioned, however, have proved beneficial, *ex usu morbis*, in the treatment of this disease. The following cases were cured while subjected to the use of the medicines which are appended:*

Caries of the right forearm and right leg, with much swelling, ichorous discharge, and slow fever: china, asaf., phosph., sulph., silic., acid. nit., carb. an.

Caries of the forearm after a fall: arn.[24], silic.[30], calc.[30], sulph.[30].

Caries of the elbow-joints with fistulous ulcers of the bone: calc., silic., lycop., and sulph.

Caries of the thigh in a scrofulous boy: sep.[30], and nit. ac.

Caries of the lower jaw, with fistula of the parotid gland: silic.

Caries of the bones of the face: calc. and silic.

Caries of the phalanges of the third middle finger: silic.[30].

Caries of the foot, with hectic fever: arn., lyc., silic.

Caries of the radius, with bluish-red swelling of the forearm, with hectic fever: puls., mez., sabin., silic., calc., lyc.

Caries, syphilitic, of the palate and nasal bones: aur.

Caries, syphilitic, of the alveolar processes, with ozæna: aur. mur.

Caries of the tibia, with swelling of the whole foot. The slightest touch cannot be borne; fetid ichorous discharge: silic., asaf.[18], calc. carb.[30], mez.[18], sulph.[30], acid. nit.

Caries, recent, of the tibia: silic.[30].

Caries tibiæ, in the inner side of the left leg; a very painful bluish ulcer, with hard edge and a fetid, dark-colored pus exuding; at the inner side of the left ankle a cold tumor: asaf.[18].

Caries of the tibia and left forearm, with many fistulous ulcers; sinking of the vital powers and debilitating diarrhœa: sulph., asaf., acid. nit., and acid. phosph.

Asaf.—Cured a caries of the leg with exfoliation of a piece of dead bone.

Aurum.—Caries of the palate and nasal bones from abuse of mercury.

Nit. ac., with the assistance of silic., asaf., calc., mez., and sulph., employed in caries of the tibia, with great pain in the bone, and a bad-colored, fetid ichor discharged from the ulcers; in a boy eight years of age effected a cure

Angustura is said to have cured caries when given daily in doses of the 1st to 6th, the use of coffee being avoided.

Sepia.—Caries femoris, with fistulous openings on the outside of the thigh, dis-

* See A Guide to the Practice of Homœopathy, by Edward Hamilton, M.D., p. 44. London, 1844.

charging a watery ichor. A probe introduced into this, after a long progress towards the knee, touched a rough carious spot upon the bone. At the lower extremity of the radius there was an enlargement of bone, which was painful when touched. Sepia, and, after six weeks, acid. nit., effected a cure in a little short of two months.*

In caries ossium digitorum, silic has proved very serviceable.

Fluoric acid. is said to possess a powerful action upon the osseous system, and from recorded cases appears to be especially adapted to caries.†

Mr. Pollock has recently used *sulphuric acid* topically, with marked success, to hasten the separation of dying or diseased bone. In his essay upon the subject he has made some most important observations. He says:

"I am not aware that the application of sulphuric acid in the treatment of carious bone has been previously adopted in preference to the use of the gouge, actual cautery, or caustic potash. I find no special reference made to its effects, nor any allusion to its extreme applicability or efficacy in the treatment of caries, in any of the modern treatises on bone. In the number of cases which have come under my notice both in St. George's Hospital and in private practice, in no one instance has evil consequences been known to follow the application of sulphuric acid to diseased bone in any part of the body, nor has the treatment been found a painful one when the acid has been used in a diluted form."

He then directs that if there be a cavity it may be packed with lint, saturated with the dilute acid; or a syringe may be used charged with the solution. A very peculiar fact connected with the process is, that the dilute acid will not act on healthy bone, but limits its operation to the diseased structure.

Mr. Henry Noad, clinical clerk to Mr. Pollock, conducted the following experiments in view of the fact stated above.

Ten grains each of (1) diseased, (2) dead, (3 and 4) healthy bone, both of middle age and of old age, were subjected for three days to the action of a mixture of sulphuric acid and water, one part in four, at the temperature of 100°. The following were the results: 1. From the dead bone, 2 grains of phosphate of lime and 3.3 of carbonate of lime were dissolved in the acid. 2. From the diseased bone, 2 grains of phosphate of lime and 1.3 of carbonate of lime were dissolved. 3 and 4. In both specimens of healthy bone *no action took place.*

March 11.—Mr. B., of New York, was brought to me by Dr. T. F. Allen, with a disease of the lower jaw. Several of the teeth became loose and had been taken out. The probe revealed denuded bone for a considerable distance on the right ramus and symphysis. There was no syphilitic taint in the system, but the patient had suffered some years since from severe bilious fever, and had taken (as he supposed) considerable quantities of mercury. For this the prescription was hecla lava, three times daily. From the exhibition of this he steadily improved for a time. In a few days, however, a swelling appeared under the right eye, which extended around the lower rim of the orbit, with soreness and apparent enlargement of the malar and superior maxillary bones. The inflammatory process was evidently proceeding to suppuration. About the same time, and without any assignable cause, a discolored spot appeared on the centre and upper portion of the chest, directly upon the manubrium of the sternum. An abscess formed, and after the evacuation of the pus there remained an opening an eighth of an inch in diameter, through which the bone could be distinctly seen and felt. He was directed to apply dossils of lint, saturated

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* See Jeanes's Practice of Medicine.

† See Laurie's Homœopathic Practice.

with a solution of equal parts of sulphuric acid and water, to the sternum, and to take silicea[30], one powder every night.

March 16.—Many portions of the diseased bones have come away, leaving a large hole in the chest, which is apparently surrounded and covered with a whitish, semi-transparent substance, resembling cartilage. The tumor under the eye presents fluctuation; the jaw is better. The acid was now discontinued, and the parts dressed with a solution of carbolated calendula.

March 22.—I made an incision in the suborbital tumor, continued silicea[200], and used the calendula locally.

April 23.—From the last date, a rapid improvement took place until this time; the disease appears to centre itself with renewed violence in the sternum. The probe revealed an extensive denudation of the manubrium. I again applied the acid as before, directing its use daily. Being very anxious to recover, the patient, instead of following the directions, used the pure acid very freely, and with the following symptoms: After the burning and tingling caused by the immediate application had ceased, a sensation of weakness pervaded the whole body, with constriction and numbness in the back part of the head, and great heaviness and weakness of the right arm, to such a degree, that, for a time, it appeared partially paralyzed. When I saw him, the hole was very deep and three-fourths of an inch in diameter. I directed him to discontinue the acid; gave him the acid phosphate of lime (Hosford's) and kali hydriodicum, internally.

May 4.—A day or so after his last visit, he brought to me a piece of bone, three-fourths of an inch in length, and half an inch in breadth, which he had picked out of the cavity, where it was lying completely loosened. The Hosford lime was continued.

July 16.—I heard no more from the patient until, being anxious to know the results of the treatment, I sent for him. He came to-day and reported a perfect cure. The swelling of the face and the scar had disappeared. The jaws were in order, but the teeth a little loose. The large cavity in the sternum had healed entirely, and the patient was feeling (as he stated) in perfect health.

Necrosis—Death of Bone.—The term necrosis, which literally means only destruction, is by surgeons applied to bone deprived of its vitality. It was first used in this particular sense by M. Louis, who restricted this appellation, however, to cases in which the whole thickness of a bone was destroyed. The ancients termed the disease "*dry* caries."

Between caries and necrosis, says Weedmann, there is all that difference which exists between ulcers and gangrene, or sphacelus of the soft parts. In caries, the nutrition of the bone is impaired, and an irregular action disunites the elements of bony structure, which consequently sustains a loss of substance. In necrosis, on the contrary, the vitality and nutritive function cease altogether in certain portions of the bone, the separation of which then becomes indispensable.

Bones are not as extensively supplied with bloodvessels as other textures of the body, and their natural powers are inferior to those of the softer parts; and this circumstance may serve to explain the frequent occurrence of the disease under consideration.

Necrosis may appear at various periods of life, but is most commonly met with in young subjects, in whom the inflammatory action is allowed to make some progress before it is noticed or attended to. It may affect the external or internal structure of a bone, or nearly its whole thickness. An entire bone seldom dies in consequence of diseased action; and it is in rare instances that the whole thickness of any portion of it is found necrosed, although a larger proportion may be involved.

Mr. Miller divides the process of necrosis into several stages: 1st. The bone or portion of bone inflames. 2d. The bone dies. 3d. The dead portion is separated from the living. 4th. Separation of the dead portion is complete. 5th. The dead portion is extruded.

"When a portion of bone is to die," writes Holmes,* in an admirable article, "the first phenomenon is the cessation of circulation in it. This leaves it hard, white, and sonorous when struck. It does not bleed when exposed or cut into, and is insensible. Occasionally, when the dead bone is exposed to the air, and acted on by the presence of putrid pus, its color becomes nearly or quite black; large surfaces of hard, black, necrosed bone are sometimes left exposed by the sloughing of the skin over the tibia. The dead bone at first retains its connection to the bone around, as well as to the periosteum or whatever part of the nutrient membrane may belong to it; but the presence of a dead part is never long tolerated by the living tissues, and accordingly the processes which are to eliminate it soon become perceptible in both these structures. The periosteum or medullary membrane, as the case may be, separates from the dead bone and becomes inflamed, a quantity of ossific deposit (more or less, according to circumstances) is poured out between it and the dead bone, and this deposit soon becomes converted into new bone, forming a sheath over the dead portion, by which the latter is inclosed or *invaginated*, as the technical term is. The dead part is now called a *sequestrum*, a name only properly applied to it when loose and invaginated, though often incorrectly used of any piece of dead bone. While this sheath is being formed from the membrane coating the dead bone, changes are going on in the living bone to which it was attached. When the latter has been previously diseased, *i. e.*, when the necrosis has been of inflammatory origin, the inflammatory deposit which surrounds the sequestrum softens, pus is formed, and a groove of ulceration is produced at the expense of the circle of inflamed bone which forms the margin of the sequestrum. If the surrounding bone has been previously healthy the sequestrum acts as an irritant upon it, setting up first inflammation and thickening to a variable distance, and then ulceration. Thus a groove is traced round the sequestrum, and the formation of the groove is accompanied by suppuration, 'the pus containing much earthy matter from the disintegrated tissue, B. B. Cooper stating 2½ per cent. of phosphate of lime.'"

When the disease has not far advanced, there is a copious discharge of purulent matter,† and the external openings, through which the pus finds exit, are found to lead to *cloacæ* or apertures in the new bone (the *involucrum*), which encases the old; through these, the dead portions can be discovered by the probe. *Sequestra* are also sometimes cast off, the hue of which resembles that of ossific matter which has been for some time buried in the earth. When a sequestrum is discharged, the disease may be considered at its height; for Nature is throwing off the dead structure, which can no longer be of any service to the economy. Often at this period, by introducing a probe, several pieces of detached bone may be readily felt. These symptoms of necrosis, thus evident in affections of those bones that are covered with thick muscular fibre, are still more so in cases of flat superficial bones and those of the skull; in diseases of the latter, the skin at first becomes thick, hard, and reddish; but soon ulcerates, and discharges matter of the character before mentioned.

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* System of Surgery, vol iii, p. 760.

† "Formation of matter is occasionally the cause of necrosis. I have seen several instances in which it occurred from neglected erysipelas of the leg." Liston's Elements, p. 76.

The prognosis varies according to the situation of the bone affected, and the circumstances with which the disease may be complicated. If necrosis occurs, and is confined to a small surface of a bone, it is not very difficult to cure; but when large portions of the osseous system are involved, and if the introduction of instruments be required to separate the exfoliated portions (sequestra), the prognosis is extremely unfavorable.

In cases of necrosis, in which the dead bone is entirely inclosed in that newly formed, the prognosis may vary, according to the state of the surrounding soft parts, the age and strength of the patient, and the form of the new osseous substance. There is in some cases a peculiar variety of intraosseous necrosis without suppuration.

W. M. Baker (*British Medical Journal*, March 3d, 1877*) mentions a case of intraosseous necrosis of the femur, without suppuration, for which amputation at the hip-joint was performed. The case presented all the characteristics of malignant tumor of the femur, even to undergoing spontaneous fracture, and the amputation was resorted to on that diagnosis. The patient recovered. On dissecting the amputated limb it was found that nearly the whole of the femur had perished, and in some parts the dead bone was beginning to separate, but not a drop of pus was anywhere to be detected. New bone had been produced, both by the periosteum and by the medullary membrane, and the dead bone was so locked in by it as to render futile an attempt to remove the disease by any other method than by amputation. This form of necrosis is held to be the last of a series of changes, of which the earlier consist of chronic osteitis with hypertrophy and sclerosis.

The tumefaction of the limb may be excessive; the fistulæ numerous; the suppuration abundant; and the patient reduced by colliquative diarrhœa and hectic; under such circumstances the danger is much greater than if the suppuration were trifling, the patient young and healthy. A favorable termination of the disease may be anticipated, if, together with these latter conditions, the newly-formed bone is perforated by nature, that the dead portion may be readily withdrawn.

The causes of necrosis may be divided into internal and external: among the latter may be classed—contusion, excessive pressure, imprudent application of caustic,† etc.; and of the former, syphilis, scrofula, or mercury, or the inhalation of the vapor from phosphorus. In persons thus constitutionally affected, a blow, or other external accident, may prove an exciting cause of the disease.

Concerning the death of bone, and the reproduction of new ossific matter, Dr. Gibson writes:‡ "So far as opportunities have been afforded me of ascertaining this point, I have no hesitation to express the belief, that the periosteum is the chief agent in both processes. If from any cause the periosteum inflame, and matter is poured out between it and the bone, so as to separate one from the other, all vascular intercourse must cease—or, at least, the bone then depends exclusively for its support upon the internal periosteum and marrow; but these being inadequate to furnish the requisite supply, a part or the whole of the bone will necessarily perish."

Violent inflammatory fever attends the excited action of the bone and periosteum, which precedes necrosis. But, after the matter has accumulated and been discharged, most of the painful symptoms subside.

Frequently fresh collections of pus are generated, as each portion of the

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* American Journal of Medical Sciences, July, 1877, p. 267.

† As happened in the case of a woman, who had caustic potash applied to an exostosis on the internal side of the tibia.

‡ Institutes and Practice of Surgery, vol. ii, p. 55.

dead bone approaches the surface. When the formation of new ossific material has extended to a neighboring joint, its motion may be very much impeded, and if the limb is kept at perfect rest anchylosis may occur.

Treatment.—In the treatment of this disease,* as in caries, the great object is prevention; to be accomplished by the successful treatment of osteitis, periostitis, caries, and of the constitutional affection (if any be present), upon which death of the bone may follow as a consequence.

One of the principal indications is the evacuation of the purulent formation, which frequently bathes the inflamed bone and detaches it from the periosteum.

Separation of the sequestrum may be hastened by the administration of medicines, which, acting beneficially upon the surrounding osseous structure, tend to increase the action by which exfoliations are cast off. The affected part must be allowed to remain at rest, and all stimulating applications avoided. In the first stage of the disease, if there should be severe or extensive inflammation of the soft parts, acon., bell., bry., hepar, merc., or sulph., are indicated.

Asaf., calc., phos., silic., sulph., and, according to some authorities, symphytum, when properly prescribed, materially lessen the tendency of parts to renewed inflammatory action, and also exert a specific action upon the osseous system; either of these may be administered, according to the presenting symptoms, to hasten the separation of the dead from the living bone. After this is accomplished, it is the duty of the surgeon to interfere, and, by the requisite incisions and proper mode of extraction, liberate the necrosed portions of bone—which, if allowed to remain, acting as extraneous matter, irritate the parts and give rise to increased inflammation and profuse suppuration. But the surgeon must ascertain that the sequestrum is entirely detached before attempting its removal. On this point Mr. Miller writes: "A common error, in practical surgery, is interference with the sequestrum before it has become loose. To lay hold of it, and use violence, after exposure by incision, is certainly to induce a combination of evils. The evulsive effort often fails, and consequently the patient has been put to a grave amount of pain, unnecessarily and fruitlessly. By the violence, inflammatory reaccession is certainly induced in and around the part originally implicated. In other words, a fresh ostitis—probably both acute and extensive—is induced, and aggravation of the necrosis most likely to follow. Also the loss of blood which attends on such attempts, whether successful or not, is invariably considerable; coming from a wound of soft parts, which are not only unusually vascular, but besides unfavorable to natural hæmostatics. And the patient's state of system is generally such, in the advanced stage of necrosis, as to be altogether intolerant of a repetition of such hæmorrhages. Therefore, on this ground alone, it is plain that the operation for removal of a sequestrum should never be undertaken, unless the surgeon be tolerably certain that his efforts will then prove successful."

In probing, the simultaneous use of two instruments is sometimes advantageous. One probe resting on the end of the sequestrum, a second is introduced through another cloaca; and by pressing with each other alternately, looseness of the sequestrum may be made plain in circumstances otherwise extremely doubtful.

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* For an interesting paper on this subject, see Quarterly Homœopathic Journal, vol. i, p. 86; an article entitled "Case of Necrosis of the Posterior Portion of the Superior Maxillary Bone, and Gangrene of the Gums and Cheek," by J. Lloyd Martin, M.D.

Treatment.—If the disease arise from syphilis, or scrofula, or if from scorbutic symptoms complications arise, the medicines must be selected with the view of meeting, if possible, both the constitutional vice and the local affection; although in many cases, by removing the former, the latter will also be remedied. If the disease originate from injury, the application of arnica externally, and the administration of a few globules of the same medicine, greatly relieves pain.

Asaf., in alternation with phosp. acid, has cured necrosis; and these two medicines, with nit. acid, after an improved secretion of pus had been induced by sulph., cured the disease, which was situated in the shaft of the tibia.

Calc. carb., effected a great improvement in the necrosis of the tarsal bones, in the case of a boy. Shortly after the administration of the medicine, there was a separation and painless discharge of a large spiculum of bone.

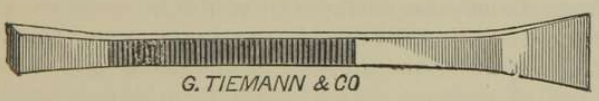
Nit. ac., preceded by a dose of sepia, proved very efficacious in an osseous swelling above the knee on the external part of the thigh, from which portions of dead bone were discharged.

Silic.—In a case of diseased phalanges, occurring in a female of sixty-two years of age, who had for a whole year covered the part affected with all kinds of ointments (from the part, a necrosed portion of bone had been extruded); relieved the pain in eight days; after the discharge of another sequestrum a cure followed.

A man, æt. 28, fell from a tree, and seriously injured his arm by striking it against a stump; for the space of four months all motion was prevented; after which, though mobility in a degree returned, the limb was somewhat painful, and at times quite rigid. Two years subsequent, several fistulous openings were formed, through which fragments of bone frequently were discharged. Arnica relieved the pain. Silic., calc., and sulph. effected a cure. A remaining stiffness of the joints was removed by colocynth.*

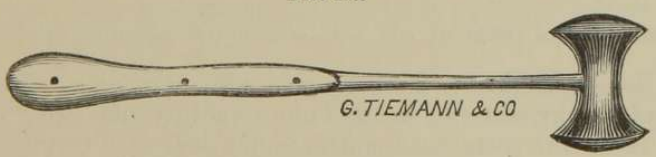
Operative Measures.—When it becomes necessary to remove a *sequestrum*, especially if it be firmly covered by the *involucrum*, a free incision should be made down to the bone with a strong scalpel, through the tissues, the point selected being out of the way of bloodvessels and nerves. It may be necessary now to enlarge the cloacæ by means of the chisel (Fig. 147)

Fig. 147.



and hammer (Fig. 148), and then to remove the sequestra with forceps, representations of which will be found in the Chapter upon "Resection of

Fig. 148.



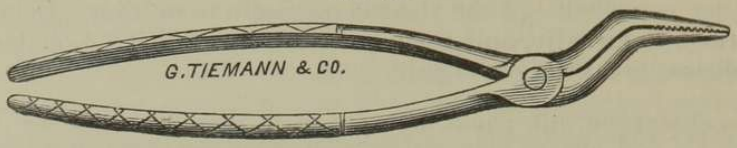
Bones and Joints." A forceps curved at the beak, in a manner seen in the cut (Fig. 149), is very useful in deep cavities.

Dr. Markoe also has a gouge for operations in necrosis (Fig. 150), which, he says, gives him "a very delicate corner to work with—delicacy is required, and a powerful instrument where heavy cutting is to be done."

* See Jeanes's Homœopathic Practice, pp. 55–57.

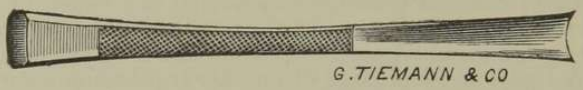
Forceps for biting or graining away bone are often serviceable, as seen in Fig. 151, and gouges, rasps, and elevators, which are contained in the ordinary resection cases.

Fig. 149.



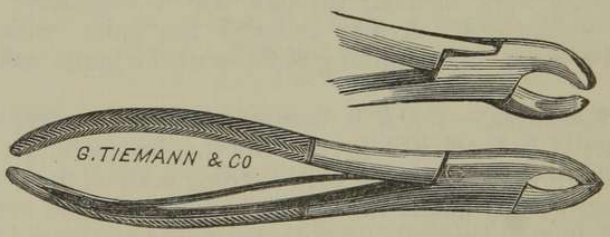
From a case of necrosis of the femur which he relates, M. Sedillot thinks he ought to draw the following conclusions in regard to the treatment of the periosteum during these operations:*

Fig. 150.



"1st. Superiority of operations saving the relations of the periosteum with the subjacent osseous layers.

Fig. 151.



"2d. Condemnation of the methods in which the periosteum is dissected and isolated from the osseous surfaces in contact.

"3d. Failure of the attempts at regeneration of bone from the periosteum detached from the splinters in the seat of fractures.

"4th. Absence of osseous reproduction from the fringe of periosteum preserved around amputated bones.

"5th. Absence of osseous regeneration in cases of pseudarthrosis treated by resection with preservation of a periostic sheath.

MOLLITIES OSSIUM, OR MALACOSTEON AND RACHITIS.

Both of these affections are occasioned by a deficiency of the requisite proportion of earthy material in the bony structure, and differ only in this, that in the latter the cretaceous matter is not deposited originally, while in the former, it is absorbed after having been deposited.

The difference between mollities ossium and rickets appears to be simply this: rickets is an affection of childhood, and bears a close resemblance to scrofula in the factors which produce it; it is curable, and patients are generally improved by constitutional treatment. Mollities is found

* See a paper prepared by Dr. Deslande, American Medical Times, November, 1861.

chiefly in adult life, and there is no scrofulous cachexia. In its obstinacy it bears a strong relationship to cancer, to which class of diseases it has been assigned by some nosologists.

Softening of the bones is met with at all ages and in different degrees. It often follows dentition, measles, whooping-cough, or other infantile diseases which induce general debility; and in females it appears to be produced by the weakening effects of leucorrhœa, miscarriages, etc. Mercury, administered in inordinate quantities, also produces the disease; but by far the greater portion of cases are said to depend on scrofulosis. As in all other chronic dyscrasiæ, the development of the affection is gradual; the first symptoms that are noticed being generally those of derangement of the digestive functions, alteration of secretion, etc.; by degrees, a material change in the solids of the body takes place, particularly in the osseous system, and the alterations of composition in the latter, give birth to many functional derangements.

The gastric symptoms that are noticed, as precursors of the disease, especially when children are affected, are: flatulence, acidity of the stomach, distension of the abdomen, sour eructations, and vomiting. The appetite is impaired, the patient usually desiring those articles of food which are particularly indigestible, the countenance is pale and cadaverous, the urine becomes turbid and cloudy, and if subjected to chemical analysis, is found to contain a superabundance of phosphate of lime, and probably benzoic and oxalic acids.

In children (rachitis) there is much emaciation; the skin and muscles become flaccid, the face is wrinkled, distorted, and resembles that of the aged. The growth of the child is arrested, walking is difficult, and in the more advanced stages altogether impracticable; the teeth become yellow, brown, or streaked transversely, are at length attacked by caries, and soon fall out.

During the progress of the disease the bones flatten and bend, are soft, cellular, and of a brown color, contain a dark fluid, and are very deficient in earthy matter. In many instances, this latter component of ossific structure is almost entirely removed—the bones consisting of an extremely thin external osseous shell, covered by thickened periosteum, and containing a pulpy substance resembling fatty matter. Although this disease has been said to attack individuals of all ages, by far the greater proportion of those affected are young children. Certain rare cases, however, have been recorded, in which all the bones of the adult were softened to a very great degree.

The vertebral column is particularly liable to be affected with rachitis, and the disease may be in certain instances confined to it alone. When the cervical vertebræ are attacked, the anterior part of the neck projects, the head falls backwards, and appears sunken between the shoulders. When the affection is general, the vertebral column becomes shorter, and is curved in various directions; the breast becomes deformed, not only in consequence of the curvature of the spine, but by the depression of the ribs and projection of the sternum; the bones of the pelvis fall inwards, and generally the pubis approaches the sacrum.*

According to the observations of Mr. Stanley, when the tibia and fibula become affected they acquire increased breadth in the direction of the curve, losing a proportional degree of thickness in the opposite direction.†

The proximate cause of softening of the bones is involved in much obscurity; various authors have endeavored to explain the origin of the

* See Boyer on the Bones, p. 190. † Med.-Chir. Trans., vol. vii, p. 402.

affection, in accordance with their own peculiar views. These conflicting suppositions, although possessed of much interest to the curious, are of no practical value, and therefore need no comment in this place.

Treatment.—In this disease great advantage is to be derived from the general treatment; the patient, if residing in a city, should, if possible, be removed to the country, where an elevated and dry situation should be chosen, nourishing diet, with a moderate quantity of wine, may be allowed, and the strictest cleanliness, with regularity of habits, should be observed. But as the poor, among whom the disease is most frequently observed, are not enabled to procure change of residence, the patient should be placed in a room that is well ventilated and clean, and in temperate weather be allowed to walk or sit in the sunlight. A straw or wheaten chaff mattress should be used, as it is dry and does not yield to the weight of the body; the clothing should be sufficient to prevent uncomfortableness from extremes of heat and cold, and should be changed to suit the variations of temperature. In the first stages of the disease, when gastric derangements predominate, ipecac., bry., nux and verat. are indicated, and their administration is frequently followed by beneficial results.

In addition to this, appropriate splints and bandages should be applied, which will, in certain cases, if used in the earlier stages of the disease, be productive of much good. If these mechanical means are not sufficient, the child should be thoroughly etherized, and forcible means employed to restore the parts to their natural position. If this also is not sufficient, the surgeon must resort to *subcutaneous osteotomy*, for which directions are given at the end of this chapter.

In children, when the abdomen is hard and distended, the gait unsteady and staggering, and the complexion pale, with occasional flushes of heat, *bell.* is particularly indicated.

Sulph., calc., hepar, and silic. are also powerful agents in the treatment of rachitis; by their exhibition the general health improves, and the disease has been known to be arrested in a short period of time. The attenuation of these medicines, however, is an important consideration; the practitioner will fail in his endeavors if recourse be had to the lower, inasmuch as the most beneficial results are more certainly attained by the administration of the thirtieth dilution and upwards.

Hartmann writes:* "I have employed with great success brucea antidysenterica, particularly when the feet were turned outwards and the children walked on the inner ankles."

In another work,† he further says: "According to my experience, it is in the preliminary stage that cod-liver oil will do the most good, and actually effect a cure, and remove the danger of a relapse, provided a proper dietetic and hygienic regimen is observed. The oil may be used internally, and at the same time rubbed on the abdomen. If no improvement should set in after using the oil a fortnight, or if the child should evince an insurmountable repugnance to taking the medicine, as a matter of course some other remedy will have to be used."

Acid. phosph., ruta, staphis., mez., lyco., calc., and asaf. may be indicated in the treatment of this disease.

According to Dr. Patzack, pinus sylvestris is often of great benefit in the treatment of rickets. It may be used both externally and internally.

In the *Medical Record*, I find an article headed "Artificial Production of Rickets and Osteomalacia," which is well worthy of mention here. It appears that Heitzman has lately been making some experiments with

* Chronic Diseases, vol. i, p. 63. † Diseases of Children, p. 401.

lactic acid, and that selecting a number of dogs and cats, he fed them every day with a small quantity of the drug, at the same time injecting it subcutaneously. After two weeks the epiphyses of the long bones, and the ribs at the attachment of the costal cartilages, began to enlarge, and at the same time, there was diarrhœa and emaciation. These symptoms increased, and finally there was bending of the bones in a marked degree. The microscope revealed *the same appearances as seen in the bones of persons suffering from rickets.* To make the experiment still more certain, some of the animals were allowed to recover, and were treated in the same manner a second time *with precisely the same results.* By persevering in the use of lactic acid for four months, every appearance of osteomalacia was presented, the medullary substance possessing a great degree of vascularity, and the compact structure being much thinned.

In those animals living almost exclusively on vegetable diet, there was a somewhat different result, death ensuing in from three to five months. The conclusions arrived at are: "That carnivorous animals, fed on lactic acid, first develop rickets and then osteomalacia. Herbivorous animals, on the other hand, develop osteomalacia without previously having rickets. Finally, osteomalacia and rickets seem to be due to the same general cause, viz., an excess of lactic acid in the system."

Subcutaneous Osteotomy.—Considerable attention is now being given to this method of relieving the deformity occasioned by rachitis. Some surgeons, as Langenbeck, perform the operation with a small auger and a straight saw. Mr. Bradley* uses a tenotome to divide the integument, and then a very fine saw to cut through the bone; the extremities are then placed in appropriate splints, and the wound covered with collodion. The cases which require the performance of this operation are those which have resisted the treatment by *splints* and *bandages;* as also those in which *forcible manipulation* has been tried while the patient is under anæsthetic influence. He says in conclusion:

"From time to time surgeons have advocated the use of instruments, in appearance worthy of an old torture-room, to break the crooked rickety bones when they resisted the pressure of the hands; but by most, these appliances are relegated to the limbo of forgotten rubbish, and, as it seems to me, wisely, since we have in subcutaneous osteotomy an operation at once so safe and so satisfactory. And one final word on this subject. When subcutaneous osteotomy is performed for the cure of rickety legs, we need be under no apprehension about the filling up of the **V**-shaped interval which is necessarily left when the bones are straightened, for, as a matter of experience, this gap always does fill up with fresh bone, and thus we secure not only a strong and straight leg, but a limb not shortened, as it would of course be if we were compelled to excise a wedge-shaped piece of bone instead of simply sawing across the concavity."

M. J. Bœckel,† who has operated nine times for rachitic deformities, always with success, gives his method of treatment as follows:

"*First,* he tries manual reduction; if this fail, he endeavors to break them by the ordinary methods of osteoclasty; if this also fail, he cuts down to the periosteum, peels it off the bone; the bone is divided by the chisel and hammer, the saw is never used. The wound dressed after Lister's method, reduction performed when it is cicatrized. The operations were performed on patients whose ages varied from fifteen months to eight years.

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* Lancet, July 21, 1877, p. 78.

† Journal de Med. et de Chir., March, 1876. Abstract Med. Science, vol. iii, No. vii.

Fragilitas Ossium is a term which ought to become obsolete, as it is merely a symptom of other diseases. This condition occurs chiefly in old people whose osseous system contains an undue quantity of earthy material. Boyer* states that a certain degree of fragilitas ossium necessarily occurs in old age, because the proportion of lime in the bones increases with age, while the organic matter decreases in the same ratio; but Mr. Wilson† observes that they are never found so friable and fragile as to crumble like calcined bone, but, on the contrary, contain a large quantity of oil. The latter fact is also noticed by Mr. Liston,‡ who gives as a definition of the disease that the bones become brittle on account of an undue proportion of earthy matter, are endowed with little vascularity, and are full of an oleaginous fluid.

In persons who have been long afflicted with cancerous diseases, the bones are said to become as brittle as if they had been calcined. In inveterate syphilis, deprivation of organic material in the osseous system has been noticed, and in those individuals who have been frequently afflicted with severe attacks of scurvy, the bones become so brittle that they are fractured from the slightest causes. Dr. Markoe, Mr. Stanley, and others have recorded remarkable cases of this kind.

The following very interesting case was communicated to me by Dr. Charles A. Church, of New York. I saw the patient with him in the Children's Hospital of the Five Points House of Industry in that city:

Willie S., aged twelve, while playing with the children, sustained a transverse fracture of the femur at the middle third, by being pushed, and, at the same time, struck upon the thigh by the knee of one of the other children. In December, 1869, he had a fracture of the tibia, caused by falling down. His family history I get from his mother, as follows: His only sister had her leg fractured at two different times; his oldest brother had one thigh fractured three times, the other twice; also one leg, one arm, one clavicle, and three ribs; his mother has had fractures of one leg, scapula, and three ribs; his mother's brother had fracture of one thigh three times, both legs, both arms, and one clavicle; and yet he served through the whole war in the Southern army without receiving an injury. His child has had fractures of both legs, one thigh, one arm, and one clavicle. The mother's sister had fractures of one arm and one clavicle; her father had fracture of one thigh three times and one clavicle; and all his brothers and sisters had more or less of broken bones,—how many I cannot ascertain. The patient has a younger brother that has not yet had a fracture, but he has an unenviable prospect before him. The general health of the whole family, aside from this tendency to fracture, has always been remarkably good.

Treatment.—This disease, particularly when occurring in the aged, is very difficult to cure. The patient should be allowed a generous diet, and prohibited from much muscular exertion; indeed, all circumstances that would be likely to produce sudden action of any particular combination of muscles should be studiously avoided.

The medicines that are best adapted to this affection are ruta, phosph. ac., nit. ac.; and from the effects that have been produced by symphytum, this medicinal agent should exercise much influence in this peculiar disorder. If the fragility of bone depend upon constitutional affections, syphilis, scrofula, etc., great advantage may be derived from the internal treatment of these diseases.

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* On Diseases of the Bones, p. 197.

† On the Skeleton and Diseases of the Bones, p. 258.

‡ Elements of Surgery, p. 80.

The internal and persistent use of the phosphate of lime in the second trituration—five grains twice a day—has produced most excellent results. Churchill's hypophosphites of lime and soda I always order taken with the food, and Dr. McCready's lacto-phosphates are also very highly spoken of.

Atrophy of Bone.—This is a peculiar affection, which, as a rule, is not marked with any characteristic symptoms. It may be caused by fatty degeneration, the result of the inflammatory process. The disease just mentioned, as brittleness of bone, is no doubt, especially in the aged, a variety of atrophy. The most frequent cause, however, of the affection is fracture occurring near or at the point of entrance of the nutrient vessels. A peculiar variety of this disease is the arrest of development of the epiphysis of the long bones. In such cases there generally has been some injury inflicted upon the epiphysial cartilages.

In the treatment of this disease calc. carb., symphytum, silicea, and sulph. are the very best medicines. They must be persevered in for a long time, and every attention paid to hygienic measures.

TUMORS IN BONE.

Tumors in bone are divided into the malignant and the non-malignant, and partake very much of the characters of tumors in other portions of the body. There is, however, great trouble often in making a correct diagnosis, and I think I may say that in some cases it is wholly impossible.

Innocent Tumors—Exostosis.—Any bone in the body is liable to enlargement, and in such cases we merely have an ordinary *hypertrophy of bone*, which can scarcely be classed as a tumor. A *circumscribed exostosis* is a bony tumor, and must be considered in this place.

The formation of exostosis is similar to that of new bones; a plasma is exuded and becomes organized; then it passes into transitional cartilage, and thence the osseous structure is gradually completed. At one time the term was made to include all growths,—fleshy, osseous, and cartilaginous,—but with propriety it is limited to growth of bone from bone.

Sir Astley Cooper writes: "Exostosis has two different seats; it is either *periosteal* or *medullary*. By the *periosteal* exostosis I mean a deposition seated between the external surface of the bone and the internal surface of the periosteum, adhering with firmness to both surfaces; and by the *medullary* is to be understood a formation of a similar kind, originating in the medullary membrane and cancellated structure of bone."

With regard to the nature of this disease, it is found to consist of two varieties. The first is the *eburnous*, or *dense ivory-like exostosis*, and the other is the common cancellated exostosis. The first is smooth, shining, and presents a polished appearance resembling ivory or pearl, is solid throughout, and appears almost destitute of those vessels by which an internal circulation is carried on. It usually appears on the flat bones, especially on the cranium, but the most frequent site of this form of the disease is the superciliary ridges.* The growth of this tumor is slow, and it is often unattended with pain.

Cancellated Exostosis appears to be mere enlargement of processes of the parent bone, the cancellated tissue extending itself and forming the interior of the new bony formation, while the exterior resembles a proportionate extension of the outer lamina.† This kind of exostosis seldom occurs but in the long bones of the extremities, and is most frequent in the

* See McClellan's Principles and Practice of Surgery, p. 343.

† Liston's Elements, p. 114.

femur at its lower part. The cancellated texture usually predominates, the external laminæ being thin and delicate.

Exostosis, according to Boyer,* rarely proceeds from an external cause, such as contusion. In most cases it is produced by an internal disease, and principally by lues venerea or scrofula.

The effects of exostosis may be divided into general and special; thus the swelling is accompanied by a sense of weight, pain is produced by the morbid action, and the affected part is necessarily deformed. Its particular or special effects arise from its situation; thus, if an exostosis forms in the orbit, the eye is expelled from its cavity, and the patient deprived of sight. If a tumor of this nature arise from the clavicle or sternum internally, death might result by compression of the principal bloodvessels.

The *prognosis* differs according to the nature of the primary disease from which the exostosis originates, and according to the particular change in the texture of the bone. The ivory exostosis, if so situated that it does not impede the action of any organ, is said to be the least dangerous of all.

Treatment.—The medicines that are best adapted to exostosis are arn., asaf., calc. c., dulc., led., lyc., merc., mez., phosph., rhus, sep., silic., sulph. The primary osteitis must be treated as before recommended, and if the disease still progress, any of the above-mentioned medicines may be selected in accordance with the presenting symptoms. For exostosis syphilitica, aur., bell., nit. ac., and phosph. are recommended.

Arnica, administered in a case of exostosis femoris, arising from injury of the thigh by a blow, produced immediate relief of the pain, and subsequent abatement of the swelling and suppuration.

Aurum.—Syphilitic exostosis and caries; nodes on the head, forearm, and tibia; extensive caries of the palate-bones; discharge of fetid ichor from the nose; ulceration of the throat; syphilitic rheumatism; excessive emaciation and debility; nightsweats. Ten grains of the first (cent. trit.) of aurum were triturated with two drachms of sugar. This was divided into eight powders, of which the patient took one twice every day. The medicine was thus taken for ten days, with evident improvement. Again, two grains of aurum of the same trituration as before were mixed with two drachms of sugar. This was divided into six powders, of which the patient was directed to take one every six days. In three weeks he was perfectly well, and remained so at the end of three years. Aurum also cured entirely, in fifteen days, a swelling of the frontal, nasal, and superior maxillary bones, complicated with syphilitic ozæna and rheumatism.

For exostosis after abuse of mercury, bella. has proved effectual. It also was useful in a case of exostosis on the forehead, with intolerable pain; the palate being covered with deep gray, painful ulcers, arising from the abuse of mercury.

Lycop. 30th, silex 24th, three doses, then mez. 24th, and finally ledum, cured exostosis in the foot of a scrofulous boy, eight years of age.

Merc. has proved very serviceable in exostosis of the tarsal bones.

I may here mention that I have given the hecla lava, as recommended by Dr. Holcomb, whose attention was directed to it by J. J. Garth Wilkinson,† in four cases of exostosis and one of caries, with the following results: Exostosis of the wrist, of two years' standing, in a gentleman who suffered most intensely. The medicine was taken in the sixth potency, and was continued for two months; great improvement, but not a cure, followed.

In a second case, a boy with circumscribed exostosis of the ulna, was also benefited, but I lost sight of the case. In a third case of cartilaginous tumor, approaching exostosis, no good result was obtained. In the fourth case the tibia was affected seriously, and the suffering was much relieved,

* See Boyer on the Bones, p. 177.

† Transactions of the American Institute of Homœopathy, 1870, p. 249.

and the tumor, though it did not diminish, ceased growing. In the case of *caries* I think I did not give the medicine a fair trial, though the patient ultimately completely recovered.

Mez.—Exostosis of the radius of the left fore-arm. Asaf. had previously been administered in large doses. To counteract this, puls. 12 was given on the sixth day; mez., one drop of the sixth, on the fourteenth day. On the thirty-first day, silic. 18. On the sixty-second day, calc. carb. 30. The improvement both in the local disease and the general health, which had been progressive under previous medicines, continued also to advance after the administration of calc., until the joint recovered perfect mobility, the bone had regained its natural size, and a fistulous orifice, which existed at the commencement of the treatment, had become completely cicatrized. The cicatrix was covered by scurf, which, after the employment of lyc. 30, speedily disappeared.

Phosph. has cured exostosis on the frontal, the parietal, and occipital bones, from the size of a bean to that of a hazel-nut; it has also, in the 30th dilution, proved effectual in the treatment of large exostosis of the clavicle, where the pain was intense, aggravated by the slightest touch, of a tearing or boring character, with nocturnal exacerbations.

Sepia.—At the lower extremity of the radius, enlargement of the bone for a length of four inches; painful when touched; sepia 30, and after six weeks, nit. ac. 30 effected a cure.

Silex.—Exostosis femoris, in a man æt. 28. The disease commenced two years before, apparently from a blow on the thigh. Sticking, boring, and tearing pain in the anterior surface of the thigh, so severe that sleep was impossible. The thigh was very much swollen from the knee to the groin. The femur much enlarged. From the fistulous openings nearly a pint of pus, mixed with blood, was discharged every morning and evening, upon the removal of the dressings. The patient was excessively emaciated, and suffered from "phthisis pituitosa" and constant sweat. As the pain in this case appeared to be an important symptom—since it had commenced with the disease, and apparently originated from the effects of mechanical injury—and as it had not diminished through the whole course of the disease, arnica was prescribed. Immediately after the administration of this medicine the patient slept for eight hours, and when he awoke the pain had in a great degree abated. From this time there was improvement, as evinced by increase of appetite and abatement of the swelling and suppuration. The improvement continued progressive until the tenth day; and on the eleventh, as there appeared to be a cessation of favorable symptoms, lycop. 28 was administered. Improvement again commenced, and in its course the phthisis pituitosa gradually disappeared.*

If the bony tumor is large, and medicines do not appear to produce any beneficial effect, the surgeon may think proper to remove it by mechanical means. This may conveniently be done by the knife, Hey's saw, and trephine. Sometimes a spring-saw will be found to answer a better purpose than any other instrument.

CYSTIC OSTEOMA—OSTEO-CYSTOMA.

By these terms are understood an expansion of a bone from a collection of matter, which is not purulent but serous, or of a glairy or gelatinous character. The cyst is not a pyogenic membrane, but is composed of a structure resembling that which is found in some encysted tumors. Its growth is slow, but the bulk acquired may be enormous. The disease may be produced by external injury exciting inflammation, and consequently suppuration in the cancellated tissue; or the inflammatory action may be of a less acute kind, particularly in weakened and unhealthy constitutions. As the disease progresses, the fluid accumulates, the cancelli are broken down, and the much-attenuated parietes of the bone are pressed outward.

* The above cases are taken mostly from Jeanes's Homœopathic Practice.

Occasionally the inflammatory action may be excited on the external surface, from the pressure of the contained fluid; and, when this is the case, minute nodules of osseous matter are effused, as if nature endeavored to strengthen the parietes, which from diseased action daily become thinner and more incapable of affording support. Sir Astley Cooper describes this disease as a species of *exostosis;** Boyer† mentions it under osteo-sarcoma; but the difference between the latter and the affection now under consideration appears to be, that in spina ventosa the discharge is uniformly fluid and of a serous character, though sometimes mixed with a cheesy matter, there is no fungus protruding after a portion of the attenuated bone has given way, and the tumor is not of a malignant character.

There is considerable pain while suppuration is being established; but after the formation of matter the more acute suffering subsides, and in some instances there is but slight inconvenience and the tumor remains stationary. In other cases the enlargement is enormous, and the constitution of the patient is very materially affected.‡

Treatment.—Previous to the development of the disease, if the patient complain of weariness, heaviness, and aching in the limbs, arnica or phosph. acid may be prescribed. These medicines are also suitable, if, upon careful examination, slight swelling of the bone be detected, which is sensitive to pressure. By the exhibition of those medicines, together with mezereum, the disease may be arrested in its incipient stage.

Merc. sol., according to Hartmann, appears suitable when the bone is swollen, but not much inflamed. He further says: "It seems to me, however, that inflammation was rather promoted than arrested by mercurius; and I now never give it until I feel perfectly convinced that it is adapted to this particular disease."

Mez. is a valuable medicine in the treatment of cystic osteoma, particularly when psora, syphilis, or scrofula exist in combination, or the patient has been poisoned by large doses of mercury. Although the proving of this remedial agent is not as complete as it might be, still its general physiological character is sufficient to convince the student who examines the symptoms that have been produced by this drug, that it must be an admirable remedy for diseases of the osseous system, particularly when there is swelling of the part and burning pains, which are aggravated at night.

Asaf., phosph., sulph., and silic., the two last never lower than the thirtieth potency, have also been recommended for this disease.

Other medicines are, calc., phosp., staphis., hepar, sepia, etc.

Together with this treatment, a moderate degree of long-continued pressure upon the part may also be resorted to. This method alone is said to have effected the cure of the disease.

Should any of the large cylindrical bones be the seat of osteo-cystoma, and after a thorough trial of remedial agents, the disease appears to be steadily advancing, amputation or resection may be performed.

Osteo-sarcoma.—This term, though rather a vague one, is applied to that variety of tumor to which the bones are liable, in which there exists an outside bony lamella with an internal *fleshy* or *fibro-plastic substance*, called by some authors *osteo-sarcoma.*

In the commencement of this disease the bone is slightly enlarged, perhaps somewhat thickened in its outer laminæ; and if a section of it be made,

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* See Gibson's Institutes and Practice of Surgery, vol. ii, p. 62.

† On the Bones, p. 182.

‡ For a very interesting case of osteo-cystoma of the cranium, which was skilfully and effectually removed by the late Dr. George McClellan, see McClellan's Principles and Practice of Surgery, pp. 348–352.

it is found to contain a brown fleshy substance instead of the usual cancellated structure. The osseous portions of the tumor are in the form of spiculæ, radiating outward, leaving interstices which are occupied by the sarcomatous tissue, partly cartilaginous, or fibrous, resembling ordinary fleshy substance. Most frequently it is composed of sarcomatous substance, containing portions of cartilage. If the structures are composed of cysts, these are lined by a secreting membrane, and it is thought by some that on the perverted action of this formation, the increase as well as the peculiar structure of the disease depends. By the pressure of the new formation, the parietes of bone are forced outwards; in some cases attenuated, in others thickened by deposition of new osseous matter, inflammatory action having been induced by the pressure. As the disease advances, the bone becomes more attenuated, and in some places extremely thin, diaphanous, and somewhat flexible and elastic. From the latter condition it would appear that the part of the osseous system affected had lost its proportion of earthy matter.

To a tumor composed chiefly of cartilage, with an admixture of bony lamella, the name *osteo-chondroma*, or *enchondroma* is given. For a full description of this variety of tumor, as well as of myeloid tumors of bone, the student is referred to the Chapter on Tumors.

For the usual forms of osteo-sarcoma there is nothing, in my opinion, to be done but amputation, or removal of the tumor, and too often when this is practiced, the disease is found to be of a malignant or recurrent character, and again makes its appearance.

Cysts in Bone.—There are cystic formations developed in bone; they may be *serous*, *mucous*, or *sanguineous*. The former are found about the jaws, in consequence of irregular development of the teeth, while the latter are of very rare occurrence, and may be situated upon any of the bones. Travers found one on the clavicle, and Stanley on the condyles of the femur. It must be remembered, in making up a diagnosis in such cases, that cysts are developed in certain forms of myeloid tumors—indeed explorations with the aspirator, or the hypodermic syringe, is the only certain method of revealing the true nature of such cysts.

Hydatids are also found in bone, but they are of rare occurrence.

The treatment consists, in freely laying open the cysts, and packing the cavity with oakum, or lint saturated with balsam of Peru.

Cancer in Bone.—Sir James Paget lays down the following important rules for diagnosis, between the innocent and malignant bony tumors:

"1. The tumor is probably cancerous if its growth commenced before puberty, or after middle age, unless it be a cartilaginous or bony tumor on a finger or toe or near an articulation.

"2. If a tumor has existed, on or in a bone, for two or more years, and is still of doubtful nature, it is probably not cancerous or recurrent, and this probability increases with the increasing duration of the tumor.

"3. If a tumor, on or in a bone, has doubled, or more than doubled its size in six months, and is not inflamed, it is probably cancerous, or recurrent; and this probability is increased if, among the usual coincidences of rapid growth, the veins over the tumor have much enlarged, or the tumor has protruded far through ulcerated openings and bleeds, and profusely discharges ichor.

"4. If with any such tumor, not being inflamed, the lymph-glands near it are enlarged, it is probably cancerous, and still more probably if the patient have lost weight and strength to amounts more than proportionate to the damage of health by pain, or fever, or other accident of the tumor.

"5. A tumor on the shaft of any bone but a phalanx is rarely innocent,

and so are any but cartilaginous outgrowths on the pelvis, or any but the hard bony tumors on the bones of the skull."

Of all the malignant diseases, the *encephaloid* is the most frequent, and presents itself as *periosteal*, or *interstitial*. The periosteal is chiefly confined to the long bones, while the flat ones are generally affected with the interstitial form of the disease.

The following are the symptoms in the periosteal variety:

The pains experienced by the patient are at first dull and deepseated, but in a short time they become more intense, the volume of the bone increases, though the soft parts appear yet in their natural state. The latter, however, soon become red and inflamed; the pain becomes severe, and is lancinating in character; the system is deranged, the tumor softens, often presents a sense of distinct fluctuation, and on being freely handled, is found to crepitate in consequence of loose spiculæ of bone being pressed against each other. Ultimately the integuments become livid, or dark red, ulcerate, and allow a portion of the softened tumor to protrude, in the form of a fungus. There is profuse discharge, thin and sometimes bloody; and, as may be supposed, much constitutional irritation and exhaustion. Not unfrequently during the progress of the disease, especially if it be situate in the cylindrical bones, fractures occur either from muscular contraction or external injury. This accident gives rise to serious complication, as the process of reproduction in the diseased bone is very slow, if, indeed, it is not altogether suspended, consequently the fracture does not unite, suppuration is increased, and the disease is therefore much hastened.

Although after the protrusion of the fungus, the soft parts are not readily involved, the tumor may properly be pronounced malignant. At an earlier stage of progress it is confined to the tissue in which it originated by laminæ of bone, but after this barrier has given way, it projects further through the aperture, and contaminates all the surrounding structures until again held in check by bony formation.

Treatment.—In the commencement of this affection, several medicines may be indicated in accordance with symptoms which present themselves, among which are bell., merc., mez., phosph., phosph. ac., nit. ac., sulph.

If the constitution of the patient suffers severely from the exhausting suppuration, china or hepar should be administered. If the disease has been occasioned by a blow, arnica, ruta, rhus or symphytum may be called for.

From the action of thuja upon fungous formation, this medicine must be remembered, and should be prescribed if the sarcomatous formations are red and fleshy, pouring out blood profusely at the slightest touch, if the patient is debilitated both in body and mind, and the symptoms are all aggravated towards evening or at night.

Calc. carb. must be prescribed when the constitution presents evident marks of scrofulous cachexy, and when the parts around are red, swollen and indurated, with several fistulous openings.

Causticum and *silicea* may also be called for. And *arsenicum* or *carbo veg.* may be indicated by the prostration, excessive thirst, dryness of the skin, and frequent shudderings.

The mercurial preparations are often used. Some have highly recommended the oxymuriate of mercury, and, according to other authors, the treatment has proved quite efficacious. The latter treatment is noticed in this place with the hope that some may be incited to experiment with the mercurial preparation just mentioned.

If medical treatment fail, which it generally does, surgeons of the present day have recourse to amputation or extirpation; the result, however, is

seldom favorable, the disease returning with renewed vigor either in the stump or in some other portion of the body.

When the cancer is *interstitial*, it arises generally in the cancellous structure, the pain being very intense, because the affection progresses rapidly, and the bone is mechanically forced open, from the continued and increasing pressure of the diseased mass in its interior.

The characteristics which distinguish malignant from non-malignant tumors in bone, are also present, and the disease has a tendency to involve the subjacent textures.

The chief indication in the treatment of these tumors is to commence early the medical treatment. Frequently, if the primary affection can be subdued, or the constitutional symptoms successfully combated, the disease may be eradicated; these ends may be accomplished by the treatment that has previously been mentioned for diseases of the periosteum and bones. The medicines that are best adapted to the medullary sarcoma are asaf., bell., calc., mez., merc., phosph., phosph. ac., silic., or sulph.

For a description of myeloid tumors as affecting the bones, the reader is referred to page 117, in which case the entire superior maxillary, malar, and turbinated bones were converted into the peculiar suetlike mass of myeloid formation.

Pulsating Malignant Tumors.—To this variety of bony tumor especial attention should be directed, because although the diagnosis in certain cases is comparatively easy, in others it is almost impossible. Nélaton collected six cases of this disease, and named it "*true aneurism of bone.*" Volkmann collected four cases, Cappelletti and Landi each recording one. It is interesting to note, that of these twelve cases, in nine the head of the tibia was affected, the lower end of the femur in two, and the head of the humerus in one.

In all these pulsation was distinct, except one, in which there was a perceptible blowing murmur. In Dr. Carnochan's case, there was a *bruit*, the only one in the twelve where such a symptom was noticed. In two of the cases an aneurism of the anterior tibial artery was diagnosed.* The chief difficulty in diagnosis is to distinguish these tumors from aneurism by anastomosis, and this must be especially the case when the tumor appears in localities where such aneurisms are found, especially in the scalp. The chief points to be looked after are first, whether there be any unmistakable signs of a cancerous cachexia; second, whether the pulsation seems to be defined, or compressed by the periosteum, which offers some resistance to the throbbing. These certainly are but meagre signs upon which to base an opinion, and it is from these very facts that the diagnosis is so difficult. When the tumor lies upon a superficial bone, and is out of the track of a large artery, the diagnosis may be more readily made out. These tumors are almost always malignant, and always serious.

If the tumor is small, it may be removed by cutting down upon it, and applying the galvano-cautery or the thermo-cautery, but as a rule the part if possible should be amputated. According to Professor Landi, who has analyzed the twelve cases already mentioned, two were cured by ligature of the main artery of the part, two ceased to pulsate, but were not removed; in three cases the ligature failed, but amputation was successful; primary amputation was successful in three, and fatal in two cases.

A most interesting case of pulsating bone tumor, which was mistaken for popliteal aneurism, is recorded by Dr. Erskine Mason.† Every symp-

* London Medical Record, Nov. 15th, 1877.

† American Journal of the Medical Sciences, January, 1877, p. 85.

tom of the latter disease was present, especially the "distinct eccentric" pulsation and loud and distinct bruit. The femoral was ligated in Scarpa's space, which effectually stopped all pulsation. The post-mortem revealed a sarcomatous tumor involving five inches of the femur.

CHAPTER XXVI.

FRACTURES: GENERAL CONSIDERATIONS IN THE TREATMENT OF—DIVISIONS—CAUSES—SYMPTOMS—EXAMINATION OF PATIENT—MODE OF REPAIR—GENERAL TREATMENT.

PROF. GROSS, speaking of fractures, indicates the importance of a thorough understanding of the subject in the following words: "If I were called upon to testify, under oath, what branch of surgery I regarded as the most trying and the most difficult to practice successfully and creditably, I should unhesitatingly assert that it was that which relates to the present subject, and I am quite sure that every enlightened practitioner would concur with me in the justice of this opinion."

From the moment the young practitioner begins his professional life, he is liable to be called upon to treat this variety of injury, and as the first case may be one of those difficult and trying ones which baffle the skill of the most experienced surgeons, it is of the utmost importance that a thorough knowledge of the subject be imparted to the student.

Let it be borne in mind by the young practitioner that there is general deformity after fracture; it may be so slight as to be almost unnoticeable, or it may be so great as to cause deformity the most unsightly; but certain it is that the best authorities of the present day are cautious in expressing their opinion in regard to *perfect* apposition of the fragments of broken bones.

On this subject, Dr. Hamilton writes: "I am frank to confess, that until I commenced these investigations, I had not any just notion of the *frequency* of deformities after fractures. Students will continue to go out from our hospitals with a belief that perfect union of the broken bones is the rule, and that the exceptions imply unskilful management; and if, when hereafter they have themselves occasion to treat a fractured femur, the result falls short of their standard of perfect success, they, taught also by the same instinct of self-preservation which actuated their teacher, will conceal the truth from others, or even from themselves, if possible." I introduce these remarks, for the sake of encouragement to those beginning their surgical career, and will produce such cases as we proceed with the subject, as will show that we must not expect too much in the treatment of fractures, especially if they be in the vicinity of joints, or complicated with much laceration of the soft parts.

By the term *fracture* is understood a solution of continuity of the osseous system, or, in other words, a separation or breakage of the bones, by various causes, both direct and indirect. Various divisions are recognized by surgeons. Thus:

Simple Fracture.—The bone being broken at one point.

Compound Fracture.—The bone being broken, and there being a wound in the soft parts communicating with the bone.

Comminuted Fracture.—The bone being broken or crushed in many places.

By the term *compound comminuted fracture* is understood the breakage of a bone into several fragments, with accompanying wounds of the soft parts.

An *impacted* fracture is one in which one extremity or portion of the bone is wedged or driven into the other ; a *complete* fracture is one in which there is an entire separation of the bone ; an *incomplete* fracture signifies but a partial division of the osseous material.

Again, terms are used to designate the directions in which the separation may occur, thus we have the *transverse*, *longitudinal*, *oblique*, or *serrated*. Of these the second variety is most rare, and is mostly occasioned by gun-shot injuries.

Causes.—These are many, and are divided as usual into predisposing and exciting. Among the former we may enumerate : 1. Sex : men seeming to be most liable, although the difference in the avocation of sexes may account for the more frequent occurrence in men than in women. 2. The season of the year: more fractures being treated in the winter than in the summer. 3. Age : old persons, from the preternatural brittleness of the bones, are especially liable to suffer from fracture, while the bones of younger persons, being supplied with more cartilaginous material, have much greater power of resistance. On the other hand, however, it must not be forgotten that in the former case, there is generally greater risks encountered from greater activity and exposure to accident. 4. The situation of the bones : the long bones of the extremities, being used naturally for locomotion and protection, are the most liable to be broken, while the small and irregular ones rarely suffer. 5. The position of the bones : the fibula is external, and is thin and slender, and is more frequently the seat of fracture than the tibia. The radius, being attached to the hand, more often suffers than the ulna, and the clavicle, from its articulations and position, is rendered very obnoxious to accident. 6. Disease : there are several diseases which render the osseous system liable to fracture, some of these are to be classed as regular diseases of the bone, which are of a constitutional character. Among the former we have rickets, mollities, and fragilitas ossium, and among the latter syphilis, scurvy, gout, mercurialization, cancer, scrofula, etc. It is in these latter diseases that the proper exhibition of medicine may, by restoring the healthy equilibrium and nutrition of the parts, render the patient less liable to fracture.

The *exciting* or the efficient causes of fracture are generally external violence and muscular contraction. Of these, the first is the more frequent, and can take place in either a direct or indirect manner. A man receives a blow on the leg or the arm, and the bone separates immediately at the spot where the force has been applied ; another man falls upon the pavement, stretches out his hand to save himself, and though the force may be applied there, yet the radius breaks above the wrist. Sometimes two forces may operate, one at each extremity of a bone, and it may separate in the centre, as is observed in the clavicles.

Muscular contraction may cause a solution of osseous continuity, especially in persons advanced in life, and also in young persons in whom the muscular system is well developed, while the bones may be small in size.

Dr. Hodgen,* of St. Louis, records a remarkable case of fracture of the sternum, and also fracture of the spinous processes of the vertebræ by muscular action.

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* Medical Record, Dec. 22d, 1877.

Symptoms.—*Crepitus.*—By the term crepitus is understood not only the sound which is emitted when the fractured extremities of a bone are rubbed together, but the peculiar sensation that may be felt by the surgeon during a careful examination. When this is really present, it is always pathognomonic, but it must never be forgotten that there are sometimes present in fractures what might not inaptly be termed false crepitus, by which I mean, that peculiar rubbing noise that may be distinctly heard in the irritated sheaths of tendons and joints, or from the accumulation of air in the tissues.

I have now in mind a case of injury of the knee-joint, caused by the fall of a horse upon the limb of a young and athletic man, in which at first I was led to suppose that a partial fracture of the patella must certainly exist, from the crepitus both felt and heard upon attempting to move the knee-cap. Sometimes the sound is very obscure, and the over-anxious surgeon may fancy that he can detect it when such is not in reality present; in such cases the application of the stethoscope may facilitate the diagnosis. We must also bear an important fact in mind, that a fracture may exist without crepitus. Thus, in the so-called impacted fractures, or in those where strong muscular contraction draws asunder the fragments, there may not be a trace of the sound, and I would have this point strongly impressed upon the mind.

Preternatural Mobility.—This symptom is generally present in fractures, although in the bones of the leg and forearm, when one bone only is the seat of injury, the increased motion may be very slight, as may also be noticed in the impacted variety; but by grasping the fractured bone above the site of contusion, and holding it firmly, and moving the lower portion of the bone in a lateral direction, an unnatural motion may be generally observed. This preternatural mobility may also be difficult to recognize, especially when the bony lesion takes place in the vicinity of a joint, and there is much contusion of the soft parts which are torn or lacerated.

Deformity.—We find deformity noticed in a great number of fractures; sometimes it is in itself sufficient to render the diagnosis perfect. In some fractures we find—as in those of the olecranon and patella—that there is a concavity existing between the broken extremities, in others an angularity may be observed; again in others a prominence indicates the injury. In the long bones it may be asserted, that the more nearly the lesion approaches the transverse variety, the less deformity may be expected, while the more oblique the direction of the fracture the more will deformity exist.

The pain and swelling belonging to these injuries, as a general rule, will have but little weight in establishing a diagnosis, for the reason that most severe symptoms of this character, together with ecchymosis, are found in most ordinary bruises and sprains.

It is well for the young practitioner to remember in this connection an important fact, viz.: that because a patient may have considerable motion of a part, there is no reason that a fracture may not exist; a man with an impacted fracture of the femur has been known to walk unassisted for a considerable distance, and Velpeau has pointed out that even with a lesion of the collar bone, the arm of the affected side may be raised to the head.

Taking now into consideration what has already been mentioned, that crepitus, preternatural mobility, and deformity are the general symptoms upon which we depend, and that in many cases these may one or all be difficult to detect; that in muscular subjects, and where the contusion or laceration of tissue is great, that these symptoms may be, if present, hard to find, and that the usual presence of pain adds doubt to the appreciation of the injury—it will readily be understood what difficulties

the surgeon may have to encounter. When to these we add the deformity that may and frequently does happen after the most judiciously managed cases, and the everlasting odium which is often cast upon the surgeon by the ignorant or the malicious, or those whose cupidity for gain has smothered their feelings of honesty—I need not say honor—is it remarkable that so distinguished an authority as Dr. Gross has written the words which I have inserted in the beginning of this chapter.

Examination of the Patient.—When called to examine a patient in whom a fracture is apprehended, if there is the slightest doubt as to the diagnosis, the best method is to place him immediately and completely under anæsthetic influence, and then conduct the manipulations thoroughly and as gently as possible. The sooner the examination is made the better it will be, before much tumefaction has appeared, and before the excessive soreness, which soon is manifested, comes on. Never be in a hurry, if many demands upon your time are engaging your attention, either postpone some of them, or, if that cannot be done, the patient must be turned over to another surgeon. Another remark may also be inserted: Do not be discouraged if the diagnosis is not made clear upon the first or even the second or third visit. There are some cases of obscure nature that the surgeon may never entirely diagnose; and if he was candid enough to admit the fact, many are the cases that have made a fair recovery which were not made out satisfactorily during a prolonged treatment.

MODE OF REPAIR.

The method which nature observes in repairing lesions of the osseous structure is most beautiful, and when carefully noted may be divided into several stages; thus we may say that we have, first—

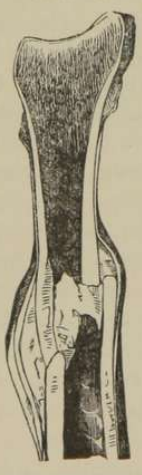
A. The period of rest or incubation, which may again be divided into

1. The period of exudation, when inflammatory lymph is thrown out around the site of injury, which may occupy two or three days. The tissues during this stage are soft and somewhat succulent, and infiltrated with a fluid resembling serum.

2. The period of true rest, so far as the ends of the bone are concerned, which remain in a quiet condition, while nature removes the debris, clears away extravasated blood, takes away the swelling, and prepares for the second period.

B. The period of uniting the fragments together. This is accomplished by the deposition of a fibrinous, gelatinous substance of a slightly reddish tinge, which surrounds the extremities as it were with a pad, holding them together. This substance may also be poured out, though in a lesser degree in the medullary canal—thus giving support both externally and internally to the fractured ends of the bone. This substance gradually and in different ways is transformed into the so-called provisional or intermediate callus. (Fig. 152.) This last process I shall not here minutely describe, supposing that all are in a measure acquainted with osteogeny, or the origin and growth of bone in the fœtus.

FIG. 152.



Method of Repair in Fractures.

According to Mr. Paget, it may be accomplished through fibrous tissue, or by either nucleated cells or nucleated blastema, or by cartilage. Perhaps the best description of the manner in which broken bones may unite, may be found in Prof. Hamilton's most excellent *Treatise on Fractures*. He states that fractures of the adult human bone, "whether

placed end to end or overlapped, unite most naturally and most promptly either immediately or mediately, and in the same manner as the soft tissues unite, that is to say, without the interposition of any reparative material, or through the medium of any intermediate permanent callus; and that all deviations from these simple methods are accidental, or the result of disturbing influences."

In whatever manner, however, the ossification of the callus takes place, so soon as the broken ends of the bone are surrounded and held in position by the provisional callus, then the uniting of the fractured extremities takes place through the permanent callus, which is followed by (C.), or that period when the provisional callus is removed by the absorbent system, by which the bone is restored to its original shape.

From these remarks, we learn that the fractured ends of a bone, being brought in direct and perfect apposition, which, by the way, is very rarely the case, will unite without the formation of the provisional callus, or more after the fashion of union by the first intention in the soft parts, but that in the majority of instances we have first a period of rest, divided into that of exudation and clearance, followed by the formation of provisional or intermediate callus, both exterior and interior to the bone; after which we have the deposition of the permanent callus, and, finally, the removal of the extraneous bony deposit, which is no longer of service. These processes are more or less varied in accordance with the extent or direction of the fracture, or the bone which is the seat of injury. When bones are not brought into apposition, the callus is thrown around the opposing ends, or, indeed, in some instances, a complete bridge of bone may extend from one fragment to the other. (Fig. 153.)

Fig. 153.

General Treatment.—The great indications in the treatment of fractures are: 1st. To set the bones; or, in other words, to restore the fragments as nearly as possible to their natural position. 2d. To maintain them in that position. 3d. To prevent or allay constitutional or local disturbances.

According to the old-fashioned methods of treatment, a fracture-bed, especially when the bones of the lower extremities were the seat of injury, was considered an almost indispensable requisite. These were often very ingenious contrivances, with pulleys and joints and hinges, by means of which the patient could be raised or moved slightly without materially affecting the broken bones; but of late, with the new methods of treating fractures of the lower extremities, all that is required is a good moss or hair mattress, covered with a sufficiency of blankets or "comfortables" to render it soft to the patient. It is really curious to look over the cumbersome contrivances called "fracture-beds," which were used by our ancestors. The fracture-bed of Jenks, at least the plate thereof, reminds one of the curious representations in the Armamentarium Chirurgicum of Scultetus, or some of the instruments of torture in the Tower of London.

Let the bed be made comfortable to the patient, and let sufficient care be taken to insure this condition. Let the bones then be set as soon as possible after the injury; this is the rule, and if it cannot be accomplished entirely, bring the parts as nearly in apposition as the swelling will allow, and apply a splint, and a pad, and a roller to maintain them in such position. Callus does not form until the eighth or tenth day, and therefore, say some surgeons, there is no particular hurry in readjusting the fragments. This

is poor surgery, as well as poor common sense. The longer any portion of the body, or any organ or part of an organ, muscle, tendon, or bone, is allowed to remain in an abnormal position, the greater will be the irritation, both local and constitutional, and the more difficult and painful will be the manipulations.

Treatment.—The apparatus for treatment of fractures are bandages, splints, adhesive strips, and cushions or pads.

In regard to fractures especially, it is absolutely required that a precise knowledge be had of the indications to be fulfilled for a satisfactory use of the means. Without the possession of such knowledge, there would be but little practical profit from an acquaintance with all the very numerous kinds of bandages and other contrivances, however ingenious or highly recommended, which from time to time have been introduced to the notice of the profession. By such as are curious in these matters, the older surgical writers may be examined. In the present work it is designed to invite attention to means now in use, selecting those only which by the most talented and experienced in the profession are considered best adapted to accomplish the ends desired.

Splints.—A great variety of splints have been introduced at various times to the notice of the profession, some possessing advantages over others. The essential points necessary for a good splint are lightness, firmness, facility of application, and adaptation to the parts to which they are applied. A great many substances have been used, some of which are capable of being moulded to the part, as those constructed of felt, sole-leather, binders' board, or gutta-percha. Again, others are constructed of iron, iron and brass wire, or of tin, and of zinc. The most serviceable material, and perhaps the best of all for the upper extremities, is wood; and for the lower, splints made of iron wire, as we will show as we proceed with the subject.

Those splints which are constructed of gutta-percha, sole-leather, etc., and prevent the proper exhalation from the part, become very offensive and foul; and if the fracture be of the compound variety, and there has been much suppuration, and the pus makes its way beneath the splints, maggots may be bred, and the patient rendered miserable from the odor and the filth.

Excellent splints for fractures of the upper extremities are those made of thin poplar boards which are glued upon sheep-skin, and then cut through lengthwise. These are greatly in vogue, and are so easily made, and are so handy of application, that the surgeon should always have them in readiness. They are manufactured in sets of different sizes by Mr. Day, and can always be procured at short notice.

An excellent variety of splints is constructed of hard rubber, which, when heated, can be moulded to the part affected. Dr. Bushrod W. James, of Philadelphia, has devised a most excellent splint for fractures of the forearm, which for facility of application and adaptation is unequalled.

New and very good splints have lately been introduced under the name of "Ahl's Adaptable Porous Felt Splints." They can be obtained in sets of fifty pieces, and are adapted to every fracture in the human body. They are constructed of porous material, and both hot and cold-water dressings can be applied without softening them. They can be moulded to the limb, will remain pliable but firm to the part applied, and are in every way most desirable.

The carved splints sometimes answer a good purpose, although to make them fit accurately they should be prepared for each individual case.

Splints often come in sets, and those used in the navy of the United States are so complete and simple, that for the country practitioner I insert here a description of them, which appeared in the *American Medical Times*, by Surgeon W. K. Scofield, M.D.

The splints furnished by the Navy Department are models of simplicity, utility, and economy. They can be easily made by the ship's carpenter at sea, under the direction of the medical officer.

The set of splints consists of a double inclined plane; a long splint for fractures of the lower extremities, with a belt and perineal pad and strap; a short carved splint for the inside of the thigh; two carved splints for general use (all of which have pads fitted and tied on them); a set of leathered wooden splints, two sheets of cotton wadding, and a package of tow. The double inclined plane has the lower part so arranged as to be easily detached, and used as a fracture-box when required. It is also provided with large buttons on the bottom, which, when turned crosswise, make the apparatus rest more firmly on the mattress.

The long splint for the lower extremities is adapted for the use of an adhesive plaster extending band. A strip of adhesive plaster about two inches wide is applied to the limb, in the direction of its axis, from near the seat of fracture, down one side and up the other, leaving a loop or stirrup under the sole of the foot. The whole is then enveloped with a roller bandage, applied with a moderate degree of firmness. A thin piece of board, about two inches square, is made to adhere to the inside of the loop or stirrup at the sole of the foot, and around this, and over the hook of the splint, a piece of tape is passed, by which to make extension.

A pocket is made in the belt to receive the upper end of the splint; and the buckles on the outside of the pocket receive the ends of the perineal straps for counter-extension.

To adapt the splints to opposite sides it is only necessary to take out the hook, and adjust it so that the opening looks upward.

Plaster of Paris Splints.—In some instances the application of the plaster of paris, or immovable dressing, is of great benefit in the treatment of fractures, especially in the bones of the leg. It seems that the use of this substance was known in quite remote times, and was employed by the Arabians over a century since. In 1814, Hendricks introduced it into the hospital of Gröningen, and Kyle and Diffenbach subsequently made use of it. Prof. Pirogoff, during the Crimean campaign, used the plaster of paris in a different and highly satisfactory manner, and in 1854 published a monograph on "A new method of bandaging fractured limbs with linen soaked in a solution of plaster of paris."

The formation and use of the *plaster of paris splint*, was devised by Dr. James L. Little, of this city (New York). He introduced it into the New York Hospital in 1861, and published the method in the *American Medical Times* of that year, from which the description below is taken.

In 1867, Dr. Little called the attention of the American Medical Association to his method, which since that time has been almost universally adopted in certain fractures, especially those of the leg. It can, however, be applied anywhere, as it moulds and adapts itself to any part. The student, however, must be careful not to confound the *plaster of paris bandage*, now so much in vogue in the treatment of spinal deformities, and employed by some in the treatment of fractures, with the *plaster of paris splint*. The former is open to the following objections:

The parts shrink away from it and it becomes loose, thus losing all its supporting power. The parts cannot be properly inspected, and the band-

age has to be renewed, or else pieces cut out of it to make it adapt itself to the parts, in either case a troublesome proceeding. Dr. Little has also published his method in the *Medical Record*,* to which the reader is referred for accurate details for the application of the splint to both upper and lower extremities.

The mode of application to the leg is as follows: "The limb is first shaven or slightly oiled; a piece of old coarse washed muslin is next selected, of a size that when folded about four thicknesses it is wide enough to envelope more than half of the circumference of the limb, and long enough to extend from a little below the under surface of the knee to about five inches below the heel. The solution of plaster is then to be prepared. Fine, well-dried, white plaster had better be selected, and before using, a small portion should be mixed with water in a spoon and allowed 'to set,' with a view of ascertaining the length of time requisite for that process. If it is over five minutes, a small quantity of common salt had better be dissolved in the water before adding the plaster. The more salt added the sooner will the plaster 'set.' If delay be necessary, the addition of a few drops of carpenter's glue or mucilage will subserve that end. Equal parts of water and plaster are the best proportions. The plaster is sprinkled in the water and gradually mixed with it. The cloth, unfolded, is immersed in the solution and well saturated; it is then to be quickly folded as before arranged and laid on a flat surface, such as a board or a table, and smoothed once or twice with the hand in order to remove any irregularities of its surface, and then, with the help of an assistant, applied to the posterior surface of the limb. The portion extending below the heel is turned up on the sole of the foot, and the sides folded over the dorsum and a fold made at the ankle on either side, and a roller bandage applied pretty firmly over all. The limb is then to be held in a proper position (extension being made if necessary by the surgeon), until the plaster becomes hard. The time required in preparing the cloth, mixing the plaster, and applying the casing to the limb, need not take more than fifteen minutes. After the plaster is firm and the bandage removed, we will have a solid plaster of paris case, partially enveloping the limb, leaving a portion of its anterior surface exposed to view. If any swelling occur, arnica lotion can be applied to the exposed surface, and we can always easily determine the relation of the fractured ends. If necessary, an anterior splint, made of the same material, can be applied, and then both bound together with adhesive plaster, and, if desirable, a roller bandage over all. If the anterior splint is not used, two or three strips of adhesive plaster, one inch wide, or bands of any kind, may be applied around the casing, and will serve to hold them in position."

The advantage of plaster of paris over the starch bandage is, that it "sets" while the surgeon moulds it to the part, whereas the starch apparatus may take several days to thoroughly dry.

Recently the use of metallic strips as an application to the plaster of paris splints, is highly spoken of.† I have found that they not only give additional strength to the splint, but do away with the necessity of keeping up manual extension until the splint has set.

Dr. Harris, of New York city, states that by preparing it in the following manner, the weight of the dressing may be considerably diminished, thus: water, by weight, 100 parts; gypsum, 75 parts; boiled starch, clarified, 2 parts.

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* Medical Record, 1873, p. 530. † Medical Record, May 1st, 1874.

In the appendix to the *Army Medical Report*, for 1869, a plaster dressing is described by Staff-Assistant Surgeon Moffit, who states that it is used by the Bavarian Ambulance Corps. Two pieces of flannel, suited to the length of the limb, are cut sufficiently wide to overlap slightly in front. When so prepared they resemble the leg of a stocking cut vertically. One is now laid over the other, and they are stitched together from top to bottom, down the mesial line, like two sheets of note-paper stitched at the fold. They must now be spread out under the injured limb, so that the line of stitching corresponds to the back of the calf. The two inner leaves, so to speak, are now brought together over the shin, and fastened by long pins, the heads of which are bent. The leg being held firmly, an assistant mixes the plaster with about an equal bulk of water, and rapidly applies it, partly with a spoon and partly pouring over the outer surface of the flannel covering the limb. The two portions of the second layer are then quickly brought over, so as to meet, and the inequalities in the distribution of the plaster are removed before it hardens, by smoothing with the hand. In about three minutes the gypsum sets, and the limb is encased in a strong rigid covering, which gives uniform pressure and support to every part. The edges of the flannel in front can now be trimmed, and the pins withdrawn from the inner layer, by seizing their bent heads. A couple of straps, or a few turns of a roller, make all secure. In order to take the apparatus off, it is only necessary to remove the straps and separate the edges of the flannel, when the two sides will fall asunder, the line of stitching behind acting as a hinge.

The application takes less than ten minutes, the removal about two. Thus, from day to day if necessary, the limb can be inspected, and the splints (for they are no less) reapplied. In cases of compound fracture, an opening suitable to the wound may easily be made. In most cases it is desirable to make a number of perforations with a gimlet, to prevent unnecessary heat.

Starch Bandage, or the Movo-amobile Apparatus of Suetin.—To apply the starch bandage, which was introduced by Suetin, of Brussels, in 1834, the following precautions are necessary, which taken, it may be used in cases of recent fracture with great benefit. It has the advantage of being much more cleanly than the plaster of paris splint, although it takes much longer to harden. There can be no doubt that this variety of permanent dressing may be properly applied in recent fractures, when there is no shortening of the limb to be overcome, and no painful spasms of the muscles have been excited by the irritation of the fractured bones. Having prepared some of the best starch, and having boiled and strained it either through a piece of cambric or a wire sieve, then envelop the part in carded cotton, in order to cover all inequalities of surface, and over the cotton apply, not too tightly, a wet bandage. After the limb has been thus encircled, with the hands, and not with a brush, apply the starch all over the bandage, taking care to cover it thoroughly; having done this carefully, again retrace the course of the bandage, and again apply the starch, and after performing the manipulation for the third time, allow the dressing to set for half an hour, and over the whole apply a dry bandage.

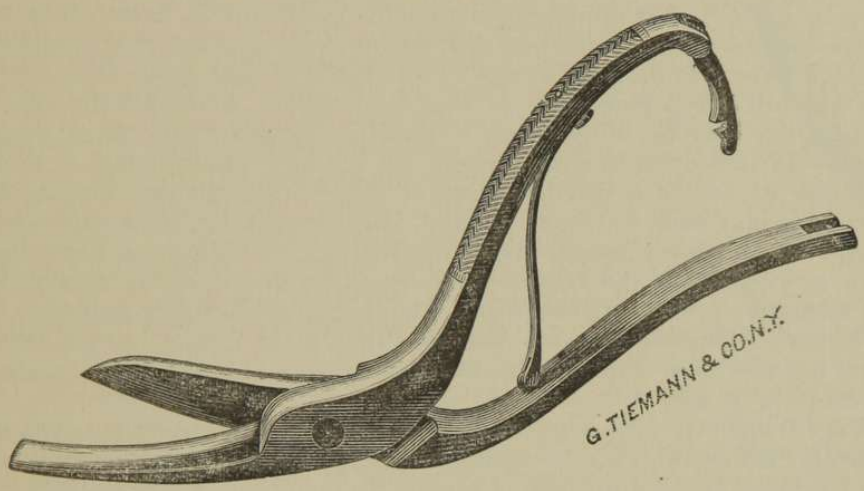
It will take nearly thirty hours for this bandage to dry, but when it has become hard, it will be found to be very immovable and permanent. If it is necessary or deemed expedient that the starch apparatus be dried sooner, by placing heated plates alongside the dressing the process will be facilitated. It is necessary on the third or fourth day to open the bandage and to examine the limb, and for the division of the apparatus, Suetin devised a pair of pliers or shears which are serviceable. After the splint has been

divided, it must be kept in apposition by an additional bandage. It will be seen that this apparatus is both immovable and movable, and in fact is called by Suetin himself, *movo-amobile.*

Velpeau uses dextrin in the preparation of such a bandage, and Hamilton says: "For myself, I am quite as much in the habit of using wheat flour paste as either starch or dextrin, and if properly made, it dries about as quickly as starch, and is equally as firm."

To remove this bandage a pair of Suetin's pliers may be used, or the instrument devised by Dr. Henry for the purpose (Fig. 154). The flat

Fig. 154.



blade being introduced under the bandage prevents any irritation of the skin, and gives support to the instrument in the act of dividing the bandage.

Fracture-cushions are made of different shapes and sizes, to correspond with the inequalities which are to be filled. They are made of unbleached muslin stuffed with horse-hair, moss, or excelsior. A form of fracture-cushion, very much in vogue, is made of oblong bags filled about two-thirds with bran or sawdust. These are serviceable to place alongside fractured bones, as they prevent displacement.

Compresses are made of muslin or linen, and must be adapted to the parts to which they are to be applied.

Adhesive straps are now employed by many of our most distinguished surgeons, not only for fixing dressings and appliances, but for exerting extension and counter-extension. In 1830, Prof. Samuel D. Gross called attention to their use, and since that period they have been almost constantly employed.

Medical Management.—So soon as a person with a fracture is brought in, it is well, as before mentioned, if possible to set the bones, and having applied a loose dressing, merely sufficient to maintain the parts in apposition, to cover the whole limb with a large towel which is wetted with a strong solution of arnica, in proportion of an ounce of the tincture to one pint of water. If the swelling be very great, it is well to use the irrigator, or to allow a stream of cold water to fall gently upon the surrounding parts as well as upon the direct seat of injury. A dose of arnica, 3d, should then be given, and at the proper time, that is so soon as the swelling subsides, the permanent bandages should be applied. The medicines

which are best adapted to the treatment of fractures, to hasten the formation of tardy callus, are the phosphate and carbonate of lime. These are to be given in the 3d trituration, about 3 grains three times daily, and the symptoms, or rather general conditions which lead to their use, are these: In children when there is a tendency to marasmus and deficient nutrition, when the nutritive nervous system is especially disarranged, and in adults who have dyspepsia, sour stomach, and frequent gastric disturbance, or in females when the menstrual function is irregular, and there is a low grade of vitality, then the carbonate of lime is the more appropriate. The phosphate must be given when there is tendency to thoracic disease, bronchial disorders, cough, etc. I have known phthisis pulmonalis result in these cases by giving, after injury, the carbonate of lime in oft-repeated doses.

Another excellent method of introducing lime into the system, and one which I have seen do good service, is by the use of that preparation known as Churchill's hypophosphites of lime and soda. A teaspoonful of this preparation may be mixed with a glassful of water, and taken during meals—an indication to either lessen the quantity administered, or to discontinue its use, is a peculiar taste of lime which remains long in the mouth, or may come on suddenly, and after continuing for a time disappear. I have never found, that either sulphur or silicea or hepar have been serviceable in the treatment of fractures, that is, so far as assisting the formative process is concerned. I have also used symphytum after the direction of Croserio, but am not sure that good results have followed. Ruta has also been employed by Dr. Henriques, and I have seen excellent effects from its use.

Very frequently after a severe fracture there is a tendency to spasmodic muscular action, which is sometimes so great that there may be danger of the fragments being drawn out of place. In such cases ignatia and cuprum have always proved sufficient in my hands; my friend, Dr. Willard, has seen similar good results from the exhibition of ignatia, and on one or two occasions hyoscyamus has produced quiet and sleep, when the jactitation was sufficient to give the patient great annoyance. Chamomilla is useful when the patient faints frequently with uneasiness about the heart, with twitching of the limbs and oppression of the chest. Other symptoms which are sometimes present, may be combated with the appropriate medicines, which may be found in the chapters on Erysipelas, Wounds, Suppuration, etc. If there are excessive pains in the bones and periosteum, mez. will be the best medicine, or phosph. acid or rhododendron may be called for.

Flexion, or Bending of the Bones.—In children, or in those whose osseous systems are deficient in lime, bending of the bones is sometimes found. In the early periods of life, when there is a preponderance of cartilaginous material, the bones, especially the cranial, are soft, and can readily, without any noticeable fracture, be flexed to a considerable degree. We find this exemplified in those Indian tribes whose craniums are subjected to pressure to alter the conformation of the skull. When, however, the patients are more advanced in life, there is a *partial* fracture of the ossific substance which allows the bone to bend. This fracture has received the name of green-stick fracture, as represented in Fig. 155.

Dr. Willard* reports a case in which there was bending of both radius and ulna, and after the removal of the splints, callosities appeared, showing that in this case the bending had been accompanied with a partial fracture. Some authors treat these as one, classing them as bending of the bones, cracked bones, or incomplete fracture. The symptoms are generally easily

* Western Homœopathic Observer, vol. vi, p. 350.

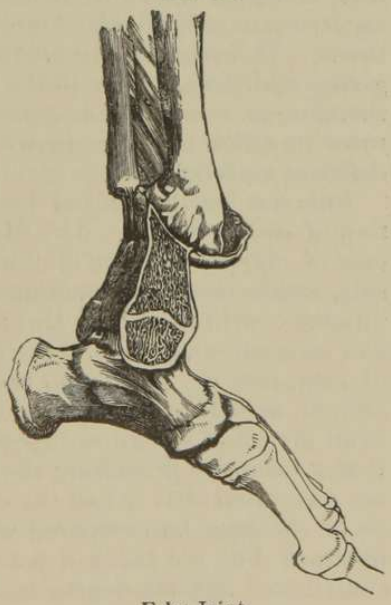
recognized. The first and only symptom upon which the greatest stress is laid in fractures, viz., crepitation, is wanting, but there is curvature, pain, immobility. The treatment consists of gradually and gently restoring the bones to their situation, and keeping them in position with appropriate splints and bandages, and administering to the patient the third trituration of the phosphate of lime.

Fig. 155.

Green-stick Fracture.

Non-union of Broken Bones, or False Joint—Pseudo-arthrosis.—The humerus and the femur are the bones that are said to be the most likely to be affected with false joint after fractures, although ununited fractures are discovered in other bones. Considering the number and variety of fractures which occur, this untoward accident is not frequent, and when such result does happen, it is generally occasioned from some disease of the osseous system, or dyscrasia, or from premature use of the limb after the fracture, or perhaps from want of the proper management on the part of the surgeon. Very frequently, in advanced life, the progress of ossification is very tardy, or indeed it is delayed a length of time in fractures occurring in persons of intemperate habits; now if these cases are not thoroughly appreciated, and are treated as ordinary fractures, that is, the bandages and splints removed at the ordinary time, then a false joint may be the result; but in such cases this unfortunate end may be prevented by the surgeon insisting that the apparatus be kept constantly on the fracture, and the appropriate medicine be perseveringly administered, ruta, calc. carb., calc. phosph., or symphytum being given. But when from whatever circumstances the fractured extremities of bones do not unite, we then have pseudo-arthrosis, or false joint. In all the long bones we have the nutrient foramina, and it is remarkable to observe the obliquity with which these holes pass into the substance of the bone. From these facts, Guéretin was led to investigate whether the peculiar course of the arteries had any influence upon the time occupied in the consolidation of fracture; from his experiments it was discovered that if the fracture occurred below the entrance of a nutritious artery which took its course upward, a false joint was most likely there to form, and *vice versâ*.

Fig. 156.



False Joint.

Dr. Norris, of Philadelphia, has classified false joints into four varieties: First, when the fractured ends are completely covered by cartilage, making the bone movable. Second, when there has been no attempt at union and the limb is wasted and shrunken. Third, in which the ends of the bone become wounded, and are covered with a cartilaginous formation, the medullary canal being obliterated and the ends working the one upon the other (Fig. 156). Fourth, when the capsular ligament has been formed over the wounded ends of the bone, making very nearly a true diarthrodial articulation; this last is quite rare, while the

third variety is that most commonly found. In a later work Dr. Norris finds:

"1st. That non-union after fracture is most common in the thigh and arm. 2d. That the mortality after operations for its cure follows the same law as after amputations and other great operations on the extremities, viz.: That the danger increases with the size of the limb operated on, and the nearness of the operation to the trunk; the mortality after them being greater in the thigh and humerus, than in the leg and forearm. 3d. That the failures after operations for their relief are most frequent in the humerus. 4th. Failures are *not* more frequent in middle-aged and elderly than in young subjects. 5th. That the seton, and its modifications, is safer, speedier, and more successful than resection and caustic. 6th. That incising the soft parts previous to passing the seton augments the danger of the method, though fewer failures occur after it. 7th. That the cure by seton is not more certain by allowing it to remain for a very long period, while it exposes to accidents. 8th. That it is least successful on the femur and humerus."

I have taken the liberty of quoting these deductions in full, because they are replete with instruction.

Treatment.—There can be generally little done *medically* after pseudo-arthrosis has taken place, although proper medicinal agents administered and judicious pressure being brought to bear on the uniting fragments, may, in many instances, prevent it. The pressure is made by compresses, wetted in a solution of symphytum, one part to four of water, and constantly applied over the seat of accident.

This unfortunate termination of fracture may in some instances be prevented by the internal administration of calcarea carb., or perhaps the phosphate of lime; the latter has been recommended for such conditions, but there are no indications in the meagre proving of this medicine which would lead the practitioner to have recourse to it. The former, however, is a well-known medicine in our school, and in numerous instances has been of essential service in the treatment of fractures and other injuries occurring in individuals of a weak, sickly constitution, and scrofulous diathesis. This medicine improves the tone of all the organs in the body, by giving additional power to the functions of assimilation and sanguification, therefore it is a valuable assistant in the treatment of those cases of fractures in which the reproductive process appears to proceed tardily from a deficient activity.

Ruta has been employed by homœopathic surgeons to hasten the formation of ossific matter. Dr. Henriques,* in recording the treatment of a case of oblique fracture of the superior third of the femur below the capsule, which occurred spontaneously in an aged patient, of enfeebled and vitiated constitution, who had been liable to periodical attacks of diarrhœa and cerebral congestion, dysuria and cough, remarks concerning the action of ruta, that it "appears to possess a decided elective affinity for the periosteum, as well as the osseous system in general; and it was the desire to avail myself of the known specific property of ruta, that led me to employ it as a means of promoting the process of ossification. I have no doubt in my own mind that it had the desired effect; for if the unfavorable prognosis of the case be compared with the ultimate happy and prompt result obtained, I do not think it possible to deny that the action of this medicine contributed in some degree to the final consolidation of the fracture."

* See British Journal of Homœopathy, vol. x, p. 448, a paper entitled Fractures, and their Homœopathic Treatment, by Dr. Henriques.

Symphytum has also been recommended for the purpose of inducing ossific deposit.

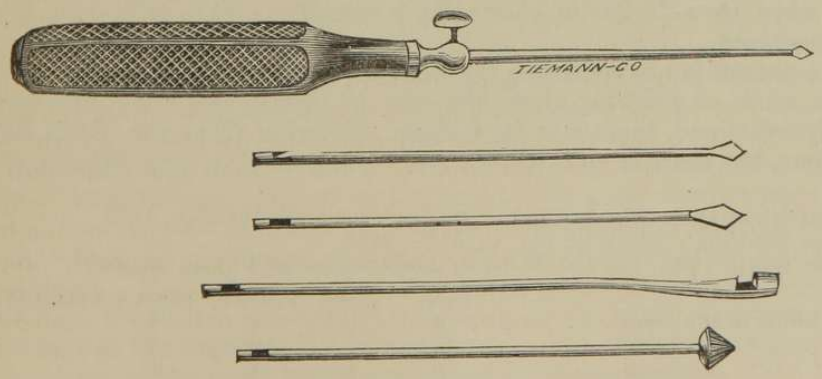
The general health of the patient should receive attention; if the constitution is worn out by disease, or debilitated either from hereditary taint or more proximate causes, the general tone of the system should be strengthened by the administration of the appropriate medicine; by such means the patient may be restored to perfect health, and the performance of painful operations avoided. However, if, after the patient administration of medicines, the formation of false joint does occur, it may then be advisable to have recourse to friction of the broken surfaces; this in some instances has produced the desired effect.

Dr. Physick's method of treatment has been successful in many instances; it consists in passing a seton between the fractured surfaces. A long, narrow instrument, called "a seton needle," is armed with a skein of silk or other material; the limb is extended, to separate the fragments, and the seton is passed between them, care being taken to avoid all large vessels and nerves. Violent inflammation follows the application of the seton in all cases, and even in ossific structure, the least liable to inflammation of all other textures of the system, this abnormal action occurs, and bony union may take place.

The late Prof. Mütter performed the following operation, first introduced by Dieffenbach, to remedy pseudo-arthrosis: The fractured extremities of the bones are exposed by incision, and, by means of gimlets, perforations made on each side of the false joint; into these openings, ivory pegs should be driven, and the wound dressed as usual. Union very frequently follows this operation, and absorption soon removes the extraneous matter forced into the bones.

There are many other methods of uniting the false joint. Dr. Brainerd, of Chicago, has succeeded by perforating the extremities of the bone in various directions, by an instrument which bears the name of Brainerd's Perforator. He uses it as follows: "In case of an oblique fracture, or of one with overlapping, the skin is perforated with the instrument at such a point as to enable it to be carried through the ends of the fragments, to wound their surfaces and to transfix whatever tissue may be placed between them. After having transfixed them in one direction, it is withdrawn from the bone but not from the skin, its direction changed and another perforation made, and this operation is repeated as often as may be required." Dr. Brainerd has several drills fitting into a single handle (Fig. 157).

FIG. 157.



Brainerd's Perforator.

Recently success has been obtained by "pounding" the extremities of the bone with a small hammer with a head of gutta-percha.

Another excellent mode of proceeding, and one which in the majority of instances is successful, is after having removed the soft substance from the extremities, to pierce the ends with a common gimlet, then, after having made considerable friction between the surfaces, pass into the holes a suture of strong iron wire, and draw the pieces of bone into apposition. After a number of weeks the wire is withdrawn, and reunion is found to have taken place.

Dr. Smith,* of Philadelphia, objects to all the modes of treating this accident at present in use, as founded on a wrong principle. He objects particularly to the opinion that absolute rest is necessary to the cure, and thinks that this idea is one very fruitful source of failure. His plan is to fix the limb in an iron framework, constructed with joints to allow movement of the limbs and by straps and pads to steady the extremities of the broken bones in a proper position. Fixed in this apparatus, he allows the patient to use the injured limb, and he asserts that union is effected with much less constitutional and local disturbance, than by means of the various plans of treatment at present used by old-school practitioners, viz., violent friction, the seton, resection, Dieffenbach's plan, and others; while at the same time the patient is less exposed to phlebitis and other risks, he escapes the disagreeable monotony of a long confinement.† This method appears to have many advantages over some of the others, but more statistics will be necessary before its actual value can be ascertained. If homœopathic medicines are administered with the use of the apparatus of Dr. Smith, the results doubtless would be more speedily accomplished than when the apparatus alone is used.‡

Resection has also been practiced, but generally it is a last resource, for it should be remembered that cutting down to the extremities of the bone and *scraping* or removing portions of them, at once converts the simple to a compound fracture.

CRACKED BONES OR INCOMPLETE FRACTURE.

It sometimes happens that a bone is cracked when the force applied has not been sufficient to produce an entire separation, but only adequate to break the continuity of some of its fibres, whilst others remain entire. This injury is generally found where there are two bones, as in the leg or forearm, when the uninjured bone supports that which is partially broken. It is probable that it occurs occasionally in both bones, although the occurrence is rare.

Diagnosis.—Diagnosis is more difficult when the bone is merely cracked than when the solution of continuity is complete; still, with care, it may be recognized.

The patient is unable to use the limb without considerable pain; he has also a sense of pricking about the seat of injury, and when the bone is closely examined, there may be a slight deviation from the direct line of the bone, but there is no crepitus; yet when the above signs follow a severe

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* American Quarterly Journal of Medical Sciences, January, 1855

† See Ranking's Abstract, vol. xi, July, 1855.

‡ Dr. Smith's plan has been tried in several cases with these results:

	Cases.	Cured.	Relieved.	Failed, but able to walk.
False joints in the femur,	4	3	0	1
" " leg bones,	8	7	0	1
" " humerus,	2	0	2	0
Total,	14	10	2	2

blow or fall upon the part, and the pain and inability to use the limb freely exist after the effects of the contusion have subsided, it is probable there is a solution of continuity in some of the fibres of the bone. In other words, the bone is cracked, but not entirely broken.

Treatment.—The treatment for the repair of this injury is the same as if the bone were broken into two fragments. It is not necessary, however, to keep the apparatus quite as long applied as in complete fracture. The medical treatment has already been given when treating of bending of the bones and the general treatment of fractures.

SPECIAL FRACTURES OF THE HEAD AND FACE.

Fracture of the Nasal Bones.—Fracture of the nasal bones is generally the result of direct violence, as falls and blows. The swelling, which usually is great and follows immediately after the accident, often prevents a correct diagnosis of the case. Of the site of the fracture, Prof. Hamilton thus speaks: "When the ossa nasi are struck with considerable force from before and from above, a transverse fracture occurs, usually within three to six lines of their lower and free margins, and the fragments are simply displaced backward; or if the blow is received partially upon one side, they are displaced more or less laterally. This is what will happen in the great majority of cases, as I have proven by the examination of the noses of those persons who have been the subjects of this accident, and by repeated experiments upon the recent subject." These bones heal with great rapidity.

Treatment.—If the surgeon is timely called, manipulation with the fingers outside and the introduction of a female silver catheter within the nares will in a measure restore the bones to something near position, the nostrils may then be filled, though not too tightly, with lint; or if there be a tendency to epistaxis, with prepared oakum, and narrow strips of plaster placed across the nose in such manner as to make the parts secure. The *septum of the nose* being flexible may be turned to one side or the other, and thus complicate the case. Under such circumstances the plugs may be introduced from the posterior nares and thereby assist in restoring the septum and give support to the ossa nasi. In a case of the kind, I found great contusion about the face, and profuse hæmorrhage from the nose, which was almost flattened upon the cheek. The epistaxis had continued for an hour, and the patient was much exhausted. Upon examination, the lower portion of the nasal bones (properly so called) were found broken, and by introducing a female catheter along the floor of the inferior meatus, the inferior cartilage could be felt turned to one side, and the loose fragments of the inferior turbinated bone on the other. It struck me at once that the hæmorrhage might be arrested, the broken bones replaced and held to a certain extent *in situ*, by plugging the posterior nares. I had not a Bellocque's canula, and therefore substituted a well-curved male catheter for that instrument, and, by the ordinary method of procedure for arresting nasal hæmorrhage, plugged up the nares. By then introducing at the external meatus conical plugs of lint, and keeping them well up to the septum, I had the satisfaction of seeing the nose almost restored to its normal position. It may be remarked, that erysipelas of the face set in on the second day, which was successfully combated by the usual remedies.

Fracture of the Superior Maxillary Bones.—Fractures of the upper jaw, like breakage of the nasal bones, are caused by direct violence. The bones are broken in many directions. The displacement also is very varied. The bone may be pressed downward and backward, or downward and for-

ward, or directly downward; or be separated from its surrounding connections, or it may be accompanied with fracture of the nasal and malar bones.

The accident is often accompanied with symptoms of concussion, and sometimes followed by severe inflammation and facial erysipelas.

Treatment.—The indications of treatment are to endeavor to mould the parts into nearly as possible a natural state, by using the fingers, and allow the parts to remain quiet. If the alveolar margins are broken away, the ends may be retained in their position by wire, although this, in many instances, is difficult to accomplish; or a gutta-percha splint may be moulded to the bone. In the efforts to replace the fragments, the parts should be approached both within and without the mouth. The symptoms of inflammation and erysipelas must be combated with the usual medicines.

Fracture of the Malar Bones.—This fracture is produced by direct violence, as falls, blows, or other injury. There may be a depression of one of the fragments or there may in rare cases, be outward displacement. In the generality of instances there is considerable injury done to the face, and the accident is followed by much swelling, which for a time may render the diagnosis very obscure. By passing the finger along the zygomatic arch, by attempted movement of the jaws, and in some cases by the projection of one of the fragments into the tendon of the temporal muscle, the diagnosis may be made out.

Treatment.—If there is not much displacement of the fragments a simple bandage is all that will be required. If, however, there is evident depression, and the movements of the temporal muscle are impaired, the effort should be made to restore the fragments by manipulation within and without the mouth. If the fracture be compound, and there is an opportunity of applying the elevator to the depressed fragments, the facility of coaptation will be very much increased. Some authors recommend that in a simple fracture with depression, it is justifiable to make an incision, and then apply the elevator. It appears to me, that in each case the practitioner should use his own judgment, and if material injury is threatened to the temporal muscle, or, more properly, its tendon, it would be perfectly justifiable to make an incision and apply the elevator. If, on the other hand, the functions of the mouth and jaws are not much impaired, nature may prove sufficient for the necessary restoration.

Fracture of the Hyoid Bone.—This bone, from its peculiar situation, being protected by the chin, and possessing a certain degree of mobility, is not often broken. When the accident does occur, it is usually from a blow upon the neck, either by falling against some unyielding body, or from a sudden grasp of the hand or clinch of the fingers, or from the tightening of a bandage around the neck. The patient is generally made aware of the accident by a sudden sensation about the throat as though something had given way; severe pain is experienced in talking, deglutition, in fact, all movements bringing into motion the muscles connected with the hyoid bone aggravate the suffering. Salivation and tumefaction are likewise present, and sometimes hæmorrhage from the pharynx, cough, dyspnœa, and expectoration.

When passing the finger along the body of the hyoid, an inequality is perceived, although in some instances the tumefaction is so great that this may not be at once distinguished; after a time, however, the mobility of the parts can be more easily detected.

Fractures of this bone or of its cornu are often accompanied with severe complications, abscesses, œdema of the glottis, necrosis, severe lacerations of the soft parts. Puncture of the adjoining tubes and other untoward

accidents may lead to an unfavorable termination of the case—the complications being, as a general rule, of more import than the fracture.

Treatment.—In ordinary cases, excepting when the complications above alluded to are present, for complete reunion of a fracture of the hyoid, from six to nine weeks are required. Reduction of the fragments should be attempted as soon as possible, by introducing the finger into the pharynx, and moulding the parts, bringing them as nearly as possible into their natural position. There appears to me to be no especial rule as to the position of the head, whether it is to be thrown backward, forward, or sidewise. The position, according to circumstances, will vary in different cases, the one being preferable which brings the fragments most nearly in apposition. After the fragments are put in position, perfect rest must be enjoined, and the head placed in the most comfortable manner and supported. Talking or any movement of the jaws must be forbidden, and very light nourishment allowed, and that of the liquid kind and at long intervals. If the patient should apparently suffer from want of sufficient nutrition, injections of beef tea may be given *per rectum*. Compresses wet with a solution of arnica and water should be constantly applied to the throat.

Fracture of the Inferior Maxillary Bone.—In most instances fractures of the lower jaw occur in the body of the bone (Fig. 158), although the rami may be the seat of the injury, as may the condyles; though the latter is infrequent. The coronoid process, owing to its muscular covering, rarely suffers. Some surgeons deny the existence of fracture in the direct line of the symphysis, while others assert that separation of the bone does occur in a direct line in that part. It is, however, difficult to decide precisely the course of fracture. The *causes* are most generally direct violence, as a blow, fall, kick, etc., although a crushing force, as the passage of a wagon, or car, over the side of the face has produced a fracture of the body of the bone. The symptoms, in the majority of instances, are easily recognized. The line of the inferior maxillary is broken, there is crepitation when moving the part, and often very severe pain is experienced. When the bone is fractured near the middle, there is a tendency of the angles of the jaw to spread outward. The points of the teeth have lost their regularity, and when the bone is broken at both angles, the action of the throat muscles tend to draw the central fragment downward. If the ramus be broken, any motion of the part is exquisitely painful, and the suffering is sometimes attributed to the ear. In this variety of fracture the displacement is not so well marked as in other parts of the bone, on account of the thick, strong, and double layer of the masseter fibres, which cover this entire portion of the bone.

Fig. 158.

An occurrence may also take place in fractures of the lower jaw which may give rise to some perplexity, and perhaps may alarm the young surgeon. I refer to hæmorrhage from laceration of the inferior dental artery. It may happen that the fragments of the bone become impacted, or driven one behind the other, and Dr. Buck gives an instance in which he was obliged to dissect up the lip and use the saw before he could adjust the fracture. Sometimes, from laceration of the nerves, the soft parts become numb and insensible; and in the majority of instances there is necessarily difficulty of mastication and articulation, together with salivation and con-

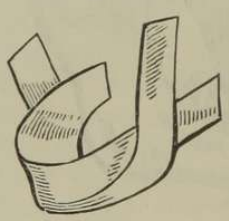
tusion. The prognosis in simple fracture is favorable; if the bone is broken in several places the treatment is often very unsatisfactory on account of the difficulty of keeping all the parts in proper position. Dr. Stephen Smith, of New York, reports a case in which, after the most careful treatment for one hundred and thirty-seven days, the bone had not united; and instances are on record where years elapsed without bony union taking place.

Treatment.—When called to treat a fracture of the lower jaw, the first thing to be done is to remove those teeth which the force has *entirely* separated from the alveoli, while those that are partially loosened should be carefully replaced in the sockets, and this must be attended to before dressings are applied. A great number of apparatuses, some of them extremely complicated, consisting of jack-screws, plates, wires, moulds of gutta-percha, bandages, slings, etc., have been devised for the treatment of fracture of the lower jaw. Many of these I shall not notice, but merely invite attention to those which are simple in construction and best suited to the object in view.

Velpeau,* on this subject, writes: "Unless there are very great displacements and difficulty in maintaining them reduced I abstain from applying any 'bandage.' The pain of the injury is amply sufficient to prevent the patient from making any injurious movements, and the consolidation is effected regularly without the patient being condemned to an immobility which is a real hardship."

The simplest contrivance is the four-tailed bandage, and many satisfactory cures have been made with it, and this, with the application of the pasteboard splint (Fig. 159) is frequently used by surgeons, especially by those residing in the country. To make the four-tailed bandage, take a piece of muslin, one yard and a quarter long, and tear it longitudinally at each end, to within four inches of its centre. To apply it, lay a piece of pasteboard, which has been moulded to the part, or the splint of Barton, on the jaw, and then having laid the middle of the bandage upon the chin, the two upper ends are carried backward and tied on the nape of the neck, and the two lower ones carried up over the sides of the face and tied at the occiput. Sometimes a slit is made in the centre piece through which the chin is allowed to protrude.

FIG. 159.



Silver wire has also been used to keep the fragments in apposition, and Dr. T. B. Gunning, of New York, has used vulcanized india-rubber.

Dr. Gibson's bandage (Fig. 160) is made by a roller an inch and a half wide, which is passed in circular turns under the jaw up the face, and over the head several times; it is then pinned at the temple and turned at right angles, encircling the back of the head and forehead by several turns; it is pinned again at the temple, and carried down the side of the face and pinned on a line with the chin; carried then, at right angles, several horizontal turns are made, embracing the chin and back of the neck. A strip of roller is then carried over the top of the head and pinned to the several turns, to secure the bandage from slipping.

FIG. 160.

Dr. Rhea Barton's bandage, with the use of a pasteboard splint, is one of the simplest and best that has been recom-

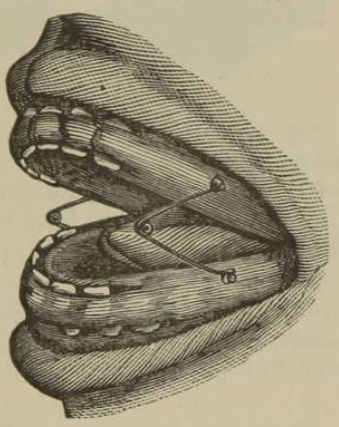
* Velpeau's Lessons, p. 15.

mended. It consists in a narrow roller, the initial end of which is to be placed under the occipital protuberance; the bandage is carried over the right parietal bone, obliquely across the coronal suture to the left temple, down the left side-face, under the jaw, up the right side-face, and obliquely over the coronal suture to the left ear (above it), being carried around the occipital protuberance to the right side, then passing under the ear, is carried around the chin, embracing the neck and chin by a circular turn; it is then carried on under the occipital protuberance, over the right parietal bone, and again obliquely over the coronal suture to the left temple, and continued in these turns until expended.

With each of these bandages it is necessary to have the compress or wet pasteboard well adapted to the jaw. The patient must be nourished by sucking liquids, the teeth always leaving sufficient space for this purpose. When the position of the fracture makes it practicable, it is a good plan to bind the teeth together at the seat of fracture by passing a silk ligature or silver wire around them. This plan is quite old and sometimes may be successful.

Dr. E. A. Clark, of St. Louis, invented an interdental splint of gutta-percha, which is held together with springs, and applied as follows: (Fig. 161.) The directions are in Dr. Clark's words:

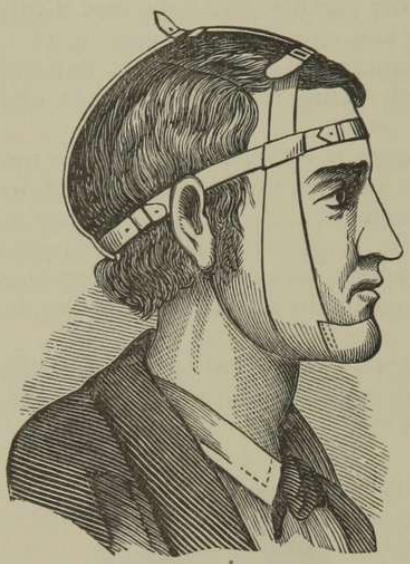
Fig. 161.



In order to adjust the splints properly, the springs should be compressed by grasping the plates between the thumbs and fingers so as to insert them between the jaws, and place them in proper position upon the crowns of the teeth, then force the fragments into their proper position, when the inferior plate will be found to fit the jaw accurately, which it will not do until the bone is properly adjusted. After the plates and fracture are once in position, the mouth will be forced wide open by the action of the interdental springs. This is counteracted by a sling bandage passing beneath the jaw and over the top of the head, forcing the jaws in such proximity as to leave a sufficient space between them in front so as to enable the patient to take food and drink, and at the same time allow him to talk so as to be understood distinctly, while he is also enabled to expectorate without difficulty. The amount of space that will exist between the plates in front, will depend upon the amount of force necessary to be used by the sling bandage, and which should be just sufficient to place the fragments in their proper axis. If the force required for this purpose should be greater than the resistance of the springs in any given case, and force the plates in contact with each other, the springs should be removed and replaced by stronger ones. Another difficulty existing in the apparatus of Gibson and Barton is obviated in this appliance, *i. e.*, instead of drawing the anterior fragment backwards, in which direction it is already displaced to some extent in fractures of the body of the bone, the interdental springs, when compressed by the sling bandage, have a tendency to push the anterior arch forwards, while, by keeping the inferior maxilla depressed by the force of the springs, the submental muscles are in a measure relaxed, and the tendency to displacement downwards and backwards of the anterior fragment is diminished. Indeed, the principle involved in the apparatus is to

substitute these two plates for the jaws, the former of which being entirely under our control by means of the interdental springs, so that just as we control the splints so do we control the jaw, while, at the same time, the force exerted is operating upon the entire surface of both maxillæ at the same time, thus adapting the apparatus to fractures occurring at any point of the jaw that can be reached by the material necessary to secure a cast of the fragments, regardless of the absence or irregularities of the teeth, or the character of displacement of the fracture.

FIG. 162.



Prof. Hamilton's sling is also often very serviceable, and is composed of a maxillary strap made of leather, which passes from under the chin perpendicularly upward, and buckles upon the top of the head. A counter-strap is then passed around the occiput and forehead, which, above the ears (Fig. 162), is looped upon the first-mentioned strap. A second counter-strap, called "the vertical," passes over the top of the head to the maxillary strap, which prevents the latter from dropping over the forehead. Beneath the symphysis the maxillary strap is narrow, becomes wider at the sides of the jaw, and to this, across the front of the chin, a strong piece of linen or webbing is stitched.

A most excellent interdental splint has been devised by Dr. Thomas Bryan Gunning, of New York. Dr. Goodwillie likewise has invented a useful splint for fracture of the lower jaw. For a full description of these splints the reader is referred to Nos. XVIII and XIX of the *New York Medical Journal*, to a *Report on the Progress of Surgery*, by E. A. Clark, and to a pamphlet on *Resection of the Maxillary Bones*, by Dr. Goodwillie.

FRACTURES OF THE TRUNK.

Fracture of the Vertebræ.—When we consider the peculiar manner in which the vertebræ are joined together, and how closely they are fitted by numerous joints to each other, the shortness of their processes, the roundness of their bodies, the double curve of the entire column when the body is erect, and the amount of tendon and muscular fibre with which they are closely connected, a fracture would appear almost impossible. Nevertheless, from great violence applied directly to the spinal column, or from the indirect force of a fall from a great height, these bones are at times broken. The symptoms of fracture of the vertebræ differ materially according to the portion of the column injured. Generally the most prominent symptom is paralysis. If the *lumbar vertebræ* are broken, the lower extremities suffer, and there is in most cases complete or partial paralysis of the legs, with involuntary passage of fæces and urine. Cases are recorded, however, where fracture has occurred below the second lumbar vertebra, without the power of motion being lost.

If the *dorsal vertebræ* are broken below the origin of the brachial plexus, the superior extremities are not paralyzed, nor are the lower, but there are abdominal and thoracic symptoms, torpid bowels, distended abdomen, and

retention of urine. If the upper dorsal or lower cervical bones are injured, there is either partial or total paralysis of the upper extremities, together with the general symptoms of paralysis exhibiting themselves upon the intestines and bladder. If the second or third cervical vertebra is injured the phrenic nerves are involved and death soon takes place. There may be crepitus, but in most cases it is absent, and *displacement* is often difficult to recognize.

With the foregoing statement of symptoms, and with a knowledge of the fact, that paralysis may occur from extravasation and concussion, it will readily be supposed that very often the diagnosis is extremely difficult, and the prognosis bad. In this connection, however, one point must be borne in mind, and it is this, that the spinous processes may be broken off without any material injury to other parts of the column.

Treatment.—Vertebral fracture is generally fatal; little can be done toward restoring displaced fragments, removing extravasations, or remedying the paralytic symptoms, the latter being caused by mechanical pressure. Professor Hamilton, the best authority on the subject, says :*

"The first and most important requisite of successful treatment in a majority of these cases, is a water-bed, since, without this, bedsores are almost inevitable, if life is prolonged a few weeks. I have, in a few cases of late, when the fracture was below the middle of the dorsal region, employed with advantage, moderate extension by means of a pulley and weight, the extension being applied to the lower extremities, in the same manner as in fractures of the femur. In case this plan is adopted, the bandages employed to make fast the adhesive plasters must not be applied very tight, lest they should cause œdema and excoriations of the limbs, and the weight must be light, not exceeding eight or ten pounds for an adult. In two examples, also of fracture of the cervical vertebræ, my patients have experienced great relief from extension in the opposite direction, by means of straps fastened under the chin and occiput."

Internal medication may be of considerable service in mitigating the sufferings of the patient. If inflammatory symptoms supervene, aconite, belladonna, nux vomica, strychnia, veratrum viride, phosphorus, cuprum, ignatia, cocculus, zincum, and that class of medicines, selected according to presenting symptoms, may be prescribed.

If there be violent fever, with inability to pass urine, acon. may be administered, at the same time compresses moistened with arnica solution may be applied to the seat of fracture. If there be much urinary tenesmus, canth. alone, or in alternation with arnica, will probably relieve the patient, if not, bell., camph., hepar, puls., or sulph., may produce the desired effect. If these means also fail, the catheter should be used.

If there be a tendency of the spinal cord to take on inflammatory action acon. should be used ; it is one of the most highly recommended medicines in the treatment of myelitis.

When the inflammation is seated in the lumbar and sacral regions, when the adjoining abdominal organs are affected, and the alvine evacuations difficult, bry. should be administered.

Ars., bella., cocc., dulc., dig., ignat., nux vom., puls., and veratrum may also have to be employed.

Effusion of blood and suppuration sometimes occur in the course of the spinal marrow, and in its sheath, which give rise to very untoward symptoms.

The patient must be kept at perfect rest, in the horizontal posture, and

* The Principles and Practice of Surgery, New York, 1872, p. 265.

the greatest care be taken to prevent gangrene of the nates. This may be effected by arranging pillows or air-cushions in such manner that the parts are equally supported. If the skin assume a bluish appearance, or, from the constant irritation of the parts, bedsores are present, a solution of arnica applied to the part greatly relieves the sufferings of the patient.

Fracture of the Ribs.—This fracture results from being run over by heavily laden wagons, or by being crushed between cars, or being thrust forcibly against a wall. A powerful force is required to fracture a rib, especially in children, in consequence of the mobility of these bones, and their attachment anteriorly to elastic cartilages. The ribs which are most frequently fractured are those which give roundness to the chest; they are mainly the fifth, sixth, and seventh. The accident is generally produced by indirect violence. The bones are most apt to yield about one-third, either from their posterior or anterior termination, and the fracture generally is slightly oblique. A single rib may be broken, or several may participate at the same time. In the case of an old gentleman who was caught between two cars, both in motion, at a railway station, four ribs gave way, the fourth, fifth, sixth, and seventh, the patient hearing distinctly the snap of each fracture; the clavicle also was broken.

In these cases there is acute pain of a sticking character at the place of injury, painful respiration, crepitus often, especially in lean subjects, and in a majority of cases emphysema. The patient often is conscious of the crepitus, detecting it when he attempts to take a full inspiration. These fractures are not dangerous in themselves, but may become so from the irritation produced from constant friction of the fragments, which are often spiculated, against the pleura and lungs.

Treatment.—The most approved treatment of fractured ribs is to envelop the body with a belt, or encircle the thorax with adhesive straps, bringing the bones as nearly as possible into apposition. To accomplish this two pieces of plaster should be heated at once; the initial end of one should be placed on the anterior face of the thorax, and the initial end of the other on the posterior surface of the chest. Having these well secured, traction should be made on the free ends of the plaster, which are to cross each other as they are laid over the chest. For this purpose, gauze and collodion will answer every requisite, and will "hold" even better than the adhesive strips, possessing the advantage of allowing any application to be made to the contused surfaces. If the fragments should press into the lung-structure and so endanger the patient's life, the propriety of resection, or at least elevation of the offending piece of bone should be considered.

If the lungs have been wounded, or any of the internal structures implicated, arnica or calendula lotions should be kept applied to the part, and either administered internally, according to the character of the wound and the symptoms manifested. If inflammation of the pleura supervene, arnica is an excellent internal medicine; its characteristic indications are, stinging pain in the affected part, dyspnœa, short, dry cough, general internal heat with coldness of the hands and feet. Other medicines are, sulph., scill., bry., nux vom., or ant. tart.

The costal cartilages may also be fractured, the repair in such cases being by bone, not cartilage. The force required to break these elastic communications of ribs and sternum is very great, and fatal results often accompany the accident from severe injury done to other organs. The *treatment* is the same as that for fractured ribs.

Fracture of the Sternum.—When a fracture of the breast-bone takes place it is usually at its articulations with the ribs. The bone originally is

developed from six points of ossification, and is not fully solidified until adult age.

This fracture is usually transverse and is occasioned by direct violence. The lower fragment rides slightly upon the upper, and by placing the patient in an upright position and forcibly drawing back the shoulders and raising the arms, crepitus and mobility are detected. The accident, like fracture of the ribs, is often complicated with severe injury of the thoracic organs, and often is followed by suppuration and hectic.

Treatment.—The patient must be placed in the upright position, the shoulders drawn back, and pressure made upon the overriding fragment. When this is adjusted, or nearly so, a compress should be placed over the site of fracture, and adhesive straps applied around the chest above and below, as well as over the fracture. A figure-of-eight bandage around the shoulders, crossing over the back, will assist in maintaining the bones in position.

Compresses, moistened with a solution of the tincture of arnica, should be applied to the fractured part, and a dose or two of the medicine administered internally.

If the fever be synochal, the pulse hard, quick, and full, the face red, excessive chilliness or heat; the pains in the chest violent, and the respiration oppressed and accompanied with anxiety, *aconite* should be given in repeated doses.

If the pain in the chest is not exceedingly severe, but there are evident signs of inflammation of the lungs; if a loose cough be present, the oppression not excessive, with constant desire to inspire, *bryonia* should be exhibited.

Bella. will be found suitable, when the fracture has occurred in plethoric subjects, when there is a tendency to congestion of blood to the brain, with delirium, when the face is bloated and very red, the lips and tongue cracked and dry. This medicine may, in severe cases, be used in alternation with aconite.

When there are evident symptoms of violent pneumonia, with sticking pains in the chest excited by coughing or breathing (also pleuropneumonia), when the pains are violent and extend over a large surface, when a considerable portion of the lung is inflamed, with dyspnœa, when the cough is dry and the sputa rust-colored, *phosphorus* is indicated, and will probably relieve the patient in eight or twelve hours. This medicine may be given in alternation with aconite or bella., agreeably to the presenting symptoms. For further treatment of pneumonia the student is referred to works on the *Practice of Medicine.*

Carious portions of the bone can be removed by Hey's saw, bone-nippers, and forceps; but aid in this way should not be rendered too officiously, lest harm, instead of good, result.

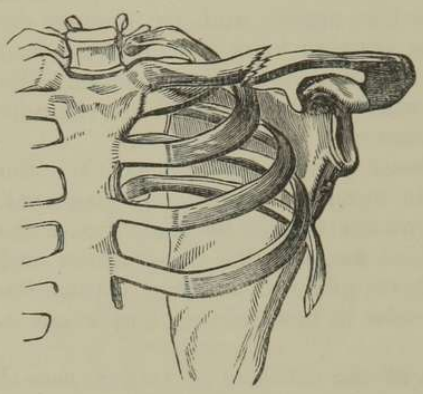
The trephine has been successfully used in evacuating collections of pus in the anterior mediastinum.

Fracture of the Clavicle.—A fracture of the collar bone may be caused either by direct or indirect violence, although most frequently by the latter. The exposed situation of the bone itself, it being the immediate support of the shoulder, renders it very liable to be broken by a counter-stroke, as a fall upon the hand, or the stretching out the arm for protection when falling. If the bone were straight it would even be more obnoxious to fracture, but nature, for its safety, gives it the shape of the italic letter *f*, which, being a double arch, adds materially to its strength.

The clavicle may be broken at its outer, its middle (Fig. 163), or its

inner third. Often the diagnosis is easy, but sometimes an occasion of extreme difficulty. When the fracture takes place at the middle third, the deformity is well marked; the outer fragment is displaced inward and downward, occasioned partly by the dropping of the arm and partly from the action of the muscles which pass from the trunk to the shoulder, drawing upward the inner fragment. The shoulder is flattened; the patient supports the injured side with the hand of the sound side applied to the elbow. The integument is stretched tightly over the protruding end of the bone; crepitus can be produced by raising and rotating the shoulder; indeed, the whole appearance of the patient proclaims "fracture of the clavicle." It has been stated that the shortening and deformity which exist, even after the best managed cases of this fracture, are greater than those of any other bone, excepting, perhaps, the femur.

FIG. 163.



Oblique Fracture near the middle third of the Clavicle.

Fracture of the Acromial Fxtremity of the Clavicle.—If the bone is broken between the coraco-clavicular ligaments, there is seldom any displacement, only a slight alteration in the direction of the bone, its *convexity* being increased.

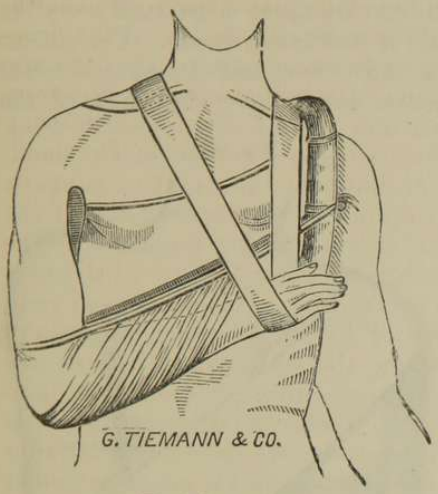
Treatment.—Numerous appliances have been introduced from time to time for the treatment of this injury, some of which are cumbrous and difficult of application, while others have the advantage of simplicity and effectiveness. Dessault's apparatus with its three rollers and anterior and posterior triangles, has fallen almost entirely into disuse. Most of the more recent appliances partake, more or less, of the principles of Fox's apparatus.

This latter contrivance is in use in the Pennsylvania Hospital, and proves extremely satisfactory. It consists of a padded ring with buckles attached, which fits over the sound shoulder; and of a wedge-shaped pad which fits into the axilla of the injured side. From the top of this pad, pieces of webbing are fastened, one of which is to be passed anteriorly over the chest and buckled to the ring over the sound arm; the other to be passed over the posterior wall of the thorax, and fitted to the posterior portion of the ring; a sling made of stout linen or other material, in length about two-thirds of the forearm, and in depth sufficient to cover it completely, is then applied to the elbow and secured tightly to the ring (Fig. 164). Dr. G. M. Pease, in the *Medical Investigator*, of April, 1869, page 241, gives a modification of Fox's clavicle apparatus.

The following is the very ingenious apparatus of Dr. Levis. It consists of a pad for the axilla, a shoulder strap, and a sling, and is adjusted in the following manner: The arm is passed through the opening above the pad, the wide band is thrown across the opposite shoulder, the elbow placed in the sling, and the long strap attached to the back of the sling and brought round in front. The extra buckle noticed in the figure at the front of the wide band comes into use when the apparatus is applied to the opposite shoulder. The apparatus is seen in Fig. 165. Many surgeons are opposed to the pad in the axilla, believing that it makes too much pressure upon the great vessels and nerves; and there is no doubt that serious consequences have followed its application. To dispense with using the pad, patients willing to submit to the irksomeness of the method have been

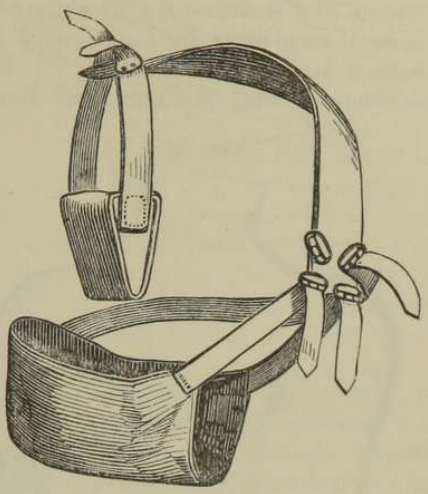
placed upon the back, with the head low and with a hair pillow between the shoulders, until the fracture is united, the use of any apparatus being

FIG. 164.



Fox's Apparatus.

FIG. 165.



Levis's Apparatus for Broken Clavicle.

unnecessary. In hospital practice this plan is often ineffectual, because the patients become dissatisfied, supposing that nothing is being done for them. The following is a case in point:

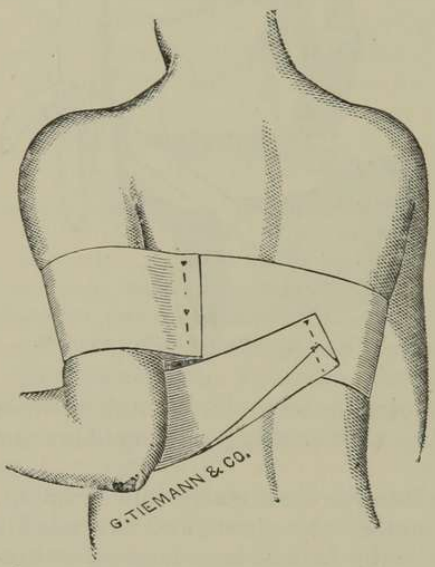
H. R., aged 40, applied for admission into the Good Samaritan Hospital. Upon examination I ascertained a fracture of the clavicle at the middle and sternal third. Upon inquiry I discovered he had been in another hospital for ten days. Upon further questioning he informed me that he had obtained his discharge because they did nothing for him, but "put him in an uncomfortable bed." I placed upon his shoulders the yoke which comes with Day's patent splints, taking care that the extremities of the splint projected a considerable distance beyond the shoulder (far enough to prevent his turning in bed), and placed him in the recumbent position. He became satisfied, endured considerable pain, and made a fair recovery with the bone shortened a quarter of an inch.

Another simple method for fulfilling the indications of upward, outward, and backward is by placing a folded towel in the axilla of the injured side, and passing a figure-of-eight bandage around from shoulder to shoulder; or a padded belt may be placed around each shoulder and drawn together by a strap on the back.

A dressing of adhesive plaster, as practiced in Bellevue Hospital, was first suggested by a surgeon residing in Western New York. Dr. Lewis A. Sayre gives an excellent description of it in *Bellevue and Charity Hospital Reports* for 1870, p. 131. "The dressing is prepared by cutting from strong adhesive plaster—that spread on canton flannel or jean is preferable—two strips, from four to six inches in width, and one half longer than the circumference of the chest. These are to be applied as follows: Begin by fixing the end of one strap upon the inside of the arm of the injured side, opposite the insertion of the deltoid; carry the strap across the belly of the biceps and around the back of the arm, bringing the arm well back. Continue the strap horizontally across the back and around under the nipples to the back (Fig. 166). In fixing the end to the arm, care must be taken not to begin too far back, lest the arm be girded and the circulation arrested. Into the axilla a pad of proper size should be placed, and the

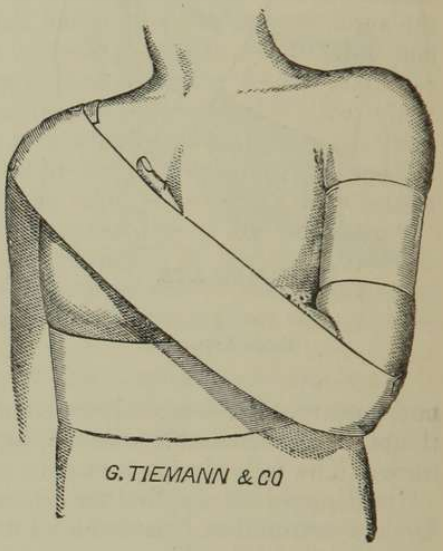
elbow pressed to the side, which carries the shoulder well outward. The hand should then be carried high up on the sound shoulder, and the elbow supported at the desired point, while the second strap is applied as follows: Begin in front of the sound shoulder, and carry the strap over the shoulder diagonally down and across the back, so that its upper edge shall cross the injured arm near the junction of the middle and lower thirds. The plaster is then moulded to the back of the arm and elbow, and dorsal and ulnar surfaces of the forearm, and finally drawn firmly over the back of the

FIG. 166.



Sayre's Dressing for Fractured Clavicle. First Strap.

FIG. 167.



Sayre's Dressing. Front View.

hand, overlapping the other end of the plaster on the top of the shoulder (Fig. 167). It is well to fasten the ends together by a pin, which prevents the possibility of slipping. At the elbow the plaster should be made to fit accurately by cutting nicks in the end and lapping them." There are several other means for the treatment of fractured clavicle, and as has been already mentioned most of them are constructed upon principles similar to that of Fox.

Fractures of the Scapula.—Fractures of the shoulderblade, especially in the vicinity of the surface articulating with the humerus, are very difficult to diagnose. There is generally so much injury to the soft parts, that the movements necessary to establish diagnosis are with difficulty performed. In fact, a mere blow upon the deltoid may so impair motion, and give rise to so much swelling, that the parts may assume an appearance similar to that of a severe injury of the joint itself.

Fracture of the acromion and neck of the scapula; dislocation of the humerus downwards; fracture of the neck and head of the humerus—all have many of their symptoms in common, and all require the most careful manipulation, thorough anatomical knowledge, and an acquaintance with the signs which may be diagnostic of each.

Let me illustrate this by a case or two in point, which have occurred in my practice, and which caused me considerable anxiety.

Case.—A man aged forty-five was driving a loaded wagon which came in contact with a street car. By the violence of the concussion he was thrown upon the pavement, striking on the right shoulder. He was very severely bruised, and being picked up by passers-by, was carried to the

office of a neighboring physician. The medical man diagnosed a dislocation of the humerus into the axilla, and called in assistance for the reduction. Several men were required, and after a time the arm was said to be replaced, and the patient was sent to his home. He was placed in bed, and shortly after a most severe chill resulted, followed by high fever. The arm still remained powerless at the side, and other physicians were summoned. He gradually improved in his general condition, but his arm hung still helpless; his friends consulted many medical gentlemen, with as many different opinions. I saw the patient in consultation. His case presented the following symptoms: There was a prominence over the point of the acromion, but the shoulder was otherwise round. There was a slight depression toward the extremity of the spine of the scapula. The arm could be moved in different directions without much pain, and the hand could, with difficulty, be placed upon the opposite shoulder. There was some swelling in the axilla, and I thought that I could detect the head of the bone in that situation. Six or eight weeks had elapsed since the accident, and I was quite at a loss for a correct diagnosis.

I could not agree with those surgeons who had declared that a downward dislocation existed, nor could I satisfy myself as to the exact nature of the accident. I placed the arm in a sling, and supported it well at the elbow, and extended a spiral bandage around the chest. Shortly after I saw him the second time, and found him not much improved. A few days after this a relapse of fever occurred, and he died in about a fortnight. A post-mortem examination, besides revealing multiple abscesses in the liver, which I am well convinced were caused by the severe contusion, showed about three-quarters of an inch of the acromion process fixed firmly to the head of the humerus, and a slightly ligamentous growth extending from the broken extremity of the spine of the scapula to the acromion process. The case was one of great interest to me. I am very sure I may assert that fractures of the acromion, especially when there is but little displacement, are very difficult to diagnose.

Case.—A young lady was thrown violently from a carriage, and struck upon her right shoulder. She was carried to a physician who stated that nothing but a contusion existed. The arm was powerless, and the pain severe. After a period of some weeks she was seen by her own medical adviser, with whom I saw her in consultation. The head of the bone was in the axilla and to be felt. It moved with the humerus, there was the double inclined plane formed by the muscles of the arm, and I was disposed to regard the case as one of an unreduced dislocation. There was, however, some considerable motion of the part. By manipulation and rotation, I brought the parts in apposition, and, having them held, applied a bandage. The shoulder looked well after the dressing was applied, but in two days the patient returned with the arm in the same position as formerly. There was a depression below the acromion, quite well marked. The head of the humerus was again in the axilla. The arm could be moved in various directions without very much pain, and with but slight difficulty the hand could be placed upon the opposite shoulder. When the arm was raised at the elbow, the shoulder appeared much more natural, but the deformity returned when upward pressure was relaxed. The diagnosis was a fracture of the neck of the scapula. A wedge-shaped pad was placed in the axilla, the arm secured to the thorax, and a sling used to elevate the elbow. In both of these cases I could not detect any crepitus—and for this reason I record them. In the latter case, it will be remembered that four weeks had intervened between the accident and the examination, and in the former, at least two months. I mention these cases because they are both instructive in several particulars.

Case.—A gentleman of forty fell down through a hatchway a distance of over thirty feet. He did not recollect exactly the posture he assumed as he fell, and must have lain for a considerable time, perfectly stunned by the severity of the blow. When I saw him, about four hours after the injury, there was immense tumefaction of the shoulder. No depression could be felt under the acromion process. I could not feel the head of the humerus within the socket, nor within the axilla; accurate measurement showed no appreciable alteration in the limb; yet, by fixing the shoulder, and rotating the arm, crepitus was detected. The elbow could be placed at the side, and could, with much pain, be moved backward and forward. The fracture was no doubt one of the intracapsular variety of the head of the humerus. A simple sling and a narrow oblong axillary pad were all that was required. A good recovery resulted.

I will now proceed to speak more in detail of these accidents occurring to the shoulderblade. These injuries cannot be too carefully studied by the surgeon. They give the greatest anxiety to the most experienced, and often present really insurmountable difficulties in diagnosis.

A fracture of the scapula may occur in the body, as well as at the neck or processes of the bone. It is, in the majority of instances, the result of direct and great violence. Oftentimes there is so much tumefaction, that the diagnosis, especially in muscular or corpulent subjects, is very difficult.

In examining a patient where such fracture is supposed to exist, the first course to be pursued by the surgeon is to trace with his finger the whole contour of the bone. He should then manipulate, or endeavor to move its body, both above and below the spine, and finally should press gently along the entire course of the spine itself, a fracture of which is more easily recognized than that of the body of the bone.

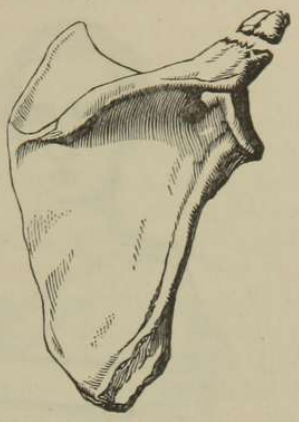
The forearm should be laid across the posterior wall of the thorax, when there is reason to suspect a fracture of the infraspinatus fossa. The diagnosis is also rendered more difficult by the *absence of crepitus*. This may result from the wide separation of the fragments, or from their closely riding one upon the other. Though in fracture of the blade, there is difficulty of motion in the shoulder, yet we must bear in mind that contusion may produce this same symptom, especially if the muscles are severely bruised. The most general site of fracture of the body of the bone is below the spine, and it is generally broken transversely. The scapula may also be incompletely fractured, of which Prof. Hamilton records an example.

Treatment.—A great variety of bandages have been devised for the treatment of this fracture. The simplest of these is probably the best, and this consists of a bandage and sling, having at the same time the elbow carried a little backward. The arm should be allowed to hang by the side of the thorax, and then bandaged to the body, with the elbow in the position above named; the forearm should be supported by a sling.

Fracture of the Coracoid Process.—This portion of the bone is not very liable to be broken, and distinguished surgeons have not, during an extended practice, met with it, although there are, no doubt, many well-authenticated cases upon record which prove beyond doubt that such an accident may occur. As a general rule, however, there is more or less complication in these accidents. A case came under my own observation in which a man, having fallen from a height and upon the right shoulder, broke off the coracoid process. The fracture was not recognized for some eight or ten days on account of the amount of swelling. If the fracture is complete and the coraco-clavicular ligament is ruptured, the combined action of the coraco-brachialis muscle, the pectoralis major, and the long

head of the biceps, tend to drag down the fractured end of the bone. To fulfil properly the indications in the treatment of this fracture, it will be necessary to fix the body of the scapula by frequent turns of the roller, or by long and broad bands of adhesive plaster well applied. The elbow must then be drawn forwards upon the anterior portion of the thorax, and the forearm placed in a sling.

Fig. 168.



Fracture of the Acromion Process.—This lesion is of rare occurrence, and if there be no displacement, it will be next to impossible to obtain a clear diagnosis. The best method of proceeding, is to pass the finger along the spine to the process, where the end of the fracture may be felt. Perhaps crepitus may be detected, or the line of the spine may be broken, and the depression behind the acromion will point to the diagnosis. (Fig. 168.)

The following may be found useful as diagnostic signs:

Fracture of the Acromion.	Dislocation of Humerus into the Axilla.
Limb movable.	Limb almost fixed.
Hand can be placed upon opposite shoulder.	The reverse.
Deformity remedied by lifting the shoulder and by raising the elbow.	Arm cannot be lifted to its place.
Deformity recurs upon relaxing the upward pressure.	Deformity the same; cannot be removed by upward pressure.
Crepitus may be detected.	No crepitus.
Depression found by tracing spine toward the acromion.	No depression.

The apparatus for fractured clavicle, carefully and firmly applied, will always be found sufficient for fractures occurring behind the acromio-clavicular articulation; whereas, if the break is found to be anterior, the patient must be laid upon his back, and the arm fixed nearly at a right angle with his body, thereby relaxing the deltoid, and lifting the fractured extremity to its place.

Fracture of the Neck of the Scapula.—This form of accident does not very frequently happen. The symptoms which indicate it are more positive than those belonging to the breakage of the processes, which have just been described, and which have many indications in common with downward dislocation of the humerus. The inexperienced may mistake the fracture for the dislocation. I have now a case in mind, where a man of sixty was placed under the influence of chloroform, and three stout Irishmen were ordered to pull upon his arm. This great pain was unnecessary, for there was no dislocation, but a fracture of the neck of the bone. More than one suit for malpractice has been instituted, and damages recovered for the mistake made by the surgeon in diagnosing a dislocation downward of the shoulder, when there was actually a fracture of the neck of the bone. In both we have the head of the humerus in the axilla; in both we have a depression under the acromion process; the same loss of motion, the same flatness of the shoulder; and the same numbness and pain in the arm. The chief diagnostic signs are: First, that the parts may, with moderate facility, be restored to their normal position, but so soon as the sustaining force is removed, the deformity reappears. Secondly, crepitus may be felt, by having an assistant fix the body of the scapula; then the surgeon,

raising the arm upwards with his right hand and manipulating the shoulder with his left, will feel the grating of the fractured extremities. It may be well also to remember that the flatness of the shoulder may assist in diagnosing this injury from fracture of the head of the humerus, and that in the latter the limb is shortened.

Fig. 169.

The treatment is quite simple. Replace the humerus in its normal position; keep it there by the sling and pad used in fracture of the collar bone. Then fix the scapula by a bandage passed around the chest and over the shoulder, or by broad adhesive strips.

Dr. C. H. Von Tagen* reports a case of fracture of the neck of the scapula treated by means of the third bandage of Dessault, with Fox's ring and sling, which made a good recovery.

In Fig. 169, an apparatus for fracture of the neck of the scapula is seen (without the sling), which will be readily understood.

FRACTURES OF THE PELVIC BONES.

Fractures of the Os Innominatum.—Fractures of the pelvis are generally occasioned by great violence. Indeed, when we consider the formation and position of the bones composing this portion of the human skeleton, it would seem that nothing but great force could cause a solution in their continuity; yet, in my researches upon this subject, I find a case recorded by Cappelletti, in which the ascending branch of the ischium and descending branch of the pubis were broken by muscular contraction. The patient, fifty-four years old, had jumped from a carriage (the horses having run away), with one leg in the greatest possible degree of abduction. This case I find recorded in Ranking's *Half-Yearly Abstract of the Medical Sciences*, for 1848, p. 83.

Mr. Handcock, in the *Lancet*, for May 23d, 1846, reports a most interesting case of fracture of the *descending ramus of the pubis*. The patient fell from a height of about fourteen feet, and presented the usual symptoms of shock; the following symptoms then resulted, which will give a fair *résumé* of what may be found in such cases: "On the tenth day, the patient got out of bed for the first time since the accident, and endeavored to dress himself; but although entirely free from pain in the buttock, he was unable to raise his left foot from the ground; and, in attempting to do so, he said he felt something move in the perinæum. Crepitus was felt close to, but rather higher than the junction of the ramus of the ischium and pubis on the left side. The shape and position of the limb were natural. There was exact correspondence of the length of the limb with its fellow; the limb resting on the bed in its straight position could *not* be raised beyond about an inch, and then only with great pain, neither could it be abducted beyond a certain distance (twenty-three inches measured from heel to heel). When the patient lay straight in his bed, he could bend his knee, and after-

* United States Medical and Surgical Journal, vol. ii, p. 51.

wards approximate the thigh to his body, the foot being in this way entirely raised from the bed. He could not assume the sitting posture without supporting himself on his hands. For ten days, the patient always referred his suffering to the left nates and the lower parts of his back, and never to the seat of fracture, but this may be referred to the bruising of his buttock having been so severe." There was not the slightest injury to the urethra and bladder. Mr. Handcock states that, in examining a patient for this accident, the limb should be abducted to put the adductor and gracilis muscles upon the stretch, and the thigh afterwards rotated upon its axis; as when rotation and circumduction were employed, whilst the limb was adducted, no crepitus was felt, but after previous abduction, crepitus was distinctly evident.

This remarkable case, which presents many symptoms to be remembered, recovered without a single untoward symptom; the complete use of the extremity being regained. As has been before stated with regard to dislocation of the pelvis, fractures are not necessarily fatal; the danger being as a rule in proportion as the viscera are implicated.

Hamilton reports several cases of comminuted fracture of the pelvis which it is unnecessary to quote here as the work is accessible to all. He is of opinion that there is not much displacement, and if any occur, it is in the upper fragment, which is carried slightly inward, although he admits that occasionally it is displaced upward, outward, or downward. He also quotes from the *New York Journal of Medicine*, a case reported by Lente, in which a dislocation and fracture of the alæ of the pelvis on the same side were recognized; the patient died, and "the autopsy disclosed what had not been suspected during life, viz., that the left ilium was broken horizontally about its middle, and vertically through the crest, and also that there was a fracture extending through the sacro-iliac synchondrosis, accompanied with considerable comminution of the articular surfaces. It was also found that a portion of the small intestine was ruptured, and probably by one of the sharp fragments of the broken pelvis."

The anterior superior spinous process of the ilium is also sometimes broken. The fragments are generally displaced downwards, and motion and crepitus are distinct. In such cases the patient must be laid upon the back, and the limbs drawn upwards to relax the muscles attached to the process, and a bandage applied. The latter, however, is not absolutely necessary, as cases are recorded wherein a good result was obtained by keeping the patient in the position alluded to.

Sir Astley Cooper—*vide* Cooper's and Travers's *Surgical Essays*, Philada., 1821, p. 39—says: "I have known three instances of fracture of the os innominatum recover; two of these were fractures of the ilium, and the nature of the accident was easily detected by the crepitus, which was perceived upon moving the crests of the ilia; the third was a fracture of the junction of the ramus of the ischium and pubis. In the first two, a circular roller was applied upon the pelvis, and the patient freely bled; but in the latter no bandage was employed." Mr. Sandford gives the details of a fracture passing through the body of the pubis on the left side, and through the ramus of the left ischium. The patient was aged thirty years, and the accident had been produced by her body being pressed by the wheel of a cart against a lamp-post. This case is too lengthy to quote in this place. The symptoms were crepitus and mobility, easily recognized by placing the patient on the face, one hand on the back of the right ilium, and the other on the pubis of the same side; the posterior spine of the ilium projected upwards; a vaginal examination revealed the pubis passing inward into the cavity of the pelvis; there was also some extravasation of blood, vomiting, cold feet, severe pain, great thirst; pulse 90 and small; the

right leg was shorter than the left, with numbness of that side. She lived about three weeks; the autopsy revealed what I have already stated.

In such cases the extension treatment is the appropriate one, and it appears to me that a most excellent apparatus would be the wire-gauze splint of Hamilton, applied with appropriate pads, with an additional band in front.

It very often happens, as will be seen from the cases mentioned, that fractures of the pelvis are comminuted; the pubis and ischium may be fractured; a distinct portion of bone may be severed; these, if they do not unite, must be exsected.

Fractures of the Acetabulum.—This injury is more difficult to diagnose than any other affecting the pelvis. In this remark I should exclude, perhaps, the breaking off of the rim or lip of the cotyloid cavity, which often happens in the ordinary dislocations of the femur, more especially than on the dorsum ilii. In such cases, crepitus is present when the reduction is being effected, and there is a great tendency for the head of the bone to slip from its socket when the extending force is withdrawn. In such cases permanent extension and a circular pelvic bandage generally suffice.

The difficulty in obtaining a correct diagnosis when fracture of the acetabulum takes place is very great, because the symptoms may simulate closely those belonging to dislocation or fracture of the neck of the femur; and although Mr. Travers asserts, *vide* Holmes's *System of Surgery*, vol. ii, p. 713, that "very acute pain produced by pressure upon the projecting space of the os pubis, and the inability of the patient to maintain the erect posture immediately after the infliction of a blow or fall which produces the mischief," diagnosticate fissures or cracks in the acetabulum, yet there are some other symptoms that must be considered when the fractures are more extensive, especially when by sheer force the head of the femur has been driven through the cotyloid cavity.

It is well known that there is a junction of the ilium, ischium, and pubis within the acetabulum, and cases are recorded by Earle, Cooper, and Travers, where the bones separated at their anatomical junction. When, however, the thigh-bone is driven through the acetabulum, then the symptoms are very liable to be confounded with fracture of the cervix femoris, as well as dislocation of the thigh-bone. Mr. Earle, in the nineteenth volume of the *Medico-Chirurgical Transactions*, gives four cases which closely simulated fracture, there being eversion of the foot and loss of prominence of the trochanter, the diagnosis being chiefly made out by the fact that the limb could be drawn outward to a considerable degree without suffering, which cannot be effected without much pain if the bone is broken.

Another case, however, is recorded in the *Cyclopædia of Anatomy and Physiology*, in which the limb was two inches shorter than the left.

Sir Astley Cooper, in the essays already quoted, relates a case that "was admitted to Saint Thomas's Hospital, having the appearance of a dislocation backward. The patient lived four days. On examination, the fracture was found passing through the acetabulum, dividing the bone into three parts, and the head of the thigh-bone was deeply sunken in the cavity of the pelvis."

Mr. William M. Tyer gives three cases of a similar injury, two of which were mistaken for fractures of the neck of the femur, and the third for dislocation. It is a curious fact that, in the majority of cases of this variety of fracture, the cervix femoris has been found entire, although I find the record of one case, by Dr. George W. Gibb (*Ranking's Abstract*, 1849), in which not only was the acetabulum extensively fractured, but there was an intracapsular fracture of the neck of the femur. He also gives another most interesting case of comminuted fracture of the pelvis, from which he

draws such pertinent deductions that I quote them entire. He says of his case:

"1st. There were the symptoms of fracture of the cervix femoris, when that lesion was not present, as eversion of the foot, shortening, crepitus, etc., and great nicety was required in forming a correct diagnosis.

"2d. The shortened member could not be drawn down to an equal length with its fellow of the opposite side, neither could it be inverted, and motion in almost any direction gave great pain.

"3d. None of the pelvic viscera were injured, although the catheter had occasionally to be used, and blood was passed at stool.

"4th. The fracture had become perfectly united, and the patient was on the eve of discharge, when another cause produced death.

"5th. The sequence showing the union of the bones, bent in an irregular manner, the formation of a ligamentous acetabulum, with the wise provision of nature in the total absence of any new deposit within the articulation which might have interfered with the function of the joint."

From what I have already written, and as has already been mentioned, from a careful inquiry and research, it has been found that the neck of the thigh-bone is rarely fractured in these injuries; that in the majority of instances, if the limb is turned outward, the trochanter having lost its prominence, with shortening, and severe pain when moving the limb in any direction, that we may be tolerably sure of fracture of the acetabulum. If the foot is inverted, and the head of the femur cannot be discovered in either of the positions it is known to assume in the various forms of dislocation, the fact must be remembered, that often the posterior lip of the acetabulum is broken, and the femur *may* be dislocated. The presence, however, of the head of the bone on the dorsum will readily diagnosticate the luxation.

From the record of these cases, it appears that the treatment in most cases of fracture of the innominata, consists, if possible, in reduction of the bones by proper manipulation, for which no especial rules can be laid down, each case being left to the judgment of the surgeon, and proper extension applied. Even the latter is not always necessary, as good recoveries have been made by perfect rest and the body bandage.

It is a question in my own mind, whether the median section of the perinæum would not be a proper step to pursue in cases of rupture of the bladder, when the surgeon is called shortly after the accident, as such measures have lately been resorted to with good results in perforation of that viscus by disease.

FRACTURES OF THE UPPER EXTREMITY.

Fracture of the Humerus.—The humerus may be broken in a number of ways, either in the shaft or extremities of the bone—the head, the surgical and anatomical neck, the greater tubercle, the condyles, either one or both, are all liable to the accident; and this bone, serving such an important part in the usual avocations of life, it behooves us to study carefully both the nature and treatment of those fractures to which it is liable, and to understand especially the relations of the soft parts to the osseous structure, particularly the insertion of the deltoid. The supra and infraspinatus, and the teres minor attached to the greater tubercle; the subscapularis to the lesser tubercle; the triceps behind, and the brachialis anticus and the biceps in front, all give certain direction to the displacements which occur in fractures in different portions of the bone.

There is sometimes a variety of that form of paralysis known as "wrist-drop," which may result from injury to the musculo-spiral nerve, or one of

its branches, in fracture of the shaft of the humerus, or in fracture of the condyle; then the hand falls into a state of pronation and flexion. In the college clinic such a case presented, in which the condyle had been broken off, partial paralysis resulting.

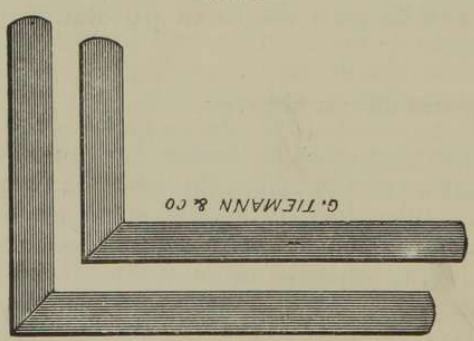
We may begin by considering that variety of fracture which is perhaps the most simple, viz., fracture of the shaft of the bone. This accident occurs generally about its centre, and, as a rule, it is found more frequently at the lower than at the upper half. It is, in the majority of instances, oblique, and the displacement takes place in different directions according to the seat of the fracture, and may, in extent, be from a half to three-quarters of an inch. Crepitus is usually well marked, the deformity apparent, except in transverse fractures, and the indications of treatment are simple.

Treatment.—Extension must be made to bring the bones into apposition, and a carved splint, or one of felt or leather, or binder's board, moulded to extend two-thirds of the distance around the arm, must be placed on the outside of the arm and should extend to below the elbow; this splint must be carefully applied while extension is being kept up by assistants. A second short splint then may be applied on the inside of the arm, and both secured by a well-applied roller. The forearm must then be placed in a sling, but without support at the elbow, as the weight of the arm will have a tendency to keep the bones in apposition

In this variety of fracture the leather and wooden splints are found very efficacious. The carved splint of Mr. Day also can be used, and will give satisfaction. In my own practice I use generally the long outside splint, and apply to the inside of the humerus a light wooden or pasteboard splint, which I inclose with the same bandage, and place the forearm in the ordinary sling. At times, when there is a strong disposition of the bones to lap over each other, Prof. Hamilton lets the forearm hang, thus promoting more prolonged and powerful extension, and relates cases where such treatment was followed by excellent results.

Fracture at the Base of the Condyles.—These fractures generally are occasioned by indirect violence, as a blow or fall upon the elbow, although cases are recorded where they have been the effect of a direct blow upon the humerus, immediately at the base of the condyles. The direction of the fracture in the majority of instances is oblique and upward and backward.

Fig. 170.

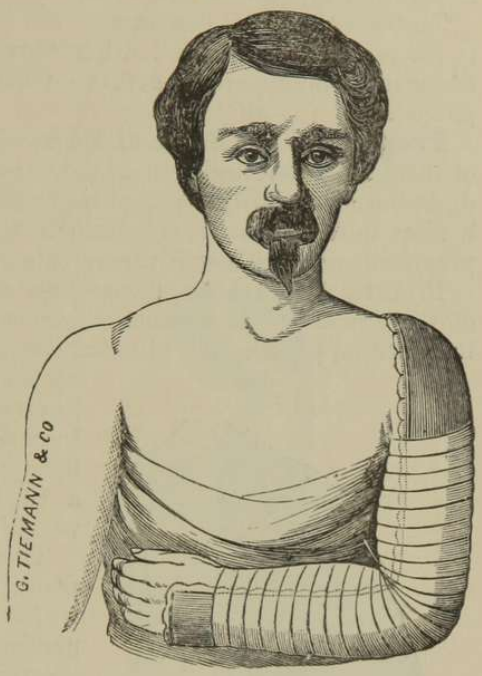


Physick's Elbow Splints.

The difficulty of diagnosis is experienced in distinguishing the accident from a backward dislocation of the radius and ulna, and from complications which may be connected with the fracture. The first duty of the surgeon is to endeavor to discover if there be crepitus, which usually will be found, by slowly and cautiously extending the arm, by which motion the fractured ends of the bone can be again brought into contact. The preternatural mobility cannot be relied upon if the fracture is not ascertained for some time after the accident, and for two reasons: first, because very often the end of the upper fragment may project into the elbow joint; and, secondly, from the stretching and bruising of the anterior muscles they become very rigid, in fact as hard as in dislocation. There is shortening of the bone, which, however, may be counteracted by extension, but the shorten-

ing returns when the traction is discontinued. There is a large prominence on the posterior and lower half of the bone, and the hand and forearm are in a state of pronation.

Fig. 171.

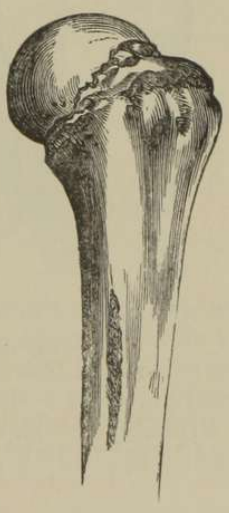


Hamilton's Elbow Splint.

Treatment. — An excellent method of treating this fracture is by means of rectangular side-splints, as advised by Dr. Physick (Fig. 170), which may be made of binder's board, felt, or leather, or by Bard's patent splint, or the well-known carved posterior splint. During the period of healing, the dressing should be removed once a week, the fragments steadied, and passive movements made to prevent anchylosis of the elbow, to which this variety of fracture has a strong tendency. The roller should first be applied, from the arm to the shoulder, then the elbow bent at its proper angle, and the splints applied. The splint of Mr. Welch is provided with hinges, and allows passive motion, without much interference with the dressings. In two cases which I recently had under treatment, I obtained satisfactory results from a rectangular posterior splint of sole leather moulded to the arm and well padded.

Probably the best splint for this accident is that of Prof. Hamilton, as seen in Fig. 171. It consists of gutta-percha, moulded to fit the shoulder, arm, and forearm; this must be well padded, placed upon the limb and secured by the roller.

Fig. 172.



Fracture of the Anatomical Neck of the Humerus.

Fractures of the Head and Anatomical Neck of the Humerus.—These fractures are generally caused by balls and other missiles, which, entering the joint, complicate the injury, either by fracturing the head of the bone or lacerating the soft parts. Direct force applied to the shoulder may also produce the injury. This fracture may be intra (Fig. 172) or extracapsular; if the former, bony union rarely takes place, and resection of the head of the bone may sooner or later be required. The displacement differs; sometimes the head of the bone is impacted in the cancellated structure, or there may be very little displacement, or the upper fragment may be turned on its axis; and cases are recorded where it has been turned completely around. If the fracture is intracapsular, undue violence must be avoided in endeavors to detect crepitus, and the arm and forearm be well supported in a sling.

Fractures through the tubercles are generally occasioned by forces similar to those producing fractures of the head and anatomical neck of the humerus. There usually is not much displacement, because the muscles cover-

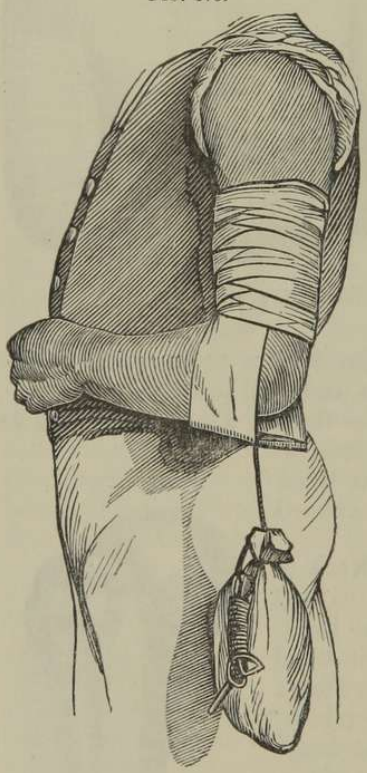
ing those portions of the bone act over a large surface, and equally on all the fragments. There may be impaction, or the head of the bone may be forced downward into the axilla.

Treatment.—This fracture should be treated with a simple sling if there is not much displacement. If, however, there should be any moving of the fragments, the apparatus used for fracture of the surgical neck may be employed.

Fractures of the Surgical Neck.—There is displacement in the majority of these fractures, and the accident is one of not infrequent occurrence; the direction of the displacement is toward the coracoid process. There may be, but not necessarily, impaction. Several kinds of treatment have been practiced, but the best is the outside splint with a shoulder support.

Prof. E. A. Clark has devised an excellent apparatus for the treatment of this fracture. It consists of two strips of adhesive plaster three inches in width, applied to the internal and external surfaces of the arm, as high up as the upper and middle third of the humerus. The strips are bound to the arm by a collar bandage, and at their lower end beneath the point of the elbow, are fixed to a cord to which a sand-bag is attached, weighing from three to four pounds.

FIG. 173.



This sand-bag is attached close to the point of the elbow, and when the patient wishes to walk, the cord to which it is suspended is knotted in order to make it shorter. When he lies in bed the cord is loosed and carried beneath the bed clothing over a small pulley placed at the foot of the bed, and in this way an equal extension is kept up, whether the patient be either in the upright or recumbent posture. The dressing is seen in Fig. 173.

Fig. 174 represents the appliance of Mr. Richardson for fracture of the upper portion of the humerus, whether through the anatomical or the surgical neck, or through the tubercles. The lower fragment having been drawn down, the upper one is maintained in its position by an axillary pad. The outside splint is of sufficient length to reach from the acromion midway to the elbow, and is held in position by adhesive straps. The body splint, which tightly fits the side of the thorax, and is attached to the arm splint, is kept in position by adhesive straps passing around the thorax. The arm is then brought to the side of the thorax, and secured by several turns of the bandage and the hand placed in a sling.

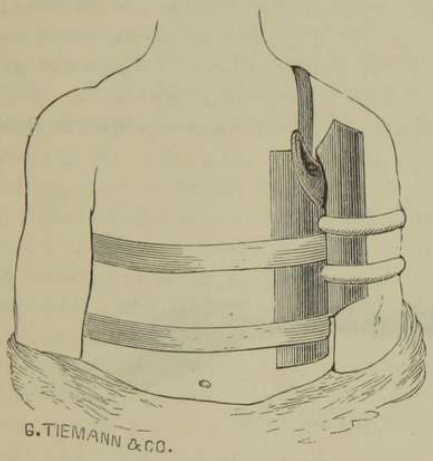
Probably as efficient a splint as can be found is that of Welch, which is readily applied (Fig. 175).

FRACTURE OF THE FOREARM.

Fracture of the Radius—Neck.—A fracture of the neck of the radius is very rare, indeed its occurrence has been denied by many distinguished surgeons. Cabinets, however, possess some specimens, though few, of uncomplicated fracture of the cervix of the bone; and Prof. Hamilton says of

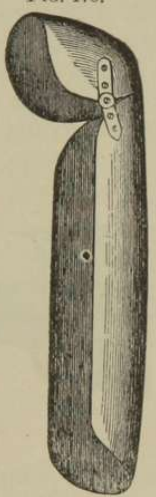
it, while alluding to the single specimen in the Mütter collection, "While, therefore, the presence of what may appear to be the rational diagnostic signs has compelled me to record one case as an uncomplicated fracture of the neck of the radius, and two others as fractures at this point accompanied either with a fracture of the humerus, or a dislocation of the ulna, I am prepared to admit that some doubt remains in my own mind as to whether, in either case, the fact was clearly ascertained, nor do I think, speaking only of the simple fracture, that it will ever be safe to declare positively that we have before us this accident, lest, as has happened many times before, in the final appeal to that court whose judgment waits until after death, our decisions should be reversed."

Fig. 174.



Apparatus for Fracture of the Surgical Neck of the Humerus.

Fig. 175.



Welch s Shoulder Splint.

The difficulty in making a correct diagnosis consists chiefly in the absence of crepitus, owing to the dense mass of muscular fibre which covers this portion of the bone, and from the lower fragment being drawn away by the powerful action of the biceps, the displacement being thus rendered greater by extending the forearm.

Treatment.—It is very essential in this variety of fracture to flex the forearm upon the arm, and to apply the dorsal splints, with an anterior splint of binder's board well secured with a roller bandage, or to use the splint devised for fractures of the olecranon by Dr. E. A. Clark, of St. Louis, and which is described when treating of that variety of lesion.

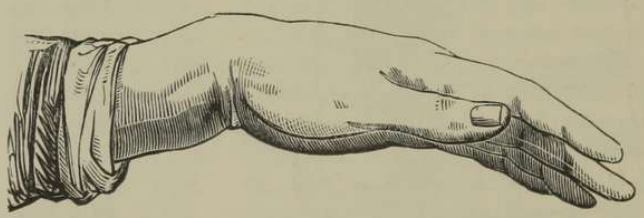
Fracture of the Shaft.—Before proceeding to treat of these accidents, the origin and insertion of the pronators of the forearm should be carefully studied, as by such knowledge the direction of the displacement of the fragments may be understood. If the bone is broken below the attachment of the biceps and above the insertion of the pronator radii teres, of course the counterbalancing action of this and the quadratus is lost, and the biceps continuing its action on the upper fragment completely supinates it. If the break occurs below the insertion of the upper pronator, this muscle, aided by the biceps, draws the upper fragment forward, while the quadratus has a tendency to force the lower fragment toward the ulna, thus making a considerable displacement. This teaches the surgeon the importance of supinating the hand, when bringing the bone into apposition, otherwise if it remain in a state of pronation, though it may be accurately adjusted, the line of the axis of the bone will be lost, and though there may be no apparent deformity, the power of supination is destroyed.

Treatment.—Supinate the hand as much as possible, and having applied the roller, place a splint on the anterior and posterior face of the forearm, and adjust the arm in a sling. Some surgeons prefer keeping the arm in a state of semipronation, which, if the fracture is far down, answers well. The plaster of paris splint also can be advantageously used.

Colles's Fracture.—We next are to consider a variety of fracture at the lower extremity of the radius, known as and first described by Colles. This fracture has received the attention of many distinguished surgeons, and requires such care in diagnosis and treatment, and is so often accompanied with deformity, that it demands all the attention of the surgeon.

By the term Colles's fracture is understood a fracture of the lower extremity of the radius, from one-half to three-fourths of an inch above its carpal surface, with displacement of the lower fragment backward; it is generally transverse, although it may be from above downwards and inward. It is in the majority of instances caused by a fall upon the palm of the hand, though a force applied to the dorsum may produce it. The head of the ulna points to the inner border of the carpus, and there is much de-

FIG. 176.



Fracture of Radius near lower end.

formity as well as displacement. (Fig. 176.) The hand takes an outward direction, stretching to a degree the internal lateral ligament, producing often the most excruciating pain.

It must also be remembered that in a true Colles's fracture the articulation of the radius with the carpus remains intact, and that the ulna is not broken.

There is another fracture which takes place in the vicinity of the wrist-joint called *Barton's fracture*, first described by Dr. J. Rhea Barton, of Philadelphia, in the *Philadelphia Medical Examiner*, for 1838. It is of rare occurrence, and its peculiarity is that the fracture separates either entirely or in part the posterior margin of the articular surface of the radius. This accident is so infrequent that many surgeons have supposed it to be merely a modification of the fracture described by Colles. In all these fractures in the vicinity of the wrist-joint, the junior or inexperienced must be prepared to meet more or less deformity—stiffness of the joint and fingers and considerable hard and tense swelling, which may remain for months and even for years. This rigidity is caused by the effusion of plastic lymph beneath the annular ligament and along the sheaths of the numerous tendons which traverse the part, as well as spurious anchylosis, which in greater or lesser degree follows in the majority of cases. With reference to this latter deformity I insert the testimony of experienced surgeons. Dr. Mott writes: "Fractures of the radius within two inches of the wrist, when treated by the most eminent surgeons, are very difficult to manage so as to avoid all deformity; indeed, more or less deformity may occur under the treatment of the most eminent surgeons, and more or less imperfection in the motion of the wrist or radius is very apt to follow for a longer or shorter time. Even when the fracture is well cured, an anterior prominence at the wrist or near it will sometimes result from swelling of the

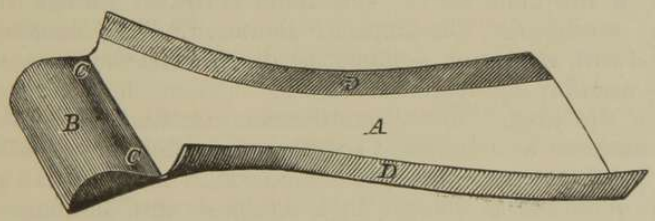
soft parts." Another says: "As the above opinion of Professor Mott coincides with my own observations both in Europe and this city, as well as with many of our most distinguished surgical authorities, I venture to hope that it may assist in removing some of the groundless and ill-merited aspersions which are occasionally thrown upon the members of our profession by the ignorant or designing."

Treatment.—A great variety of apparatus has been invented and used by surgeons for the treatment of fractures in the vicinity of the wrist, but that in most general use is termed the "pistol-shaped splint." It must be remembered that the great object in view is the raising of the lower fragment to its place and maintaining it in apposition with the upper fragment. Sometimes this may be accomplished by a palmar and dorsal splint applied to the forearm, the hand being allowed to drop, and by its weight falling to the ulnar side of the forearm may preserve the bones in apposition. Some forcibly flex the hand upon the wrist and keep it there.

Velpeau renounces, of late years, all bandages which are complex, and uses a simple contrivance, the idea of which he states he received from a Danish surgeon. He says :* "At first I obtain immediately the required position by very strongly flexing the hand upon the forearm at a right angle. The extensor tendons thus constitute a pulley to push back the fragments. The limb is then fixed in this situation ; a dry roller and a graduated compress upon the back of the forearm and the hand ; a splint of moistened pasteboard, which moulds itself perfectly, and a dextrin bandage maintains the whole."

The splint I have used, and with a good deal of success, is that of Dr. Bond, of Philadelphia (Fig. 177). It can be made by any one having a

Fig. 177.

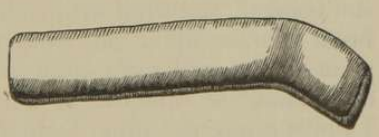


Bond's Splint.

moderate degree of ingenuity, and is simple and will prove satisfactory. With a little care a properly cut shingle or the side of a cigar box, suitably padded, will make an excellent pistol splint.

Hamilton's splint (Fig. 178) is made from a wooden shingle, and should extend from half an inch below the bend of the elbow to the metacarpo-phalangeal articulation. This splint should be well padded, and applied on the palmar surface of the arm. A dorsal shaped splint is also used with a sling.

Fig. 178.



Hamilton's Splint for Fracture of the Radius.

Professor Moore, in an interesting paper on Colles's fracture, gives a dressing so simple and efficacious as entitles it to notice. He observes that in Colles's fracture especially, there is a luxation to encounter, as well as a fracture, and that the former must be reduced before the latter is. He says :†

* Velpeau's Lessons, p. 27.

† *Vide* Transactions of the Medical Society of the State of New York, 1870, p. 238.

"The patient may be etherized or not. An assistant holding the forearm of the patient, the surgeon grasps his hand, the right with the right, and *vice versa*. With the other hand placed under the forearm above the fracture, he is enabled to bring the thumb over the back of the ulna, the fingers wrapping around the radius. Traction is first made by extension, then drawing the hand laterally to the radial side, then backward, next keeping it held backward, and while making extension, it is swung toward the ulnar side, bending well laterally, when the extension of the hand is changed for flexion, thus describing nearly a semicircle in circumduction. The position of the hand grasping the forearm undergoes constant change, as it is the antagonist of the other hand in everything but the extension. As the backward position of the hand, when it is carried to the extreme ulnar side, is changed to flexion of the hand, the thumb of the surgeon rolls around the border of the ulna, and is below when the manœuvre is complete. The test of reduction is to be found by the presence of the head of the ulna on the radial side of the ulnar extensor.

"The head of the ulna rests mediately, through the triangular fibro-cartilage, on the cuneiform bone, and is restrained from going backward by the annular ligament, holding on each side the tendons of the extensor minimi digiti, and the extensor carpi ulnaris, thus making a concavity corresponding in form to a socket. When it is pressed into this socket, and the hand flexed so that the head is supported by the wrist, the position of the hand is also restored in its relation to the radius. As a result of the displacement of the ulna, the ulnar extensor is carried from its place above the styloid process to the opposite side of the ulna, in an extreme displacement, but sometimes remains above its centre. To disentangle the styloid and swing the tendon of the ulnar extensor over into its place, is the purpose of the manœuvre. The hand is drawn toward the radius to pull off (by stretching) the annular ligament. The backward motion, accompanied with extension, renders the ulnar extensor tense, which serves to draw the annular ligament backward. This is effected by pressing the thumb upon the ulna. The circumduction carries the tendon over the side. Its character as a luxation is still further shown by the fact that the restoration is often accompanied by a snap, both tangible and audible. If restored, the retention is effected by a compress and bandage of adhesive plaster. When the manœuvre described has been completed, the hand is flexed, and the thumb of the surgeon rests on the under side of the ulna. Its head appears on the back of the wrist, and corresponds with the opposite arm in every respect, except the swelling from blood effusion. As in the treatment of any other luxation, the effort should not be abandoned until the deformity is removed and the ulnar extensor in its place—a fact that can be determined at once. The dressing I propose is intended to hold the head of the ulna up in its fascial socket, by bringing the weight of the hand to bear upon the ulna to retain it home. If the thumb of the surgeon is kept under the ulna after reduction, it will be found that the weight of the hand is sufficient to keep it in place. As a substitute for the thumb, I place along the ulna, from the pisiform bone upward, a cylindrical compress about two inches in length, and about half an inch in thickness—in fact, a single-headed roller. This is placed against the ulna, resting also on its radial border against the tendon of the flexor carpi ulnaris. A band of adhesive plaster of the same width is wrapped firmly around the wrist, and over the compress, extending downward to the extreme point of the radius, thus grasping the bones neatly and tightly. The ordinary rule of loose dressing on the first visit to a fracture is one that I distinctly reject. I propose to bring all the parts into close relation. The patient is allowed to cut the bandages along the back of the wrist in about six hours, if the

swelling and pain seem to demand it. But I find it is not often done. The thickness of the compress raises the adhesive plaster so far from the anterior surface of the forearm that strangulation of the vessels does not take place. Moreover the compress yields a little, and thus diminishes the pressure. A narrow sling passing under the compress, so as to bring the hand's weight to bear upon the ulna, completes the dressing."

I cannot close this subject, without allusion to a paper which has lately appeared on the subject of wrist-joint injuries,* and which certainly, so far as the explanation of the various appearances resulting from Colles's fracture and the great simplicity of the treatment recommended, is the most rational that has yet been offered to the profession. Dr. Pilcher claims, and I think proves clearly, that in the majority of cases it is the severe sprain that always occurs in Colles's fracture that demands the chief attention in the treatment. He explains the manner in which the fracture takes place as well as the resulting deformity with great accuracy. Owing to the firmness of the articulation between the carpus and the metacarpus they virtually act as *one bone*, joined to another bone (the radius) by strong anterior and posterior ligamentous attachments. Now by forcible extension of the hand backward, of course the ligaments posteriorly are put upon the stretch, while the anterior are somewhat relaxed, by which the end of the radius slips forward as far as that relaxation will allow. If the force be continued in the same direction the bone gives way above the ligaments, thus making the fracture. He says, "The lower fragment of the radius is now virtually a part of the carpus, with which it moves and by which it is carried backwards. At its inner border it is still tied to the ulna by the triangular fibro-cartilage and by the radio-ulnar ligaments; at its outer border, being less restrained, the fragment has been displaced to a greater extent than at its inner, as the result of which, a decided inclination to the radial side has been impressed upon the entire hand and wrist. The upper fragment driven downward and forward has become entangled in the lower, near its palmar margin. The impaction is but slight, and disentanglement is easy when the attempts are properly made. The lower fragment is a broad thin shell of bone. If the upper fragment is driven into it with much force, its comminution is inevitable. That this sometimes occurs, post-mortem examinations have repeatedly demonstrated."

He then goes on to show that the periosteum on the lower and back part of the radius is very thick, and strengthened by fibres from the posterior ligaments of the wrist, and that this periosteum is not torn, but stripped up from the back of the upper fragment, in accordance with the amount of displacement of the lower fragment.

He says further: "When the radius has given way, and the force of extension is no longer arrested by the insertion of the anterior ligament into its broad margin, this force is felt strongly by that portion of the ligament which is inserted into the ulna; the whole hand with the lower radial fragment is caused to move backward and outward as in supination. The styloid process of the ulna becomes approximated to the radius upon the back of the wrist, while the rounded head of the ulna is brought to project strongly upon the front and inside of the wrist. In this position the parts are firmly held, all rotation in either direction being prevented as long as the backward displacement of the lower radial fragment remains unreduced." This peculiar appearance which I own, has

* Reason *vs* Tradition in the Treatment of Certain Injuries of the Wrist-joint. By L. S. Pilcher, M.D. The Proceedings of the Medical Society of the County of Kings, March, 1878.

often puzzled me, and I have never been able to understand, nor have I ever had it satisfactorily explained, is said by Dr. Pilcher to consist in the action of a strong fasciculus of the anterior ligament passing from the front of the cuneiform bone upward and inward to the ulnar side, to be inserted into the anterior border of the styloid process of the ulna. By the backward displacement of the carpus this is put upon the stretch, and limits all rotation until relaxed.

The points in treatment to be deduced by these anatomical peculiarities are these: First, that always in Colles's fracture there is a severe strain, the treatment of which is of paramount importance. Second, that the mere breaking of the radius transversely entails no permanent disability. Third, that it is the sprain from which those untoward results occur which I have already detailed when speaking of this fracture.

The fracture of course must be first reduced, which is often difficult, but can be accomplished thus: "By simply bending the hand and wrist backward, approximating the position in which the parts were when the displacement took place, the tense periosteum is relaxed. Slight extension now in the line of the forearm is sufficient to disentangle the rough surfaces of the fragments from each other. Moderate pressure upon the dorsum of the lower fragment causes it to fall into line. The weight of the hand is now sufficient to secure perfect apposition of the fragments; the periosteum again envelops closely the whole length of the radius; the tense inner fasciculus of the anterior ligament is completely relaxed; the radio-ulnar movements are free; the head of the ulna has ceased to project as if subluxated." Therefore we see, that for fractures without displacement, that if the wrist is supported in the prone position, and the hand allowed to hang, and appropriate straps applied, a good result may be anticipated. When there is displacement, the fracture may be reduced as above directed, and the application of a broad and strong strip of adhesive plaster, two inches wide, around the lower ends of the radius and ulna, sometimes assisted by a compress applied along the inner border of that bone, is all that is required.

FIG. 179.

Fracture of the Ulna.

This is the treatment which appears rational in every particular, and certainly the best theoretically. I have not tried the method, but shall as soon as opportunity offers, and the members of the profession must thank Dr. Pilcher for his information concerning the "untorn aponeurotic dorsal periosteal strip, and the inner oblique fasciculus of the anterior ligament" in fractures of the radius, as they have awarded their praises to Dr. Bigelow for his explanation of the action of the ilio-femoral ligament, and the obturator internus muscle in coxo-femoral dislocations.

Fractures of the Ulna.—Any part of this bone may be fractured, the accident being generally occasioned by direct violence. The displacement sometimes is not very well marked, but if the injury be near the centre of the bone, the tendency of the inferior fragment is toward the interosseous space (Fig. 179) owing to the action of the pronator quadratus muscle, while the firm articulation of the superior fragment with the humerus would prevent that portion from being thrown inward. The bone lying superficially beneath the integument on the inner side of the arm, the deformity and crepitus may readily be detected. A fracture of the ulna is often complicated with other injury, especially dislocation of the head of the radius forward. This necessarily increases the deformity and shortens the forearm from one-half to one inch.

Treatment.—Make extension with the hand supinated, and press with the finger and thumb the broken fragments to their places, and apply the dorsal and palmar splints well padded. If the tendency of the lower fragment be toward the interosseous space, the fingers must be passed along the border of the radius and the parts pressed out, and a graduated compress applied on the integument, over which the roller is to be turned, and the splints applied as before. If the head of the radius be dislocated, the arm must be flexed to relax the biceps, the counter-extension be made by holding firmly the condyles of the humerus, and the head of the bone pushed into its place.

Fracture of the Coronoid Process.—This fracture is exceedingly rare, and the cases that are cited of it are all more or less amenable to criticism. Its symptoms are displacement of the ulna backward, its process felt on the anterior face of the elbow-joint, and if broken off it may be drawn upward by the action of the anterior brachial muscle. When extension is made with the forearm the resemblance to luxation disappears, to return, however, when the traction is no longer applied. Another important symptom would be that the olecranon, prominent when the arm was in an extended position, would resume its natural shape when the forearm was flexed.

The *treatment* would be to flex the arm at a right angle, and retain it with angular splints from eight to ten days, then to allow a little motion to prevent anchylosis, and the splint reapplied.

Fracture of the Olecranon. Fractures of the olecranon process are, in most instances, occasioned by falls or blows upon the posterior surface of the elbow-joint, or, though rarely, by the powerful contraction of the triceps. The direction of the fracture is generally transverse, although sometimes oblique. It is scarcely necessary to observe that the only direction of the superior fragment is upward, owing to the action of the three-headed muscle which is inserted into the process (Fig. 180).

The *symptoms* are first, a depression on the posterior surface of the joint; inability to straighten the arm and the absence of crepitus, although sometimes this may be produced by extending the arm and forcing downward the upper fragment upon the lower. This is more readily effected when the patient is thoroughly under anæsthetic influence. The fragments sometimes unite with ligament, sometimes with ossific formation.

FIG. 180.

Considerable discrepancy of opinion exists between surgeons as to the position the arm should maintain during the treatment of this fracture, some insisting upon flexion or demi-flexion, while others are emphatically in favor of extreme extension. Velpeau asserts positively that "it is not in the least necessary to obtain a union of the fragments," because the olecranon is free and analogous to the patella in very many animals, without impairing the movements of the limb, and that the only possible harm that can result is an inability to extend the arm completely; he considers nothing more necessary for its treatment than the application of a figure-of-eight bandage.

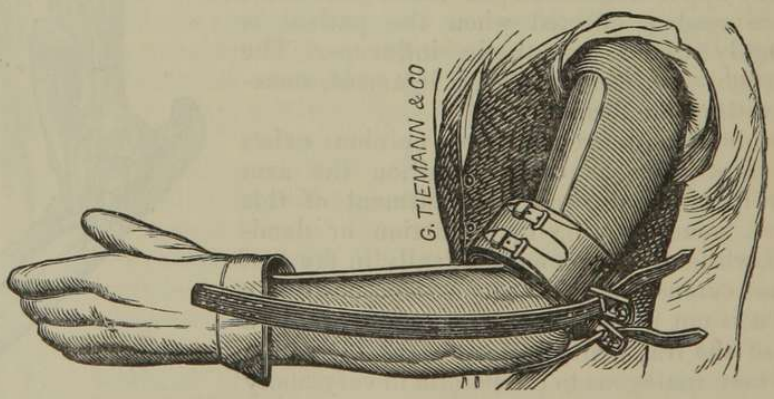
Notwithstanding such distinguished authority, I think too little importance is attached to the olecranon process. It is true that the actions of some animals, having a species of movable olecranon, are not impaired,

but the movements are those of extension and flexion only. The motions of the human arm require the olecranon to be fixed.

Treatment.—In treating this fracture complete extension should be made, and as a general rule it is better adapted to relax the triceps, then bring the parts in apposition with the usual apparatus. The figure-of-eight bandage simply applied to draw the fragments in apposition has been employed with success. The apparatus of Sir Astley Cooper, with transverse bands and lateral tapes, is also successfully used. Several folds of the roller are placed securely above the elbow, and a similar number below it. Two lateral tapes are then passed beneath these and drawn tightly together: above this a straight carved splint or one of felt, leather or pasteboard is applied.

Professor Hamilton's method is as follows: "The surgeon will prepare extemporaneously always, for no single pattern will fit two arms, a splint from a long and sound wooden shingle, or from any piece of light thin board. This must be long enough to reach from near the wrist-joint to within three or four inches of the shoulder, and of a width equal to the widest part of the limb. Its width must be uniform throughout, except that at a point, corresponding to a point three inches or thereabouts below the top of the olecranon process, there shall be a notch in each side, or a slight narrowing of the splint. One surface of the splint is now to be thickly padded with hair, or cotton batting, so as to fill all the inequalities of the arm, forearm, and elbow, and the whole covered neatly with a piece of cotton cloth, stitched together on the back of the splint. Thus prepared, it is to be laid upon the palmar surface of the limb, and a roller is to be applied, commencing at the hand and covering the splint by successive circular turns until the notch is reached, from which point the roller is to pass upward and backward behind the olecranon process, and down again to the same point on the opposite side of the splint. After making a second oblique turn above the olecranon, to render it more secure, the roller may begin gradually to descend, each turn being less oblique, and passing through the same notch, until the whole of the back of the elbow-joint is

FIG. 181.



covered. This completes the adjustment of the fragments, and it only remains to carry the roller again upwards by circular turns, until the whole arm is covered as high as the top of the splint."

The following is a minute description of Prof. E. A. Clark's apparatus, given by himself, he having kindly allowed the use of the above drawing (Fig. 181):

The apparatus above represented consists of a band of ordinary sole

leather, about two inches in width, and of sufficient length to surround the arm, lined with cloth or chamois, and well padded with cotton or hair. In order to give the band additional firmness, and also to secure it around the arm, a strip of common harness leather is stitched upon the outside, to one end of which two small buckles are attached, while the other end, which extends about three inches beyond the band, is split or cut into two straps to correspond with and fasten into the buckles. The band is fastened around the arm above the fractured process, and may be drawn to any degree of tightness necessary to bring the broken fragment down when traction is made upon it.

The same band may be used on either arm, and may be adapted to an arm of any size. On the outer side of this band, and one inch apart—one on each side of the olecranon—are two buckles or staples, which should be two inches in length, and three-fourths of an inch in width, and clinched on the inside of the leather band, from which they project at a right angle, These buckles or staples also have three bars across them, with two tongues, made to turn either way.

In applying this apparatus the arm should be fixed at an angle of forty-five degrees, and a common pasteboard splint bent at that angle placed upon its anterior surface. The leather band is then buckled over this splint, just above the fragment of the olecranon, and the entire forearm is covered with a bandage to hold the anterior splint firm to the arm, and thus prevent any movement of the elbow-joint, which, if allowed, would be constantly modifying the force exerted upon the fracture. A common buckskin glove is then placed upon the hand, to the anterior and posterior surfaces of which are attached two leather straps, which are to be buckled into the staples on the hand. By buckling these straps over the bars at a greater or less distance from the band, and tightening them as required, we obtain the necessary amount of leverage to turn the lower edge of the band in upon the arm, and push the fractured process down before it.

By making traction upon these straps any degree of force may be exerted upon the band necessary to draw the broken fragment down and hold it in perfect apposition with the head of the ulna.

It may be objected to this method of treatment, that the arm is held in a flexed position, thus increasing the space between the two fragments. But the advantage of this position is apparent in the relaxation of the biceps, and prominence of the olecranon.

Fracture of both Bones of the Forearm.—When both bones of the forearm are broken the fracture is generally about the middle third or lower part of the lower third (Fig. 182), the upper parts being so covered by muscular structure that they are more protected from injury. The solution of continuity is generally single, although Dessault has treated a patient in which he found six distinct fractures. This, however, must be regarded as a very rare occurrence. The causes are generally direct violence, although a counter-stroke produces the fracture, though such force generally operates upon the radius alone.

FIG. 182.

Fracture of both bones of the forearm.

Symptoms.—Preternatural mobility of parts which are normally inflexible; crepitus, which is easily produced; a depression at the site of the fracture, or sometimes, when the displacement is greater, a sharp bony projection is distinguished under the

skin ; more or less pain when attempting to move the part, and the patient will state, if questioned closely, that quite a noise was noticed at the time of the accident ; the forearm is bent, and the power of supination and pronation is lost. When the fracture occurs near the wrist-joint the appearance of the part may simulate dislocation. In fracture, the crepitus and the position of the styloid processes either above or below the joint will reveal the true diagnosis. If there be a dislocation, by moving the hand the styloid processes remain in their situation, if there be a fracture they will move with the hand. Displacement in the longitudinal direction is rare on account of the arrangement of the muscles and the interosseous ligament ; but the transverse displacement is generally perceptible, the four pieces then approaching each other and diminishing, if not obliterating, the interosseous space. There is likewise a tendency of the fragments to ride one upon the other, causing also an angular displacement.

Treatment.—In the treatment of this fracture I formerly followed, and with success, the method of Boyer, as follows: The forearm is to be bent at a right-angle with the arm and hand, which must be placed in a position between pronation and supination. An assistant then takes hold of the four fingers of the hand and makes the requisite extension, while the counter-extension is kept up by another assistant, who grasps the lower portion of the humerus with both of his hands. The bones are thus restored to their natural situation, and the soft parts can be pushed into their natural position. Two graduated compresses, with their apices to the interosseous space, are then placed, one on the anterior and one on the posterior surface, the depth of the compresses corresponding with the thickness of the arm. Next, the surgeon takes a single-headed roller six yards long, and makes three or four turns over the fractured part, and descends upon the hand and up again over the forearm ; two well-padded splints are applied, anteriorly and posteriorly, and these embraced with the turns of the bandage as it descends. In ordinary cases this method will be found successful.

A simpler method, however, and one which has given me great satisfaction, is that in which adhesive straps are employed. Having set the fracture, take two pieces of adhesive plaster, each about seven inches wide, and six or eight inches long, and roll each upon itself as tightly as possible, with the adhesive side out. These are for the compresses. Lay one on the anterior, the other on the posterior surface of the arm, over the interosseous space. Having the splints prepared, place one on the anterior, the other on the posterior surface of the arm, and hold them in position with straps of plaster, each strap enveloping the arm twice. Three strips of this kind will generally be sufficient to hold the parts firmly.

Fracture of the Hand.—Fractures of the metacarpal bones are generally easily recognized, although the swelling may be so considerable, immediately after the accident, that the injury will not be ascertained for a day or more. In the majority of cases, the mobility, pain, and crepitus are readily discovered; indeed the latter symptom can be detected by the patient, even when the swelling is considerable. There is, in many cases, a tendency of the fragments to override each other, the anterior generally overlapping the posterior, in which case the surgeon, by passing his finger over the bone, on the dorsum of the hand, will readily detect the inequality of surface.

Treatment.—The best treatment for fracture of these bones is to apply an anterior and posterior splint, each well padded on the dorsum and palmar surface of the hand, allowing the support to extend almost to the

elbow. These splints may be secured by broad strips of plaster, or by the ordinary roller bandage.

Fractures of the Phalanges.—Crepitus and mobility without severe pain are the symptoms most characteristic of this accident. In some cases the displacement is so slight that the break is not at once discovered.

Treatment.—Extension soon replaces any displacement, and a pasteboard splint, or one made of a narrow and light piece of wood, extending to the wrist, and kept in place by strips of plaster, is all that is required. If more than one finger is broken, a carved splint, in which the whole hand may rest, would be appropriate. When the *carpal bones* are broken, the injury inflicted is generally so severe that amputation or resection must be resorted to. If, however, hopes can be entertained of saving the joint, a splint well padded should be placed on the palmar surface of the hand and secured by plaster placed above and below the seat of injury. By this arrangement the parts may be carefully examined without disturbing the dressing.

FRACTURES OF THE LOWER EXTREMITIES.

Fracture of the Femur.—The femur is generally broken at the upper portion of its middle third, although its lower third, the cervix, either within or without the capsule, the trochanters or the condyles may be the seat of injury. According to the statistics given by Prof. Hamilton,* out of one hundred and fifty-six cases treated by him, sixty-seven were of the middle third, sixty-three of the upper third, and twenty-six of the lower third.

Fracture of the Neck.—This variety of fracture may occur either within or without the capsule, and the symptoms and prognosis as well as the method of union have been the subject of very much discussion among surgeons.

The fracture within the capsule generally occurs in persons of advanced life, and is usually the result of indirect and even slight violence. The position of this portion of the bone, the greater brittleness of the osseous system in advanced life, and other constitutional diseases have a material influence in this fracture. Sometimes it may occur from apparently trivial causes, such as a tripping of the foot or a slight fall. It has been asserted by some surgeons that if it be possible to ascertain the exact direction in which the force has been applied, that we can readily diagnose the locality of the separation. A fall upon the knee or the foot it is contended will cause an *oblique intracapsular* fracture, while, if the force be applied in front of the trochanters the break will be, though still within the capsule, of the transverse variety (Fig. 183). In fractures within the capsule, crepitus is, in the majority of instances, absent. There may be a very slight degree of *immediate* shortening, which may be temporarily removed by moderate extension. The pain is slight during complete rest, but insupportable when the slightest movement is attempted. Eversion of the foot almost invariably takes place, though, according to some authorities, inversion has been noticed in some cases (Fig. 184). After a time, as the swelling subsides and the muscular action commences, there may be a sudden shortening of the limb of one to two inches, which fact may be explained as resulting from the sudden rupturing or wearing out of the cervical ligament. In those cases in which, from many contingent circumstances,

* Fractures and Dislocations, p. 348.

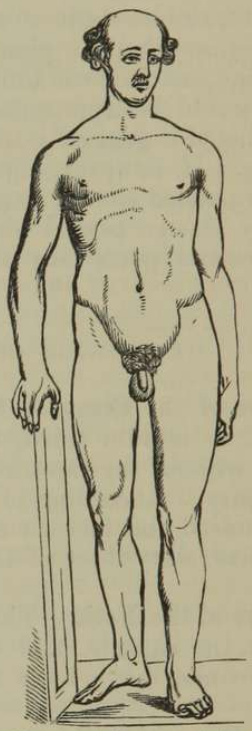
there may be difficulty in the diagnosis, the thigh must be carefully measured in many directions, and if it be possible the patient raised upon his sound leg for careful and accurate examination.

The question as to whether these fractures unite by ligamentous or bony

Fig. 183.

Fracture of the Neck of the Femur.

Fig. 184.



External Characteristics of Fracture of the Neck of the Femur.

union it is not necessary here to discuss, but from the most careful investigation of the subject there appears to be no doubt that both osseous and ligamentous union occur, the former most frequently when there is a slight degree of impaction.

Fracture without the Capsule.—Fracture without the capsule is almost invariably accompanied with fracture and displacement of both trochanters, which generally are split or divided obliquely downward and forward; if, however, the fracture should be of the impacted variety, then there will not be so great a displacement of the trochanteric eminences. In these fractures the superior fragment is denominated the acetabular, the latter the trochanteric. The causes are very similar to those producing the variety of fracture last considered.

The symptoms are: a considerable amount of shortening *immediately* upon the receipt of the injury, which may reach even two inches and a half. There is also pain, lack of prominence of the trochanter, and eversion of the foot. If there is considerable difficulty in bringing the foot and leg to its natural length, then impaction may be suspected. Crepitus can be detected by rotating the bone with the fingers on the trochanter.

Prof. Hamilton's differential diagnosis between fractures within and without the capsule is here introduced:

FRACTURE WITHIN THE CAPSULE.	FRACTURE WITHOUT THE CAPSULE.
1. Produced by slight violence.	1. Produced by greater violence.
2. A fall upon the foot or knee, or a trip upon the carpet, etc.	2. A fall upon the trochanter major.
3. Generally over 50 years.	3. Often under 50 years.
4. More frequent in females.	4. Relative frequency in males and females not established.
5. Pain, tenderness, and swelling less and deep.	5. Pain, swelling, and tenderness greater and more superficial.

The following measurements are to be made from the anterior superior spinous process of the ilium to the lower extremity of the malleolus externus or internus:

6. Shortening at first, less than in extracapsular fractures, and often not any.	6. Shortening at first greater, almost always some.
7. Shortening after a few days or weeks, greater than in extracapsular fractures. Sometimes this takes place suddenly, as when the limb is moved or the patient steps upon it.	7. Shortening, after a few days or weeks, less than in the intracapsular—that is, the amount of shortening changes but little, if at all; if the impaction continues, not at all; if it does not continue, it may shorten more.
8. Measuring from the top of the trochanter to the inner condyle, or to the malleolus internus, the femur is not shortened.	8. Measuring from the top of the trochanter to the inner condyle, or to the malleolus internus, the femur may be found a little shortened.
9. More mobility of the limb at the joint.	9. Less mobility.
10. Trochanter major moves upon a longer radius.	10. Trochanter major moves upon a shorter radius
11. If the patient recovers the use of the limb, it is not restored under three or four months.	11. If the patient recovers the use of the limb, restored in six or eight weeks.
12. No enlargement or apparent expansion of the trochanter major, after recovery, from deposit of bony callus.	12. Enlargement or irregular expansion of the trochanter, which may be felt sometimes distinctly through the skin and muscles.
13. Progressive wasting of the limb for many months after recovery.	13. The limb preserves its natural strength and size.
14. Excessive halting, accompanied with a peculiar motion of the pelvis, such as is exhibited in persons who walk with an artificial limb.	14. Slight halt. Motion of the hip natural.

Treatment.—About the same as that for intracapsular fracture. *Vide* the end of this chapter.

Impacted Fracture of the Neck of the Femur.—In this variety of fracture, in many instances, the lower end of the upper fragment is forced into the upper extremity of the lower fragment, and generally at the point of union between the cervix and the diaphysis of the bone. In other cases the upper end of the lower fragment is forced into the cancellated tissue of the lower end of the upper portion of the bone. In this variety of fracture the patient may be able to bear weight upon the injured side; there is no crepitus, but there is shortening and eversion of the knee and leg, though the latter is not so well marked as in the non-impacted variety of extracapsular fracture. The injured limb may also be rotated, abducted, or flexed, although with pain, but great force is necessary to bring the heels to a level, and in some cases such a position is impossible. There is also

considerable alteration at the site of the trochanter major, which is drawn upward and out of a line parallel to that of the opposite side.

It must be borne in mind by the student that there are often injuries, especially falls upon the hip, which simulate fracture of the neck of the femur, and from which it may be at first almost impossible to correctly diagnose. The fact that there may be little immediate shortening of the leg in the intracapsular fracture, and that impacted fractures present no crepitation, are the chief sources of uncertainty. An elderly person falls upon the hip, he finds himself unable to move, and is carried to his home, placed upon his bed, and the surgeon is summoned. There is almost total inability to move, the slightest attempt giving rise to severe pain; the foot is everted, the leg may be of the natural length, but more frequently is apparently shorter. No crepitus can be found, and by placing the patient upon the back, the heel of the injured limb may be brought down to a level with that of the sound one. The pain is not always experienced at the site of injury, but along the internal portion of the thigh, and the heel cannot be lifted from the bed. In these cases there is great difficulty of diagnosis and frequent and careful examination and measurements are necessary before a positive opinion can be reached. In cases of sprain the shortening is apparent, not real; in intracapsular fractures, the shortening will sooner or later appear. In sprain, the foot is not so completely everted, and there is more muscular power, which increases as the violence of the injury subsides. In such cases, time, watchfulness, careful measurements, the history of the accident, and all minutiæ in connection with it must be taken into consideration before a certain diagnosis can be made out. From a knowledge of these facts I here insert thirty "deduced conclusions" relative to fractures of the neck of the femur, taken from the excellent work of Dr. Robert William Smith, of Dublin. This gentleman has condensed in a manner remarkable for a judicious conciseness, all the information appertaining to this subject contained in one hundred and twelve pages of his work on *Fractures* and the analysis is well worthy a careful consideration.

1. "A slight degree of shortening, removable by a moderate extension of the limb, indicates fracture within the capsule.

2. "The amount of *immediate* shortening, when the fracture is within the capsule, varies from a quarter of an inch to an inch.

3. "The degree of shortening, when the fracture is within the capsule, varies chiefly according to the extent of laceration of the cervical ligament.

4. "It varies according as the fracture is impacted or otherwise.

5. "In some cases of intracapsular fractures, the injury is not immediately followed by shortening of the limb.

6. "This is generally to be ascribed to the integrity of the cervical ligament.

7. "In such cases, shortening may occur suddenly at a period more or less remote from the receipt of the injury.

8. "This sudden shortening of the limb is in general to be ascribed to the accidental laceration of the cervical ligament, previously entire, and is indicative of a fracture within the capsule.

9. "The deposition of callus around the fragments is not necessary for the union of the intracapsular fracture.

10. "When osseous consolidation occurs in the intracapsular fracture, it is effected by a direct union of the broken surfaces, which are confronted to one another.

11. "The osseous union of the intracapsular fracture is most likely to occur when the fracture is of the variety termed 'impacted.'

12. "In the intracapsular fracture, the mode of impaction is different from that which obtains in the extracapsular.

13. "The degree of shortening when the fracture is external to the capsule, and does nor remain impacted, varies from one inch to two inches and a half.

14. "When a great degree of shortening occurs immediately after the receipt of the injury, we usually find a comminuted fracture external to the capsule.

15. "The extracapsular fracture is accompanied by fracture with displacement of one or both trochanters.

16. "The extracapsular *impacted* fracture is accompanied by fracture without displacement of one or both trochanters.

17. "In such cases the fracture of the trochanters unites more readily than that of the neck of the bone.

18. "The degree of shortening in the extracapsular impacted fracture varies from a quarter of an inch to an inch and a half.

19. "The exuberant growths of bone met with in these cases have been erroneously considered to be merely for the purpose of supporting the acetabulum and neck of the femur.

20. "The final cause of their formation is the union of the fracture through the posterior intertrochanteric space.

21. "The difficulty of producing crepitus and of restoring the limb to its normal length are the chief diagnostic signs of impacted fracture.

22. "The position of the foot is influenced principally by the obliquity of the fracture and the relative position of the fragments.

23. "Inversion of the foot may occur in any of the varieties of fracture of the neck of the femur.

24. "When the foot is inverted, we usually find that either a portion or the whole of the extremity of the lower is placed in front of the superior fragment.

25. "In cases of comminuted extracapsular fractures, with fracture and displacement of the trochanters, the foot will generally remain in whatever position it is accidentally placed; it may be turned either inwards or outwards, or there may be inversion at one time and eversion at another.

26. "Severe contusion of the hip-joint, causing paralysis of the muscles which surround the articulation, is liable to be confounded with fracture of the neck of the femur.

27. "Severe contusion of the hip-joint may be followed at a remote period by shortening of the limb and eversion of the foot.

28. "The presence of chronic rheumatic arthritis may not only lead us to suppose that a fracture exists when the bone is entire, but also when there is no doubt as to the existence of fracture, may render the diagnosis difficult as to the seat of the injury with respect to the capsule.

29. "Severe contusions of the hip-joint, previously the seat of chronic rheumatic arthritis, and the impacted fracture of the neck of the femur, are the two cases most likely to be confounded with each other.

30. "Each particular symptom of fracture of the neck of the femur, separately considered, must be looked upon as equivocal; the union of all, can alone lead to the formation of a correct opinion as to the nature and seat of the injury."

Prof. J. S. Wright,* both from measurements upon the living person and the cadaver, whose soft parts had been removed by dissection, has found that only one person out of every five has lower limbs of the same length,

* Archives of Clinical Surgery, February, 1877.

and that this difference in length varies from one-eighth of an inch to one inch. It is, therefore, useless to expect to obtain limbs of the same length after every case of fracture of the femur. Whatever treatment may be adopted, certain cases will inevitably show a shortening of one inch ; and, he affirms, that excessive efforts to bring down the injured limb to an equality with the uninjured, are calculated to do harm, since the strong fascia of the thigh offers great resistance.

Dr. Hamilton appears to place but little reliance in these measurements, and says,* " This cannot be so, for in nine out of every ten cases of fracture of the femur we do get actual shortening, and how would this happen so constantly, if the fracture had occurred in the longer limb."

Fracture of the Shaft of the Femur.—When the *upper third* of the bone is the seat of injury, the fracture is mostly oblique, and the symptoms so apparent as to lead to little doubt in the diagnosis. The limb is shortened from two to three inches, and its superior portion exhibits a convexity of surface with a concavity on the internal side of the limb. This is caused by the overlapping of the lower extremity of the upper fragment over the lower. This displacement forward, as will readily be seen, will be caused by the action of the internal iliac and large psoas muscle, and by that of the pectineus and the short head of the biceps, while the external rotators twist the fragment outward, and the lower fragment is drawn upward by the flexors, and outward by the tensor vaginæ, vastus, and glutei.

Fractures at the Middle of the Shaft.—This accident is, according to most surgeons, of rare occurrence, although I have treated two patients, each with a fracture very nearly at the centre of the bone.

The direction of the fracture is oblique, and the upper fragment projects over the lower; there is eversion of the foot, shortening of the limb, and an unevenness of surface at the site of fracture, which is readily detected both by sight and manipulation. Crepitus is distinct and is more pronounced by extension.

In fracture of the *lower third*, especially if the accident has happened some time before the surgeon is called, and the bone is broken near the joint, the tumefaction may be so great, especially around the knee, that some difficulty may be experienced in making a diagnosis. In this fracture there is overlapping of the ends of the bone, though when broken in the immediate vicinity of the condyles, the fragments do not "ride" upon each other to such an extent as when the fracture is higher up. In some instances serious complications ensue from the fragments penetrating the joint, and thus giving rise to additional serious symptoms. The fractures in this portion of the femur are oblique, the upper fragment overlapping the lower. In other instances the lower extremity of the upper fragment has been known to push the patella upon the tibia, thereby producing the appearance of a dislocation. There is shortening, eversion of the foot, and angularity of the limb, which will suffice to diagnose the accident.

Treatment.—Very many splints, bandages, and apparatus have been devised for fractures of the femur. I do not purpose a detail of these many contrivances, the greater number of which have been thrown aside and the remainder will soon be consigned to a like oblivion. The greatly simplified means now used relieve the patient of all the inconvenience, pain, and discomfort of the cumbersome and complicated contrivances of the past.

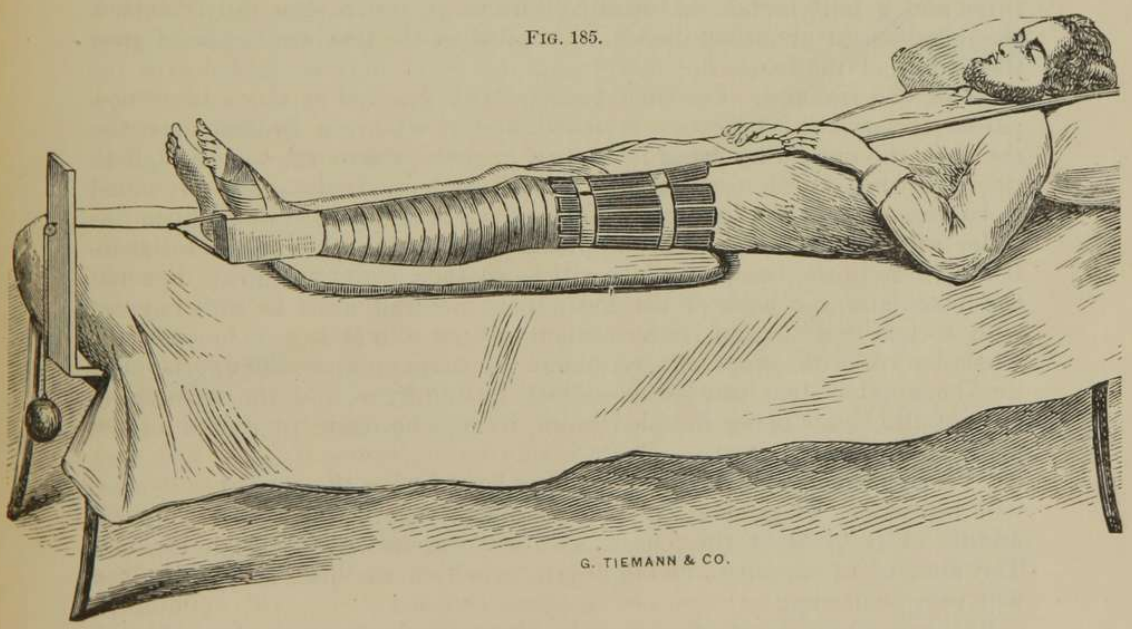
In treating fractures of the femur most surgeons of the present day prefer the straight position of the extremity *with extension*, to the double inclined plane, which for the time was very much in vogue, and as most of

* Archives of Clinical Surgery, November, 1877.

the apparatus now employed is equally adapted to fractures of the shaft, as well as of the neck of the bone, I have thought fit to first detail the symptoms of each fracture, and afterwards, in due order, a description of the means to be used. This plan will save unnecessary repetition. It is proper to remark at this place that some surgeons prefer *both* positions in treating fractures of the femur, being guided in the selection of the position by the locality of the fracture. If the separation be below the trochanter minor, the upper fragment is tilted forward and upward by the action of the psoas muscle ; if the fracture occurs at the lower third, then the heads of the gastrocnemius draw the lower fragment downward and backward, and in either case, it is argued, that extension in a straight line will not produce the desired effect. This reasoning is very plausible, but I am persuaded, from some experience in the management of these fractures, that properly applied extension with weight and pulley, or by suspension, or both, will effect in the majority of cases, results equal, if not superior to any other methods.

I am disposed to believe that each surgeon having become thoroughly acquainted with the application and results obtained by his favorite method of treatment, is loath to change his apparatus, and continues experimenting and arranging his particular device, until it not only becomes better adapted for the purposes to which it is applied, but the surgeon himself becomes more perfect in his method of applying it. However this may be, I think with these two truly "American methods" all the cases of fracture of the thigh may be successfully treated. It is well known that in Buck's original apparatus, as seen in Fig. 185, there was a *perineal band* to effect counter-extension. That "*instrument of torture*,"* as Dr. Van Buren calls it, is

FIG. 185.



done away with by the elevation of the foot of the bed, and the old and terrific and almost invariable accompaniment of a fracture of the thigh or leg, viz., "a sore heel," is also avoided by the elevation of the foot in the anterior splint, and by the extension in the straight method.

* Is there an American Method of treating Fractures of the Thigh?—Medical Record, N. Y., March 30th, 1878.

The following is the manner of preparation and application of the straight extension method, as laid down by its great advocate, Dr. F. H. Hamilton.* I quote his own words:

"Saw from a half-inch board a strip four inches in breadth, and of such length that, when made fast to the foot of the bedstead, it shall rise four inches above the toes of the patient as he lies supine upon the bed.

"Construct a long slot in the upper portion of this strip, intended to receive the pulley.

"Make holes with a gimlet from side to side through the strip, traversing the slot, the holes being about three-quarters of an inch apart. These holes are intended to receive a large wire, which will serve as an axis upon which the pulley will turn. In case a metallic pulley cannot be obtained, a spool will serve the purpose.

"This piece of board, thus constructed, is to be fastened upright to the foot of the bed.

"In order to complete the apparatus for extension, there will be required a small rope, four feet long, a bag of sufficient size to hold twenty-two pounds of sand or of small shot, and a piece of thin board, four inches long, and three and a half inches wide, to traverse the sole of the foot, and prevent the adhesive plaster bands from pressing upon the malleoli. This traverse must be perforated in the centre to receive the cord, in the end of which a knot is to be made, which will prevent its being drawn through. Half a pound of cotton batting, cotton or woollen rollers, four feet of strong adhesive plaster, and two small blocks or bricks to place under the foot-posts of the bedstead will also be required.

"The adhesive plaster extending band will be composed of one single piece, which, for adults, must generally be about four feet in length, and three and a half inches in breadth; but as it approaches the middle, it should widen to about six inches, so that when the traverse is placed upon the middle of the band, the margins of the band may be folded over the sides of the traverse. The rope having been knotted at one end, is now passed through the hole in the traverse, and while an assistant steadies the foot, the extending band is applied to each side of the leg as high as the knee, the traverse touching the sole of the foot. If the straps are found to be longer than the leg, the ends may be left and folded down upon the roller after the first turns are applied. The application of the roller intended to hold the bands in place will be commenced at the ankle, but first the instep and the back of the leg above the heel must be well covered with cotton batting, and if the patient is very thin it is well to cover the whole length of the spine of the tibia in the same manner. The roller may now be applied over the bands as high as the knee, and the superfluous ends of the bands being doubled down, it may be made to return a short distance towards the foot.

"Passing the rope over the pulley, and attaching the weight, extension will be made. The pulley ought to be one or two inches higher than the middle of the sole of the foot, so as to lift the heel gently from the bed. The amount of weight to be employed, or which the patient can endure, will vary somewhat.

"I have found the maximum to be about twenty-two pounds, and generally patients will not endure, for any length of time, over twenty pounds.

"To render it more certain that the patient will not be drawn towards the foot of the bed by the continuous extension, the foot-posts must be lifted about three or four inches by blocks or a couple of bricks."

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* Principles and Practice of Surgery, p. 296.

To secure coaptation and support the fragments, four splints, made of sole leather and covered with woollen cloth, must be applied to the circumference of the limb. These splints should not quite touch at their margins. The inside and outside splints ought to be long enough to embrace the condyles, and the posterior splint should be wider than either of the others, and extend from the tuber ischii to a point below the knee.

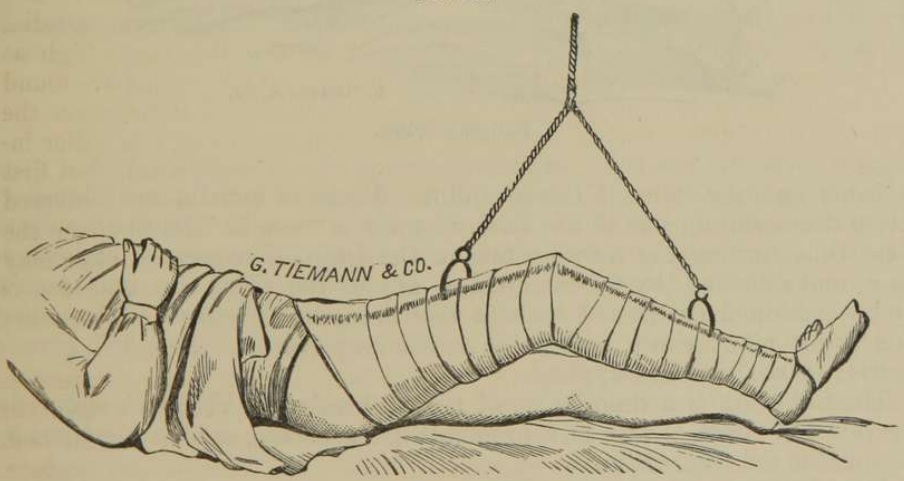
The whole is to be secured in place by four or six strips of bandage, and knotted over the front splint and stitched fast to the covers of the side splints to prevent displacement. To obviate the tendency to eversion which exists in nearly all fractures of the femur, a long side-splint, four inches wide, and extending from near the axilla to beyond the foot, must be laid outside of the limb, supported on the side next to the limb and body by a long sack filled with cotton batting. From the lower end of this splint a foot-piece should project six or eight inches outward, the more effectually to prevent eversion. The whole is to be secured to the leg, thigh, and body by separate bands of cotton cloth.

Perhaps it is because I have had more experience with the anterior splint of the late Nathan R. Smith and the improved splint of Prof. Hodgen, of St. Louis, but certain I am, that in my hands more comfort has been given to the patient and better results obtained by this method than by straight extension. I see, also, that Mr. Bryant, of Guy's, prefers this method, and that it is used in the Greenwich Hospital in preference to others. In this city (New York) the modification of Buck's method is the one which is preferred, being used in all the larger hospitals and public charities.

The following is the manner of applying the anterior splint of Dr. N. R. Smith:

The fracture having been adjusted, the splint is so bent that the upper angle may come up upon the abdomen to the anterior superior spinous process of the ilium; the lower end is also bent to a convenient angle, to

FIG. 186.



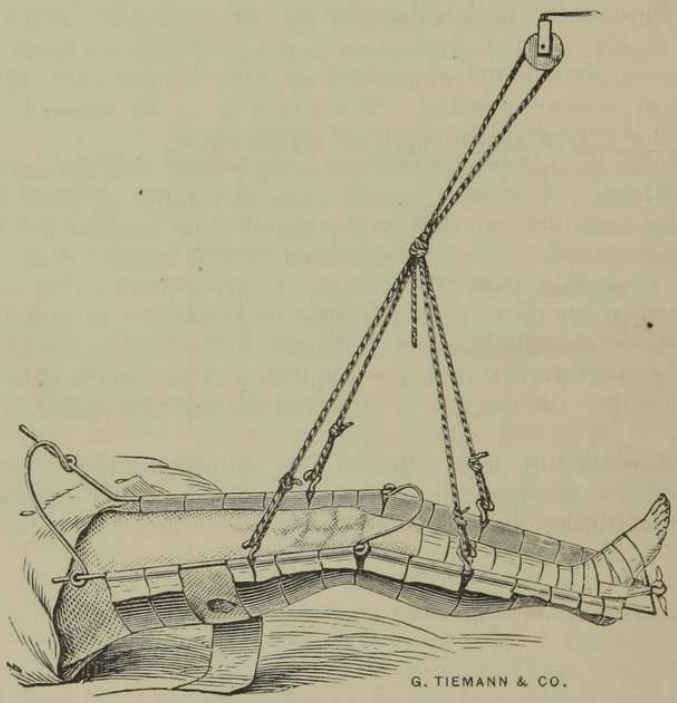
Smith's Anterior Splint.

lie over the dorsum of the foot. A roller bandage is then applied to the limb, an assistant keeping the fractured ends of the bone in apposition. A layer of cotton batting should then be placed over the crease on the groin, over the knee, and over the anterior face of the ankle-joint. The splint is then laid on the anterior portion of the leg, and fixed thereto by another

bandage, which must be long enough to extend from the toes to the groin, and thence several times around the body. Over this a thick coating of starch must be applied, the upper hook placed nearly over the seat of fracture, the lower one about the middle of the leg; the cords are then attached and fixed to a pulley, which may be screwed to a frame extending over the bed, or to the ceiling. See Fig. 186.

The differences between the splint just described and that of Dr. Hodgen are as follows: In the latter, the point of suspension is at an angle from the seat of fracture, making thus additional counter-extension by the body.

FIG. 187.



Hodgen's Splint.

It is not an *anterior* but a *lateral* splint. Pieces of muslin are pinned or sewed from side to side of the bars, to make a "cradle" for the fractured bone, thus leaving the anterior face of the limb, if necessary, exposed to view, and allowing (by the removal of any of the slips) a wound or ulcer to be examined or dressed without disturbing the fracture. I have used this splint many times with most satisfactory results. Fig. 187 gives a correct idea of it when applied.

The following is a description of a modification of Hodgen's splint by the late Dr. Clark. The measurements are accurate, so that a splint may be constructed from them.

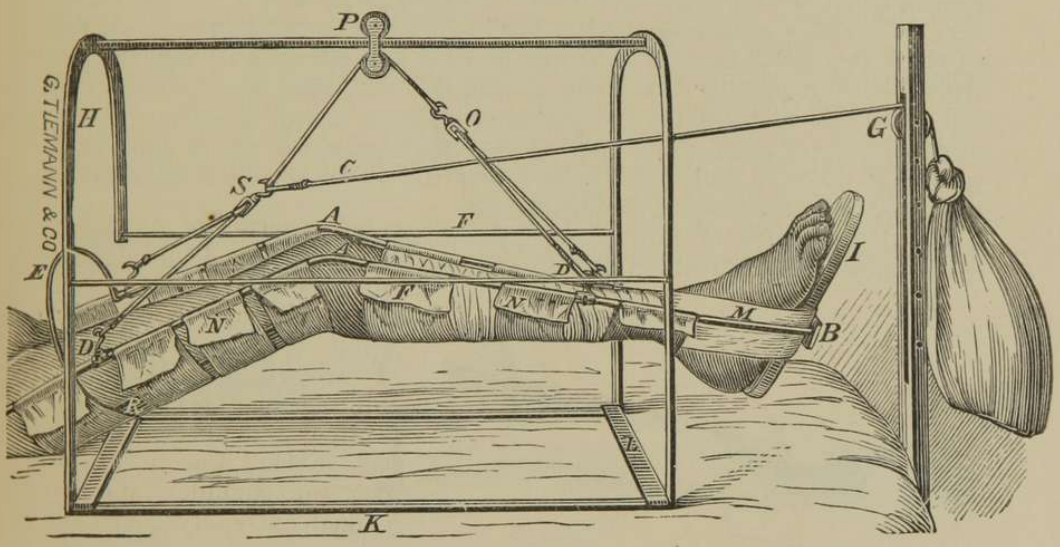
Dr. Clark reports six cases of fracture of the femur treated by this splint without shortening or deformity. I can also add my own testimony as to its efficacy in ten cases.

The arch should be turned of iron bars (Fig. 188), one-eighth of an inch in thickness and half an inch in width. The top of the arch, H, should stand eighteen inches from the surface of the bed, while the width of the frame at the bottom, L, should be fifteen inches, and its length, K, twenty-four inches. The two arches are braced upon each other by the two slen-

der bars, F F, at either side, and the rail at the top upon which the pulley, P, glides. This rail, to prevent bending, should be made of steel, three-eighths of an inch in width and one-fourth of an inch in thickness, with its broad diameter placed in the vertical position, and fixed with a thumb-screw at one end, so that the rail may be withdrawn to apply the pulley. It will be observed that the arch at the proximal end is cut away at the inner side below where it joins the lateral bar, F, the object of which is to allow the patient to use the other limb more freely.

The splint of Dr. Hodgen, upon which the limb is mounted, consists of iron rods, A A, one-fourth of an inch in thickness, placed parallel on both sides of the limb, extending its whole length and transversely across the bottom of the foot, much after the manner of Smith's anterior splint. The

Fig. 188.



Clark's Splint.

limb is then adjusted in the splint by placing it in position, and pinning strips of bandage, N N, four or five inches in width, over the bars on either side, constituting the floor of the splint, upon which the limb is allowed to rest in the suspended position; adding, however, as will be seen in the diagram, R, a sheet of pasteboard five inches in width, extending from the nates to the knee upon the posterior surface of the thigh, thus giving a more equable support to the limb at the point of fracture. These bars upon which the limb is supported, are prevented approaching too near to each other or to the limb, by an iron bow, E, holding them in position at their upper extremities. The attachment for extension is by means of the adhesive strips, M, extending to near the knee and passing around the footpiece, I, to which is attached a small bracket, B, which hooks over the lower end of the main splint. Then the limb is suspended by the four hooks, D D, which are attached to thimbles that slide back and forth upon the bars, and are fixed at the desired point by means of thumb-screws in their outer sides. The limb now being suspended, the extension is made by means of the cord, C, attached to the hook in the pulley at S, passing forward between the cords playing over the pulley at O, to drop over the

pulley, G, fixed in the slender post at the foot of the bed, and then attached to a sand-bag of sufficient weight to make the necessary amount of extension. The weight ordinarily required for an adult will be from 10 to 15 pounds. Now with the limb completely adjusted in the apparatus, the axis of the femur may be changed to any line, by sliding the thimbles nearest the foot, forward or back, which will elevate or depress the leg, and in doing so will produce just the opposite effect in the position of the thigh. Or again, the same can be accomplished by sliding the thimbles at the thigh back or forth. Or the axis of the femur may be still more conveniently adjusted by gliding the pulley, P, back or forth upon the suspension rail, which, as will be seen by a glance at the diagram, if the pulley be drawn towards the body, will have the effect of elevating the thigh and depressing the foot, and *vice versa*. Then by means of the lateral movement in the pulleys, S, O, the patient is enabled to rotate the limb sufficiently to allow him to lie upon his side if he desires, or if it become necessary. The only counter-extension required with this dressing is the weight of the body, which is quite sufficient in all cases; for even though the patient should gradually slip down in bed, the extension is constantly the same until his foot reaches the post at the foot of the bed, when, without any assistance, he can draw himself up in bed again, the whole apparatus connected with the limb coming back with the pulley, P, upon the suspension rail, when the body is drawn upwards.

Dr. H. L. Hodge, of Philadelphia, has invented a means of extension and counter-extension which has been introduced into the Pennsylvania Hospital, and which is said to produce very satisfactory results. It consists (Fig. 189) of an ordinary Dessault's splint, to the upper extremity of which is made fast an iron bar, so bent that it passes over the shoulder, and its hooked extremity comes in a line with the axis of the fractured limb. A broad strip of plaster is laid along the chest and abdomen, as seen in Fig. 190,

FIG. 189.

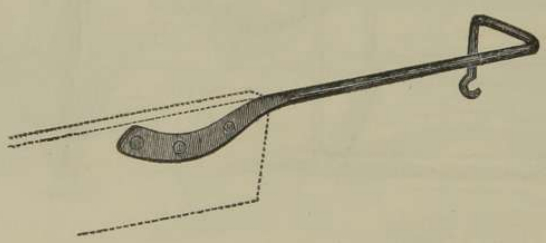
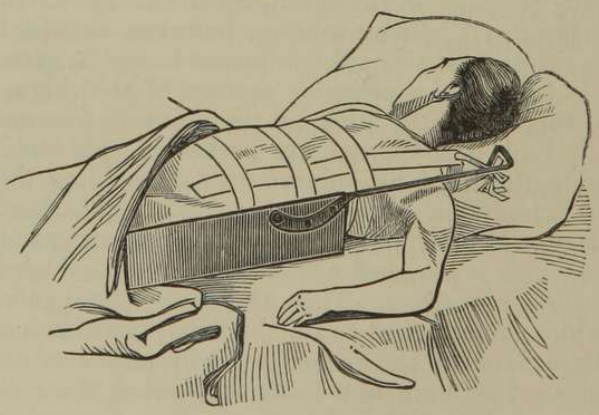


FIG. 190.



a loop left over the shoulder; it is then carried down the back to the nates. A block is fixed in the loop, and to this a cord is attached, which is tied

firmly to the iron hook. To make the counter-extension strap more secure, transverse bands are placed around the chest.

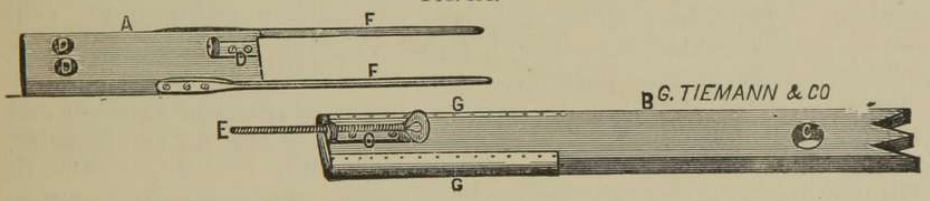
Among the recent useful additions to surgery is a new splint for dressing compound fractures of the femur, invented by Dr. E. A. Munger, of Waterville, N. Y.

The advantages claimed for this splint are: 1st, cheapness; 2d, durability; 3d, simplicity; 4th, facility for dressing the wound; 5th, ease of making extension; 6th, ease and certainty of regulating the amount of extension.

The cheapness, simplicity, and durability of this new appliance is best illustrated by a description of the splint itself.

Description.—Take an ordinary straight splint, such as is described in *Liston's Surgery*, and fit it to the injured limb as if for application. Then saw it in two at the point of fracture, and remove an inch or an inch and a half from each section of the splint at the point sawn asunder. To the outer edges of the upper or body portion of the splint, A (Fig. 191), screw two iron rods, f f, three-eighths of an inch in diameter, and a foot or more in length. These rods slide into grooves, g g, in the lower section, B, which are covered with tin to prevent displacement of the bandages. At the upper end of the lower segment is attached an iron brace, G, through the head of which runs a screw, E, ten or twelve inches in length. The end of this screw strikes against a corresponding brace, D, attached to the upper segment; and it is by turning this screw that the two portions of the splint are forced apart. By this means extension is made and kept up to

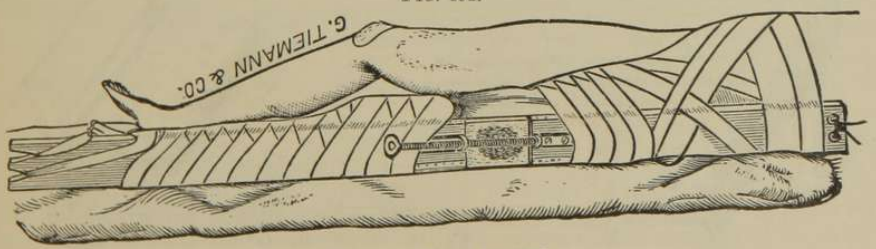
Fig. 191.



Munger's Splint.

any desired degree. The iron parts of this splint, as described, can be made in a short time and at trifling cost by any blacksmith, and if well made

Fig. 192.



Munger's Splint applied.

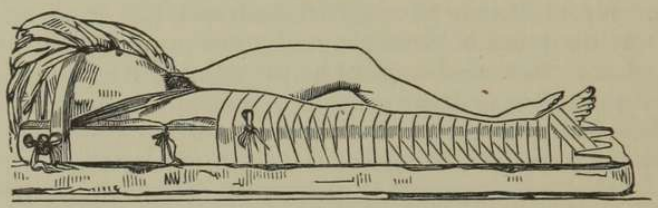
will last a lifetime. These irons can be easily removed from one splint and applied to another, either long or short, as the case in hand may require.

Application.—Each section, when made according to the foregoing plan, should be well padded, and the whole is then applied to the limb in the same manner as an ordinary Liston's splint, with rollers and perineal band, excepting only that the space between the sections is not to be covered by

the roller, but with a light dressing separate from the rest. By this means a wound may be examined and cleansed as often as necessary without disturbing any other portion of the apparatus. It is obvious that with this splint, properly applied, extension may be made with great ease. Placing his thumb and finger upon the head of the screw, the surgeon, with a few turns, easily forces the limb to its natural length. This is done without his being troubled or annoyed, or the limb endangered by the rude efforts of bungling, inefficient, or inexperienced assistants.

The straight splint of Mr. Liston (Fig. 193), which has been used and recommended by Cooper and Fergusson, and has been variously modified

FIG. 193.



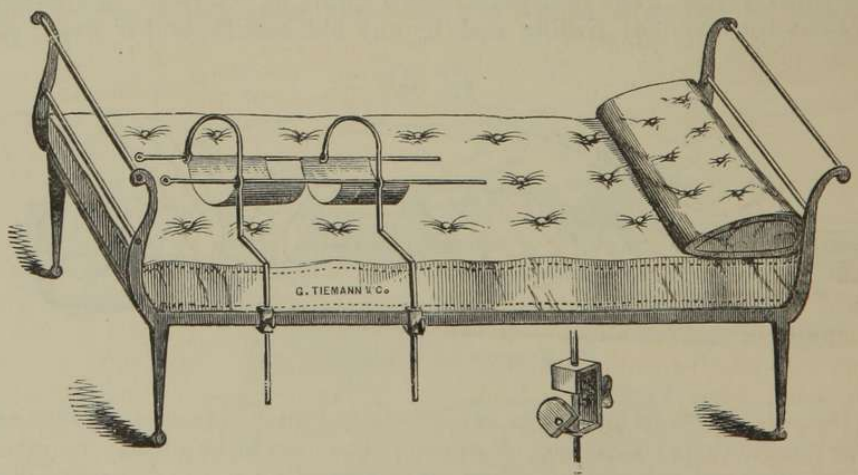
Liston's Splint.

by many of the patent splint makers, consists of a narrow board about a hand's-breadth in width, and extends from a short distance below the axilla to several inches below the foot; at its upper extremity are holes through which tapes are passed to fix it securely to the body, together with a perineal band, and at the lower extremity it is notched to receive the extending bandages. This splint is modified by Day, who appends a foot-board, which may be graded to the proper length for each subject, and is divided in its middle, to render it more portable.

Dr. Physick, of Philadelphia, modified the long splint of Dessault and had it extended from the axilla to the foot, using also an inside splint, keeping up the extension at the perinæum.

In treating fractures of the femur a great variety of apparatuses from time

FIG. 194.



Shrady's Apparatus.

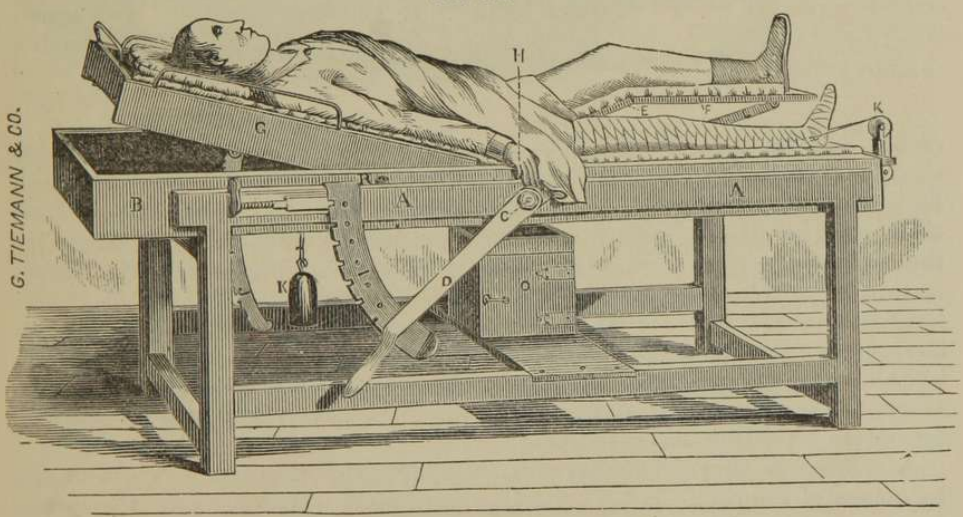
to time have been introduced to the profession. Very few of them can be mentioned here. Fig. 194 represents an ingenious and comfortable suspen-

sion devised by Dr. George F. Shrady. The iron rods bent to sustain the limb, as seen in the figure, are fitted with clamps, which allow removal, render the suspensory apparatus easily applied to the sides of the bed, and have the additional advantage of elevating the injured limb to any required height.

One of the best contrivances for treating not only fractures of the femur, but hip-joint disease in its early stages, is the fracture-bed of my friend Dr. E. J. Morgan, of Ithaca, New York. The following cuts and description will show its admirable workings:

Fig. 195 represents one view of the bed and a patient with a fracture of the neck of the femur, with the thigh resting upon a plane, and extension effected by weights and pulleys, while the sound thigh rests upon an inclined plane for the purpose of counter-extension. It will be seen that while the fractured thigh remains in the horizontal position, the other is elevated and the leg raised above and on a line corresponding to the axis of the body. In this position the pelvis becomes *fixed* and counter-extension maintained by the position of the sound thigh. When the surgeon has to deal with fractures of the neck of the femur in the aged and infirm, when failing strength prevents the possibility of maintaining extension by means of the long splints and perineal bands, the value of this novel mode of treatment must be apparent. For the more robust, perineal bands may be used, if preferred, and attached to the ring R, as seen in Fig. 195. This

FIG. 195.

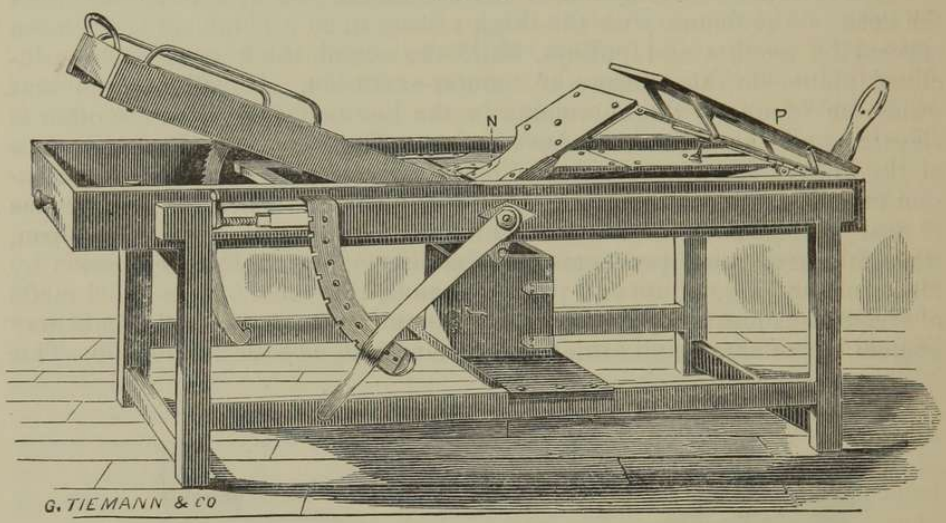


position of the bed may be effected by simply disconnecting the thigh-bar from the rack-shaft pendant on the side corresponding to the fractured limb, and by depressing the spring lever. This allows the surgeon an opportunity of making an accurate measurement of the fractured limb at any time without disturbing the fracture; for it will be seen that by reversing the spring lever, the sound limb will be placed upon a plane by the side of the other. This bed is particularly adapted to the treatment of hip-joint disease in the *acute stages*, where extension and counter-extension are necessary. In both diseases of the hip-joint and fractures of the neck of the thigh, the body of the patient may be elevated at any desired height without disturbing the joint in the least.

This is effected by detaching the top of the body-plane from the tilting-

frame, after which the elevation of the back-plane bends the patient at the small of the back. For fractures below the middle of the thigh (see double leg-plane on Fig. 196), disconnect the lower end of the parallel bar on the side corresponding to the fracture, which breaks the union of the thigh-bar and pendant of the opposite side, and depress the spring-lever until the thigh and leg planes take the desired angle for a double inclined plane (having previously adjusted the double leg-plane to the side in use). Then it will be seen, also, that by turning the thumb-screw the thigh-plane be-

FIG. 196.



comes lengthened and extension is easily effected. Fractures of the leg should be treated with the leg-plane somewhat elevated and secured to the foot-piece. By withdrawing the spring point from the sound arm, the patient may be tilted forward over the circular opening until he rests over the earth-closet, and this may be done without changing relatively a joint in the body. Therefore, instead of being tied down on Liston's or Physick's long splints and excoriated with dampness and perineal bands, besides having the fracture disturbed daily and torture inflicted upon the patient by the "infernal bed-pan;" on *this bed* he may sit up or lie down, be moved about the house or out of it, and be made as comfortable as it is possible for one to be with a fractured thigh.

A represents the rectangular frame which supports the tilting-frame, B, by means of the rack-shaft, C, passing through it; D, represents the spring lever attached to the rack-shaft for elevating the thigh and leg planes, E F; G, represents the back-plane, and H, the body-plane; I, represents the sound arm, that holds the lifting-frame at any angle; J, the circle-ratchet, that holds the back-plane at any angle; K K, the pulleys and weights attached for effecting extension; L, the parallel rods which support the leg-planes; M, the thigh-bars attached to the rack-shaft pendants; N, the circular opening leading to the earth-closet; O, the earth-closet; P (on Fig. 196), represents the double leg-plane separated by a thumb-screw for the purpose of making extension, when the double inclined plane is used; R, represents the ring for the attachment of the perineal bands.

Fracture of the Patella.—A fracture of the patella is generally occasioned by the sudden action of the quadriceps, or direct violence; the separation may be either longitudinal or transverse. In either case the

diagnosis is not difficult. In the former, a depression can be felt running along the bone, the chasm being diminished by lateral pressure; in the latter, the separation of the fragments is transverse, and through the rent in the bone, the synovial sac protrudes, which often in itself prevents the replacement of the fragments. This fracture is often the result of direct violence; and the sudden loss of power, the sensation as though something had given way at the time of the injury, and the effusion and pain, are sufficient to diagnose the accident. In the last case of fracture of this bone that came under my care the fracture was directly transverse, and was caused by a fall upon the knee, as the patient was stepping from a carriage.

In some cases both patellæ are broken at once, and the bone is often fractured in several places. The union may be either by bone or ligament, which latter, in some cases, may be half or three-quarters of an inch in breadth.

In the *starred* or vertical fracture, osseous union generally results.

Treatment.—In the treatment of fractured patella the chief desideratum is to prevent flexion of the knee-joint, and to keep the fragments as nearly as possible in apposition. This is well effected by a posterior splint, which should be of sufficient length to extend from the tuber ischii to the heel; this being well padded, should be applied, and a figure-of-eight bandage put on, so to envelop the patella, that the fragments are drawn into apposition. The hooks of Malgaigne are not much used at present, although I am informed by Dr. Levis, that they still are employed in preference to other methods at the Pennsylvania Hospital. Sir Astley Cooper's method of applying a band around the thigh and drawing it down with lateral bands which pass under the foot, is not much in vogue and is liable to many objections.

Dr. W. A. Gibson, in the *St. Louis Medical and Surgical Journal*, describes a ring made of iron, about three-eighths of an inch in thickness, and sufficiently large, after being padded, to embrace the patella closely. All the fragments are gathered within the ring, which is then retained in position by attaching a strap or band on either side, and fastening them around a wooden splint, laid upon the posterior surface of the leg and thigh, the splint being retained in position by a roller bandage, thus preventing any motion of the knee-joint.

The apparatus of Professor Hamilton is as follows, and is the one which in my hands has been productive of most good (*vide* Fig. 197).

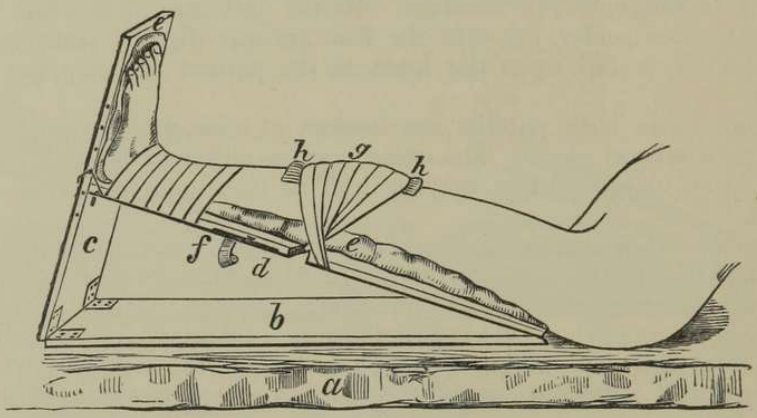
"The dressing consists of a single inclined plane, of sufficient length to support the thigh and leg, and about six inches wider than the limb at the knee. This plane rises from a horizontal floor (*b*) of the same length and breadth, and is supported at its distal end by an upright piece of board (*c*), which serves both to lift the plane and to support and steady the foot. The distal end of the inclined plane may be elevated from six to eighteen inches, according to the length of the limb and other circumstances. Upon either side, about four inches below the knee, is cut a deep notch (*d*). The foot-piece stands at right angles with the inclined plane, and not at right angles with the horizontal floor; it may be perforated with holes for the passage of tapes or bandages to secure the foot.

"Having covered the apparatus with a thick and soft cushion (*e*) carefully adapted to all the irregularities of the thigh and leg, especial care being taken to fill completely the space under the knee, the whole limb is now laid upon it, and the foot secured gently to the foot-board, between which and the foot another cushion is placed.

"The body of the patient should also be flexed upon the thigh, so as the more effectually to relax the quadriceps femoris muscle.

"A compress made of folded cotton cloth, wide enough to cover the whole breadth of the knee, and long enough to extend from a point four inches above the patella to the tuberosity of the tibia, and one-quarter of

FIG. 197.



Hamilton's Splint for Fractured Patella.

an inch thick, is now placed on the front of, and above the knee (*h h*). While an assistant presses down the upper fragment of the patella the surgeon proceeds to secure it in place with bands of adhesive plaster (*g*). Each band should be two or two and a half inches wide, and sufficiently long to inclose the limb and splint obliquely. The centre of the first band is laid upon the compress partly above and partly upon the upper fragment, and its extremities are brought down so as to pass through the two notches on the side of the splint, and close upon each other underneath. The second band, imbricating the first, descends a little lower upon the patella, and is secured below in the same manner. The third, and so on successively until the whole extent of the compress and knee are covered, is carried more nearly at right angles around the leg and splint; the last bands passing obliquely from below the ligamentum patellæ upwards and backwards. The dressing is now completed by passing a cotton roller (*f*) around the whole length of the limb and splint, commencing at the toes, and ending at the groin. This is applied lightly, as its object is only to support and steady the limb."

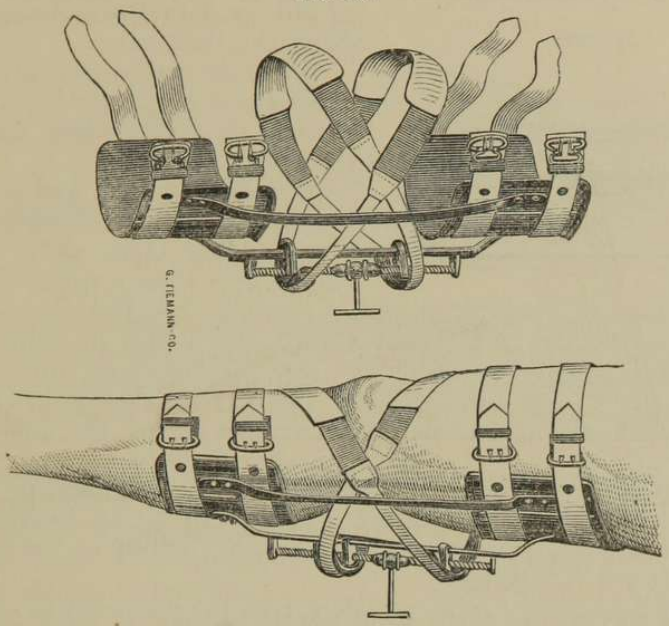
Fig. 198 (on following page) represents Turner's apparatus. The thigh and leg pieces are of sheet-iron, which are fastened around the leg and thigh with buckles and straps, and united to each other by three bars, two lateral and one posterior; to the latter are joined two troughs with a double reversed screw. By turning the screw the troughs can be made to approach or separate from each other. Adhesive straps are applied around these troughs, as seen in the figure, and by turning the screw the fragments are drawn together.

Dr. Ed. Hornibrook* procures osseous union of the fragments in transverse fracture of the patella by the use of the posterior splint, immovable fixture of the lower fragment by means of adhesive straps, and coaptation of the upper to the lower fragment by traction, made by weight, pulley, and cord, after the manner of Buck's extension in fractures of the thigh. Ad-

* Monthly Abstract of Medical Sciences, Jan. 1877.

hesive straps, placed lengthwise over the upper fragment, and extending up the thigh, three inches, form the means of attachment to the cord.

FIG. 198.



Fracture of the Tibia.—The tibia may be fractured throughout any portion of its extent, although the separation is most likely to occur at the upper extremity of the lower third, or the lower extremity of the middle third, and as a general thing, the fracture is of the oblique variety, and is perhaps more generally occasioned by direct violence. The prominence of the spine of this bone and its exposed position renders it very obnoxious to *direct* force.

The *external malleolus* is sometimes broken by a fall upon the foot or by a twist of the ankle; the latter happens often while running, and I have in mind a case in which, after fracture of the malleolus, there was a compound dislocation of the ankle, which lasted for many months, and only recovered with a severe stiffness of the articulation.

The fracture is not, in the majority of instances, difficult to diagnose. The line of the spine of the tibia is broken, and in most instances there can be distinctly felt and seen, a sharp projection beneath the skin, which indeed often pierces the skin, and thus complicates the case. If the fibula remain intact, we do not look for very much displacement, for the latter bone acts as a splint in keeping the varied muscles in position, and for the same reason we very rarely have shortening of the limb, which can only occur when the fracture is high up, above the fibula, or in other complications which are rarely to be met with.

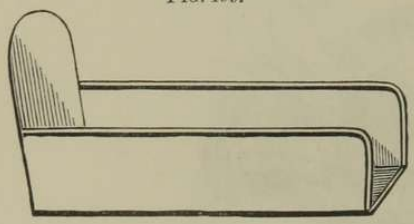
The Treatment of fracture of the tibia is very simple. Neither extension or counter-extension is necessary in the majority of cases; if, in the judgment of the surgeon, it may be necessary to use slight extension, a pulley at the foot of the bed, over which a weight of five or six pounds is hung, the other extremity of the cord being attached to the sole of the foot by means of adhesive strips, will answer the purpose; or the limb may be placed over an inclined plane.

Usually, the carved splint of Day answers the purpose, or the wire splint

of Dr. Lewis Bauer, formerly of Brooklyn, now of St. Louis. Dr. Gross uses a tin case with a foot-piece, which is accurately adjusted to the leg, and extends up to the knee.

Ordinarily a good fracture-box, well supplied with cushions (Fig. 199) or pillows, with deal-board splints, will effect excellent cures.

FIG. 199.



When the malleolus is involved, it is necessary to adjust the foot to the foot-piece of the fracture-box, and secure it there with tapes.

A simple method, and a good one, too, consists of first laying upon a firm mattress four tapes about a yard in length, over these a splint-cloth, which is nothing more than a piece of muslin reaching from the sole of the foot to a little above the knee, and about a yard and a half in width. Having adjusted the bones, lay alongside the leg junk-bags half filled with bran, and neatly adapt to the inequalities of the leg; lay side-splints, flatwise on the splint-cloth, and roll them up firmly, and secure the whole with the tapes.

Fractures of the Fibula.—The position of this bone and its peculiarly slender formation, render it liable to fracture. Slipping, twisting or turning the foot, stepping from a carriage, or falls, directly or indirectly, give rise to fracture of the fibula.

The most frequent site of the accident is at the lower fourth of the bone, and the fracture is generally accompanied with dislocation of the ankle, in which *the foot is everted*, which has been called Pott's fracture. Dr. Jernegan* reports a case of this fracture where there was *inversion* of the foot. I have lately seen a case, in which I could recognize no displacement. For a time I could not believe, the bone was broken until, by rotation in a certain direction, I obtained distinct crepitus. Sometimes this bone is split upward from the lower extremity, and from a careful study of the anatomy of the joint we can readily see what deformity may exist at the point when such fracture occurs. Great pain is often present, also, from the rupture of either the deltoid or the external lateral ligament. We generally find that the displacement of the lower fragment is inward toward the tibia. In those cases of fracture of this bone when there is *in*version, the internal malleolus is generally broken, while in that already mentioned, Pott's fracture, the internal lateral ligament may remain entire. In some cases of compound fractures, implicating the ankle-joint, amputation or resection may have to be performed.

A great deal of stiffness remains for a long time after this fracture, no matter how diligently the treatment has been attended to; and in some cases, even after the lapse of years, in damp and rainy weather, pain and inconvenience are experienced. In a case in which I was lately summoned to testify as a medical expert, the plaintiff sued for permanent disability ten years after the accident. The treatment had been of the best kind, and yet a certain amount of pain and stiffness remained. Professor Hamilton mentions an extraordinary case, in which the joint remained almost immovable after twenty years.

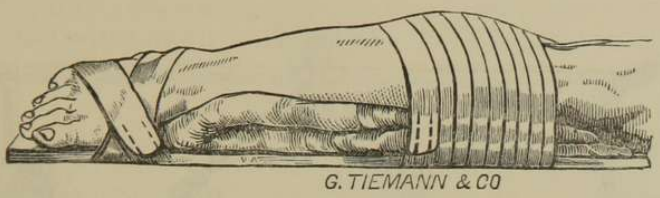
Treatment.—In fractures of the fibula above the middle, with but little eversion or inversion of the foot, a fracture-box is as good an appliance as can be made. When Pott's fracture is to be treated, the old-fashioned

* New England Medical Gazette, Dec. 1877, p. 541.

Dupuytren's splint is excellent, although Mr. Thomas Bryant, in his late work,* recommends as preferable a posterior and two lateral splints.

Dupuytren's splint must extend from the condyle of the femur to two or three inches beyond the foot. Upon this a long triangular pad must be

Fig. 200.

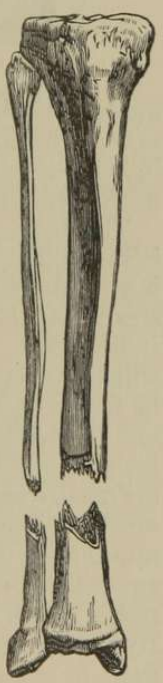


Dupuytren's Splint.

laid, the thickest portion of the triangle corresponding to a point about an inch above the internal malleolus. The bone is then set, and the splint, with the pad resting upon it, applied alongside the inside of the leg, which is secured as seen in Fig. 200, the bandages *not* covering the site of the fracture.

Fracture of both Bones of the Leg.—Fractures of the tibia and fibula are of frequent occurrence, and are often both compound and comminuted. Accidents of all kinds, kicks, blows, falls, or wounds, in which direct violence is applied to the leg, may result in fractures of the leg (Fig. 201).

Fig. 201.



The bones may be broken at the same point, or one higher up than the other, and the direction may be either transverse or oblique, but probably that most frequently met with is the former, having its site three or four inches above the ankle.

The symptoms are generally unmistakable. The superficial nature of the spine of the tibia, the loss of power, preternatural mobility, and crepitus, generally proclaim the nature of the accident. In some cases, when the break has occurred in the vicinity of the ankle-joint, a doubt may arise as to the presence of a luxation, but in these cases the relative normal position of the malleoli with the foot, and the facility of restoring the displacement, should give sufficient evidence of the true nature of the accident.

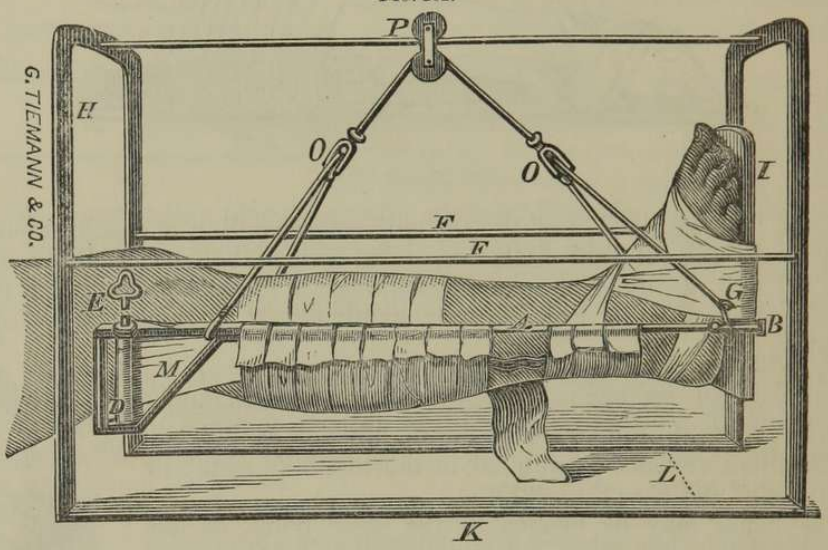
In some cases, where the fracture has occurred in the vicinity of either the knee or the ankle joints, *anchylosis may exist for a long period of time.*

Treatment.—A great variety of apparatus have been introduced for the treatment of fractures of the leg. In some cases I have used a simple fracture-box with a pulley and weight; in others, I have applied the anterior splint of Professor Smith with very great success, and it is so simple and so comfortable that I would advise a trial of its merits. The swing of Dr. Clark I have also seen applied with good results. A description of this I published, by permission of Dr. E. A. Clark, in the *Western Homœopathic Observer*, for April, 1870, and saw the splint in use in the City Hospital of St. Louis, and I have used it with excellent results. By referring to Figures 202, 203, the following description of the splint by Dr. Clark will be readily understood.

* The Practice of Surgery, by Thomas Bryant, F.R.C.S., London, 1872, p. 961.

The two arches, represented by the letter H at one end, are made of iron bars one-eighth of an inch in thickness, and three-fourths of an inch in width, and are continuous with the bottom pieces, K, which rest upon the bed, and measure twenty-two inches in length. The arches are also supported on the sides by the two slender bars or rods, F F, while the bar supporting them at the top, upon which the pulley, P, glides, should be

Fig. 202.



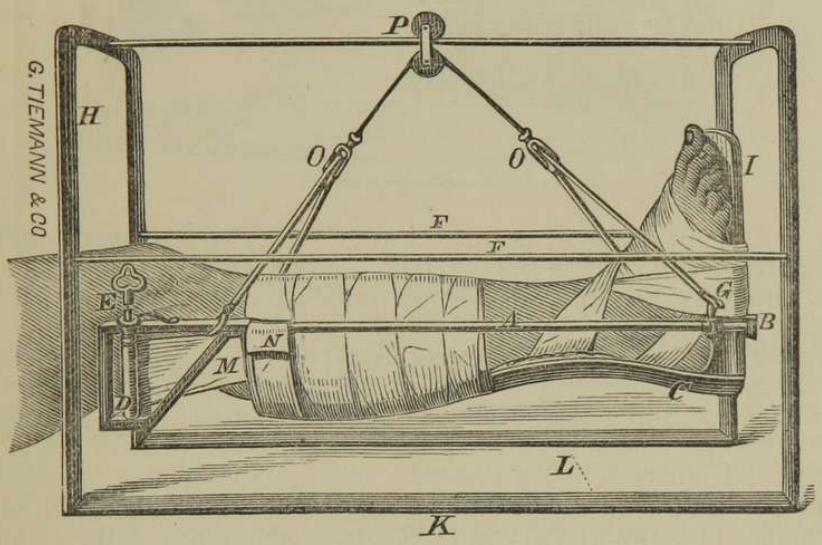
made flat, with the long diameter vertical, and of sufficient strength to prevent it bending with the weight of the leg. The width of the arches, as indicated by the letter L, should be fifteen inches, and their height eighteen inches from the surface of the bed (Fig. 202).

The bars, A, of the frame or portion of the apparatus in which the leg is suspended, should be about two feet in length—unless when the fracture is so close to the knee that it may be necessary to attach the adhesive straps, M, above the knee, when the bars may extend to near the perinæum if necessary, and the crossbar passing beneath the foot-piece, I, and upon which the foot-piece rests by means of a suitable hook or bracket, B, should be flattened, the more readily and securely to engage in the hook or bracket, and be five inches in length, so as to allow ample space for the limb to rest between the bars; the space between these bars at the upper end should ordinarily be about six inches. The leg is supported entirely by strips of muslin pinned over the bars on either side, rendering the apparatus more appropriate for the treatment of compound fractures, as the wound may be examined and dressed when necessary, by removing one or more of these strips, which may be replaced by new ones without disturbing the fracture. By means of the pulley at the letter P, the patient is enabled to move his limb, or even his body, forward and back, to the extent of the length of the bar upon which it glides; and by means of the cord playing over the under wheel in the same pulley, the patient is able (when the fracture is not so near the knee as to necessitate the apparatus extending above the knee), by a very slight effort, to flex or extend the knee by depressing or elevating the foot, while at the same time he can swing the leg from side to side to any extent, within the space of the arches; and by means of the cords playing through the pulleys at O O, the leg can be rotated to any extent, even to allow the patient to lie upon his side if he desires, without disturb-

ing the fracture in the least. It will be observed in the diagrams that at the letter G there is a thimble, which can be made to slide up on the bar, by means of which—sliding this thimble forward or back and fixing it at any point, by the thumb-screw attached to the thimble—the lower end of the leg can be elevated or depressed at the will of the patient.

The apparatus just described is especially designed for the treatment of compound fractures; for simple fractures a posterior splint is used (*vide* C, Fig. 203), constructed either of tin or felt, well adapted to the limb. Dr.

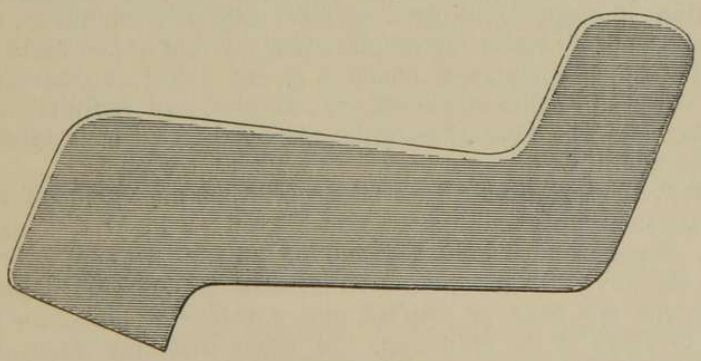
Fig. 203.



Clark afterwards constructed this splint with an aperture at the extremity for the heel to project.

A favorite method of treating fractures of the leg is in Pott's position. This dressing is composed of an outside splint of angular shape, as seen in Fig. 204, which should be seven inches in width, constructed of deal-board

Fig. 204.



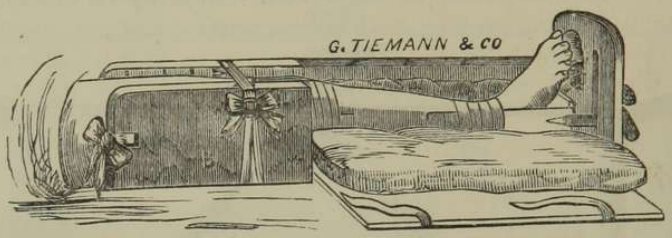
Pott's Splint.

and with a projection to accommodate the foot; this splint, well padded and with a hole with bevelled edges to accommodate the external malleolus, and otherwise well padded, should be placed on the outside of the limb, which must be flexed on the abdomen and the leg kept at a right angle

with the thigh; on the inside of the leg a padded straight splint of felt, leather, or pasteboard, extending from the ankle to the knee, is placed, and the two secured by a roller-bandage. The limb is now allowed to rest on its outer side.

Fig. 205 represents Neill's apparatus for compound fractures of the leg. The illustration explains itself.

Fig. 205.



Neill's Apparatus.

In very many cases of compound fracture, extension, made with the pulley and weight, and a fracture-box constructed with hinges, that the parts may be examined and dressings applied, answer very well all the indications required.

Fractures of the Foot.—These accidents are not very frequent, and are generally accompanied with destruction or laceration of the soft structures, which may result in gangrene and require amputation. The toes may be injured by heavy weights, as happens to coal-heavers, quarry-men, stone-masons, and others similarly exposed; and as amputation is the advisable recourse in most of such cases, the question of greatest importance for consideration will be with reference to the site of operation. Unless, however, the tarsus be involved in the injury, the idea of amputating the foot ought not to be entertained; and as a general rule applicable here, as in most other parts of the body, the smallest possible degree of mutilation ought to be inflicted, consistent with the object of the operation, which is to remove such parts as are irrevocably injured, and at the same time leave a properly formed stump. In instances of fracture of the foot, where there is no necessity of resorting to the knife, it is scarcely requisite to use any apparatus to keep the fragments in apposition; in the toes, the phalanges are so short, that, if properly adjusted at first, they will remain so, unless the patient injudiciously bears his weight upon the foot at too early a period; even in the longer metatarsal bones it is not found necessary to employ splints. The application of arnica, etc., at first, and complete rest of the foot for about twenty days afterwards, constitute the most important parts of the treatment.

Treatment of Compound Fractures.—The management of compound fractures is oftentimes troublesome, and requires a great deal of care and attention. In some instances the end of a bone protrudes through the wound in the soft parts and cannot be restored to its natural position; in such cases, the saw must be applied and a sufficient portion of the bone removed to allow of its reduction. In other instances, when there is a comminution of bone, the spiculæ must all be carefully removed, which may require incisions in different directions through the soft parts. After either of these operations, the entire wound should be thoroughly washed with a solution of carbolic acid, and the parts brought as nearly in apposition as the character of the wound will allow, the object of the surgeon being to obtain union of the soft structures as soon as possible, and thus convert the compound into a simple fracture.

In dressing such fractures the bandage of Scultetus should always be employed next to the skin, in order that the wound may be opened and examined. If the injury be to the thigh, the cradle-splint of Hodgen, or the extension apparatus of Buck, will be of service. If it be the leg, and one bone is broken, the simple fracture-box, filled with bran which has been sprinkled with carbolic acid, should be used. If both bones are broken, and extension and counter-extension are necessary, Neill's apparatus may be employed. An excellent splint is that invented by Dr. A. Hays, which can be made by taking a long side-splint, cutting out a sufficient portion opposite the site of fracture, that free access can be had for dressing and an exit for the discharge, and uniting the two portions of the splint, which are separated, by a convex iron-hoop, which must be securely fastened by screws. The hoop of iron also acts as a protection from the pressure or rubbing of the bedclothes on the affected part.

Dr. Hays remarks: "This plan I found to meet my wishes and expectations very fully. The extension and counter-extension being continued, the dressing might be repeated as often as requisite, without in the least disturbing the position of the limb."

If inflammation and swelling supervene, the bandages must be loosened, and a lotion of arnica or calendula applied to the part; if the pain is very severe and synochal fever be present, aconite may be prescribed, or if cerebral symptoms develop themselves, arnica, bella., cuprum, or hyos. may be indicated; if strangury be present, acon., nux, cann., canth., or some other appropriate medicine must be resorted to. Other indications for the treatment have been already alluded to in the chapters upon Wounds and Abscesses.

The great object in the subsequent treatment is to prevent the lodgment of matter, by sponging and pressing it out carefully at each dressing, and applying compresses to prevent its accumulation, and, if necessary, to make openings for its discharge. In this state of excessive discharge, dry bran, as an absorbent, is one of the best beds the limb can be laid upon. If the patient seems likely to sink under the discharge and irritation, notwithstanding the local application of calendula, and the administration of acon., bella., china, hepar, merc., and other medicines that have been mentioned for such conditions, amputation is the last resource.

For further information on this subject the student may refer to the Question of Amputation, at page 277.

CHAPTER XXVII.

INJURIES AND DISEASES OF THE JOINTS.

Wounds.—The joints are wounded from various causes—from cuts, thrusts, or by machinery. Of these wounds by far the most dangerous are those which penetrate the synovial membrane, allow the escape of synovial fluid and the admission of air into the cavity of the joint. Other accidents, as the crushing and severing of articular surfaces, are treated in other portions of this chapter and in that upon fractures. All wounds in proximity to the joints are more or less serious, because sometimes even a slight puncture has been followed by most disastrous consequences. When the

cavity of a joint has been opened by a wound and synovia escaped, there may at first be but little pain; in a few hours, however, symptoms of inflammation become manifest; there is throbbing, severe pain, a tense stiff feeling of the part affected and redness; with these symptoms there are also decided indications of constitutional disturbance, as exhibited first by chilliness, followed by fever, thirst, anorexia, and aching pains in the bones. The discharge which issues from the wound loses its ordinary character; it is thin, sanious, and I have seen it of a reddish hue. At times suppuration takes place, pus is discharged, and the bones are threatened with caries; this latter, however, need not always happen, inasmuch as the inflammatory process may be arrested and terminate in resolution.

In many persons, especially those disposed to the disease, erysipelas makes its appearance; or, in other cases, the parts appear to be doing well when, either gradually or suddenly, symptoms of tetanus supervene, and the patient, after undergoing the agonies of this disease, either dies or has a prolonged convalescence.

Treatment.—In wounds of the joints the parts first must be thoroughly cleansed, and the lips of the wound brought as nearly as possible in apposition. Absolute rest for a number of days is necessary. The patient should take internally arnica, if there has been much bruising of tissues, but if there is that peculiar *coldness of surface* which belongs to ledum, that medicine must be administered.

During the first few days of the treatment, the patient must be narrowly watched, and if chilliness, stiffness of the nape of the neck, or other symptoms of approaching tetanus supervene, the appropriate medicines must be given.

The reader may refer to this subject, Chapter xxiii, page 399.

For erysipelatous inflammation, aconite, bella., rhus tox., apis, lachesis, canth., arsen., and other medicines will be required, according to the symptoms. If synovitis ensue, it will be known by the symptoms detailed in the next section of this chapter.

Synovitis.—Inflammation of the synovial membrane may result from traumatic inflammation, or other local causes, or be caused by constitutional disease. Mr. Athol A. Johnstone, the author of the essay on Diseases of the Joints in Holmes's *System of Surgery*, divides synovitis into scrofulous, rheumatic, gouty, syphilitic, and pyæmic. Briefly, however, the terms acute and chronic will suffice.

The disease commences with severe aching in the joints, together with shooting pain, sometimes extending into the surrounding parts. After a short period of time the joint enlarges, becomes of a reddish hue, is extremely sensitive to pressure, and symptoms of severe constitutional disturbance develop themselves. The fever is intense, with redness of the cheeks, glistening eyes, coated tongue, high-colored urine, and, in some instances, derangement of the digestive functions. The swelling often advances rapidly, and is caused by rapid effusion into the synovial cavity. If the joint be superficial, fluctuation is distinct; the inflammation may terminate in suppuration, and the formation of purulent secretion, to which the term *arthropyosis* is applied. In a case which I attended with Dr. Lilienthal, of New York, the symptoms were rather remarkable, the pain being chiefly confined to the rotator muscles of the thigh, the knee also exhibiting the usual symptoms as above detailed, with profuse perspiration.

In the syphilitic variety of this disease, it occurs as a tertiary manifestation, and the knee and elbow are the joints most frequently attacked.

In chronic synovitis, the pain is not so severe and is of a dull aching character, the part is but little sensitive to pressure, and there is experi-

enced a sensation of weakness and relaxation of the limb. The swelling appears a few days after the pain, which in cases of an indolent character may be of trifling moment. After a time, an effusion takes place within the cavity of the joint; this fluid contains but a small proportion of lymph, and coagulates by the application of heat. The joint is rendered useless and there is a feeling of insecurity that prevents the movement of the parts. To such, the term *hydrops articuli* is applied.

The disease may follow local injuries, or be dependent on constitutional causes, as rheumatism, gout, syphilis, scrofula, abuse of mercury, etc. Children are seldom attacked. The knee-joint is most generally the site of the affection. In such instances the patella is protruded, and there is fulness at each side of it, and also at the lower and anterior portion of the thigh. At the elbow, the swelling is most marked above the olecranon; at the hip and shoulder articulations, there is general swelling of the surrounding muscles.

The disease is considered of a serious nature when it arises from penetrating wounds of the joint, as, in such instances, the constitutional disturbance is so severe, that life is brought into imminent danger.

Delirium and typhoid symptoms are very unfavorable. In severe cases suppuration within the cavity may ensue, or ulceration of cartilage and complete anchylosis may result.

Treatment.—The limb should be kept at rest until the violent inflammatory symptoms have been subdued, which may be accomplished in the first stages by the employment of aconite. This medicine is especially indicated by the severity of the fever, and when there are drawing and sticking pains in the affected joint, with tension, aching, and gnawing; when the patient complains of frequent chilliness and thirst, together with prostration and trembling of the limbs.

I have tried very many remedies in the treatment of the chronic forms of synovitis, and must give my most unqualified preference to the iodide of potash over all other medicines. I must say also that I have been obliged to give it in substance, from three to ten grains at a dose, three times a day; in addition to this the diseased surfaces *must be kept apart*. This is accomplished by the weight and pulley, five pounds being sufficient in most cases to effect the result. It is astonishing what relief this simple contrivance often gives, and from experience I should lay it down as a rule, that this mechanical treatment should not be lost sight of in the management of either the acute or chronic forms of the disease.

Bella. should be employed in acute synovitis when there is congestion to the head, with flushed cheeks, etc.; when the pain is excessive, with sensation as if the surrounding ligaments were contracted; or when there is bubbling, as from drops of water, in the fore part of the knee, with cutting and drawing pains.

Calc carb. is more suitable to this disease when it assumes a chronic character; when the patient is pale, debilitated, or of a scrofulous habit; with drawing pressure in the joints; or when the disease is accompanied with other affections of the osseous system.

Caust. may be employed when there is stiffness of the joints; bruised, tearing, and sticking pain; profuse sweat; numbness of the parts, and the sufferings aggravated in the evening.

Ledum is especially adapted to diseases of the joints, but particularly to affections of the knee. It possesses a powerful action on the absorbent vessels, and should be used in both acute and chronic synovitis when there is effusion, with sensitiveness of the parts to pressure; aching, tearing pains; great coldness or constant chilliness.

Iodium is an important medicine when there is much swelling of the parts, with erratic, tearing pains.

Merc. should be prescribed when the disease is accompanied with syphilitic com-

plication; when there are drawing pains, with aching in the bones, and rigidity of the parts; particularly when the symptoms are exacerbated at evening and at night, with profuse sweat.

Lycop. may be used if there is stiffness of the joints, when the pains are relieved by warmth, and aggravated in cold rainy weather.

Kali carb. may, in some instances, prove valuable, when there is aching in the joint, dread of the open air, and liability to take cold.

Rhus tox. is indicated, when, beside the ordinary pain, there are stitchings in the tendons surrounding the joints, accompanied with tingling and burning, with rigidity of the joints; or when there are sticking pains with stiffness, and especially if the constitutional symptoms tend to a typhoid condition

Sepia should be remembered when the patient is delicate; or, if females are affected, when there are jerking, sticking pains; or when the disease has been occasioned by violent strains of muscles or tendons.

Silicea is also highly recommended for diseases of the synovial membrane, particularly that of the knee-joint.

Dr. A. P. Williams records two cases of synovitis acute which were cured at the Homœopathic Hospital on Ward's Island, by the internal administration of apis mel.*

Aur., calc., lyc., nit ac., phosph. ac., sulph., together with silic., have been found useful in inflammation of the synovial membrane, in consequence of effects of mercury; and bry., china, lyc., nux vom., rhus, and sulph., when the disease occurs in gouty or rheumatic individuals.

Calc. carb. and sulph. have been chiefly recommended in lymphatic or scrofulous enlargements of the knee. If suppuration ensue, silic., merc., and hepar; and in cases of serous infiltration, silic. and sulph., or calc. merc., and iodium.

Other medicines are hell. (particularly in hydrops articuli), iod., natr., phosph., ruta, stront.

By some of these medicines the motion of the joint may be restored, but if there has been much effusion of plastic material, anchylosis, either spurious or bony, generally the former, will result.

In all cases, when the symptoms indicate the presence of fluid within the joint, the aspirator must be used, and if pus follows its introduction, the fluid must immediately be evacuated. There need be no fear in the withdrawal of fluid from the joints by this means. I have repeatedly performed the operation, and often punctured the same joint several times, and have never known an untoward result. Dr. Dieulafoy,† in one hundred and five punctures recorded, finds but one fatal case. His directions for aspirating the knee-joint are as follows:

"The limb is placed in extension, the joint being surrounded by a caoutchouc or linen bandage, leaving the point exposed towards which the liquid has been pressed, and where the needle has to be passed in. This place of election is the external *cul-de-sac* of the synovial membrane, opposite the upper end of the patella, and at about two centimeters exterior to this bone. The No. 2 needle, which is to be *exclusively* employed, only measures a millimeter in diameter, and when passed into the joint is to remain in a fixed position while the fluid is aspired. All manipulation of the joint is to be avoided as causing unnecessary irritation. When the liquid has been removed the needle is withdrawn and compression employed. The knee is surrounded by a layer of wadding, pretty firm compression being maintained by means of a flannel or linen bandage. A roller is also to be applied to the foot and leg in order to prevent the production of œdema. Twenty-four hours afterwards the joint is examined, and if there is no or

* New England Med. Gazette, January, 1877, p. 20.

† Abstract Medical Science, April, 1878, p. 77.

only very slight reproduction of the liquid, compression is again had recourse to; but if the effusion has been reproduced in a notable quantity, aspiration should again be performed before reapplying the compression."

Dr. Sayre's apparatus, already described in Chapter XVIII, for making extension in sprained ankle, and which, from its action, prevents the constant friction which otherwise would take place in chronic inflammation of the ankle-joint, is an excellent appliance.

In chronic inflammation of the knee, the same gentleman has also devised an ingenious apparatus. Fig. 206 represents the instrument, made

Fig. 206.

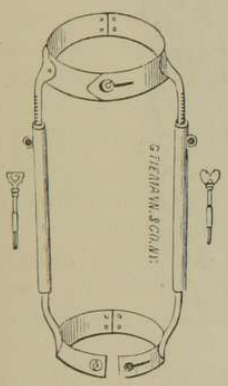


Fig. 207.

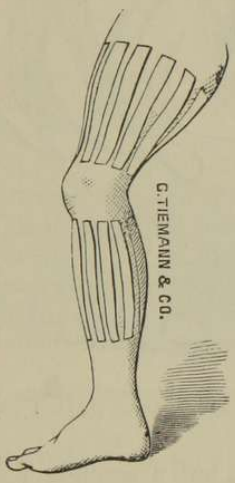
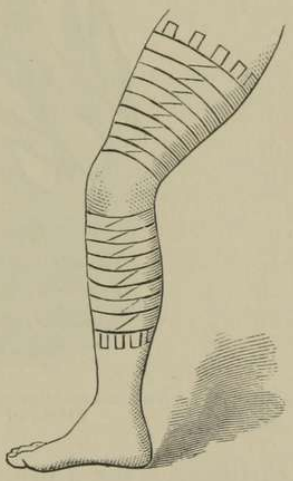


Fig. 208.



of two steel collars, one being fastened above the other below the knee; they are connected on both sides by extension rods, which are worked with a key; strong strips of adhesive plaster one inch wide are then applied longitudinally, as seen in Fig. 207, which are secured by a roller, as shown in Fig. 208, to within an inch of their extremities. The instrument is then applied, the collars drawn sufficiently tight to be comfortable, and the ends of the adhesive plaster wound over the collars above and below, as seen in Fig. 209. The limb is then brought down as nearly straight as possible, and the rods extended simultaneously, until pressure can be made on the foot without pain. A sponge is then placed in the popliteal space, and others around the joint, and the whole kept in position by a bandage saturated with cold water. The apparatus complete is seen in Fig. 210. If this apparatus cannot be obtained, the weight and pulley, as recommended on a preceding page, may be advantageously used.

Fig. 209.

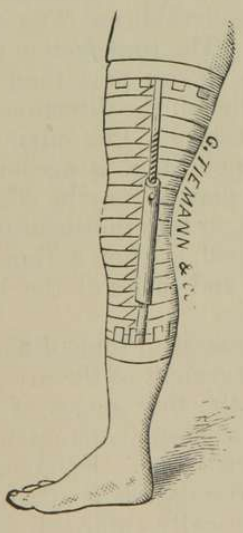
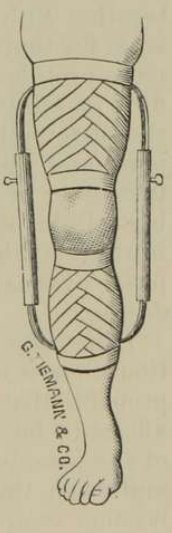
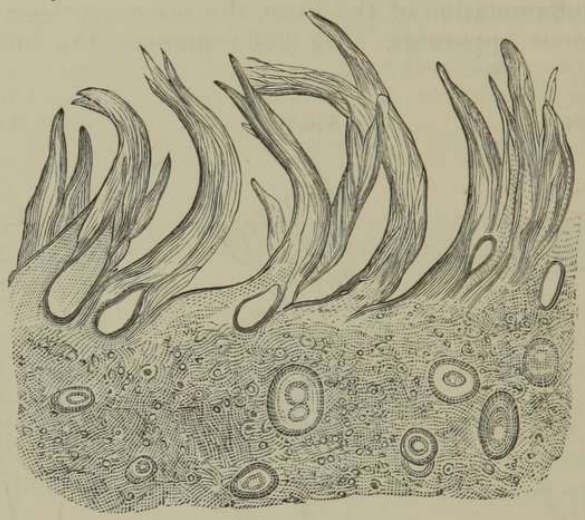


Fig. 210.



Ulceration of the Articular Cartilages.—If inflammation continues, the articular cartilages suffer, and finally molecular death occurs—the "*ulceration of cartilages*," of some authors. In these cases the degeneration takes place in a linear direction, and the surface of the cartilage appears to split into fibres as shown in Fig. 211. In reality, this destruction of the articu-

FIG. 211.



Vertical Section of Inflamed Cartilage, showing the Splitting into Fibres of its Surface. From Redfern.—HOLMES.

lar cartilages is not a primary, but a secondary affection. It is caused by an extension of the inflammatory process; it may follow either acute or chronic synovitis, generally the latter. Scrofulous and syphilitic constitutions are especially liable to the affection. When such process goes on, the synovial membrane ulcerates and is finally converted into a thick, pulpy substance, intersected by white membranous lines. This condition has received the name of *pulpy degeneration*. There is much pain and stiffness, together with considerable swelling of the joint, which is elastic, but there is no fluctuation. The tumefaction presents an irregular appearance, being more protuberant in one part than in another, from the accumulation of fluid or solid matter in the directions where least resistance is afforded by the surrounding tissues. Pus often accumulates within the cavity of the joint, and the suppuration is accompanied with much constitutional disturbance; or the matter may be effused into the bursæ, into the surrounding cellular tissue, or into that beneath the tendinous sheaths of the muscles in the neighborhood. After a time the capsular ligament ulcerates, the pus is evacuated, and caries of the bone is added to the already alarming disease.

It has been a matter of some difference of opinion, whether in this affection there is enlargement of the articulating extremities of the bone. It is probable that, in the first stages of the disease, they are seldom or never affected; but, as abnormal action increases, inflammation and ulceration of the osseous parts ensue. Frequently the knee is the seat of the disease; and when this articulation is affected, the lymphatic glands in the groin become sympathetically enlarged. The same fact may be noticed when the swelling occurs in the elbow-joint, in which instance the axillary glands participate.

When the patient has suffered for a considerable time, hectic supervenes, with its alarming train of symptoms, which are always aggravated after the opening of the abscess. Emaciation, excessive debility, loss of appetite, nightsweats, and diarrhœa are also present. In some cases, health is restored, and the disease abates spontaneously; in others, complete cures are effected by careful and judicious treatment. A method of restoration resorted to by nature is anchylosis, which may be either ligamentous or osseous. New bone is deposited, whereby the ulcers become, as it were, cicatrized, and the articulating extremities are joined by firm bony union. The process of ossification is assisted by the effusion of lymph, and consequent thickening and induration of the ligamentous substance exterior to the joint. By such means the parts are retained in exact apposition, and the calcareous matter is regularly deposited, as in fractures retained *in situ* by the application of splints.

This disease, however, may again recur, and both ligamentous and osseous formation be destroyed by the ulcerative process. In many cases, however, the anchylosis remains permanent.

Treatment.—Silic. is the principal medicine in the treatment, repeated every day. If it should not effect a cure, one of the following should be employed and persevered in: ant. crud., petrol., iod., clem., or sulph.

In the first stages of the disease, when there is inflammation of the synovial membrane, acon., bell., mez., nit. ac., phosph. ac., lyc., sulph., or calcarea, should be employed. When the pulpy fungus makes its appearance, phosph., thuja, caust., or sepia may be indicated. In the event of suppuration, silic., hepar, merc., or calend. should be remembered.

If the swelling is shining, white, soft, and doughy, puls. is to be prescribed. In many cases iodine is useful, and may be employed in alternation with puls. When the swelling is red and very painful, bryonia would, perhaps, be more appropriate; when there is serous infiltration, ledum, calc., iodium, merc., or sulph. may be required.

Excision of the joint, or amputation, may have to be resorted to in cases resisting all other treatment.

Genuthrotomy.—This operation consists in making a free incision into the knee-joint and the introduction of drainage-tubes. The operation should be performed under strict antiseptic conditions. The cases that call for the operation are those of acute serous-gonitis, purulent genuthro-meningitis, osteo-myelitis of one or both epiphyses, and in all cases where there is threatened destruction of the epiphysial cartilages. Dr. Scriba* has collected the reports of a dozen cases treated by this operation; seven of them were acute suppurating synovitis, four were cases of caries and tuberculosis, and one of *hydrops articuli*. In four of the seven there was perfect recovery, and in three the result was fatal. The four operated on for fungoid disease were fatal, and the one for hydrops successful. These statistics are not very encouraging, but are sufficient to prove the reliability of the operation in cases of simple effusion or suppuration.

Anchylosis.—Anchylosis, or, as it is sometimes spelled, ankylosis, signifies, in surgical nomenclature, an affection of a joint in which motion is either partially or entirely lost.

The derivation of the word, however, does not at all indicate that it should be used in such a sense, as the English word "angle" or "angular" comes directly from the Latin *uncus*, which in turn takes its derivation from the Greek *angkulos*. According to Celsus, the term was used in ancient times to indicate a *contracted* joint.

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* London Medical Record, March 15th, 1877.

The loss of motion is occasioned by deposits of a fibrous or osseous character, which are found either within or surrounding an articulation. We have *true anchylosis* when motion is entirely lost, which is generally occasioned by ossific deposits, *synostosis* being used to designate such a condition; while *false anchylosis* indicates that motion is more or less impaired.

Loss of motion in a joint, in certain cases, may be looked upon as a method of cure, as described by Liston.* Hunter,† in his *Lectures on the Principles of Surgery*, makes five kinds of bony anchylosis, and, though concise in description, they are very complete. They are as follows: 1st. From lateral attachment, where there is no joint—as the union of the tibia and fibula, of two ribs, or two metatarsal or metacarpal bones. 2d. Bony formations in the surrounding parts. 3d. Between bone and bone, the ossific deposits taking place in the intermediate substance, as between vertebra and vertebra. 4th. By the capsular ligament. 5th. By the whole substance of the articulation.‡

There is also another subdivision made by authors in reference to other circumstances—first as to position, angular or straight; or as to complication, simple or compound. It has also been noticed, that whenever anchylosis affects the amphiarthroses, synostosis is the result, but the diarthrodial joints can be affected with either spurious or true anchylosis, although bony union is more frequent in the ginglymoid, and false or spurious anchylosis in the enarthrodial.

The affection in question may be produced by various causes, and all those affections which give rise to inflammations in or around joints, whether arthritic, scrofulous, traumatic, or syphilitic in character, are known to be productive of either one or the other form of the disease.

It is not my intention to enter into the great variety of adhesions that may take place in and around the various and complicated joints of the human body, but to proceed at once to the detail of cases, after a word or two in reference to the great difficulty in diagnosing the different forms of the disease. In the olden time it was considered an impossible thing to distinguish true synostosis from false anchylosis. Mr. Bonnett wrote: "We have no certain signs by which we can recognize bony anchylosis;" but since the introduction of chloroform, the diagnosis is made more easy. If anæsthesia had done nothing else, the assistance it gives the surgeon in this disease alone would be sufficient to render it invaluable.

Any one who has had opportunity of examining and treating these cases, is fully aware that so soon as any attempt is made to "handle" the limb, the patient, from the consciousness of the suffering he has already undergone, the painfulness of slight motion, the sensitiveness of the joint, and other circumstances, immediately and almost unconsciously resists; the voluntary muscles are put upon the stretch and the limb remains fixed; the greater the effort made by the manipulator, the greater will be the exertion on the part of the patient to prevent the motion. What a different result is obtained when the patient is fully under the influence of ether! Let me here, therefore, offer some rules which I have condensed from Brodhurst,§ whose work on this specialty is of the highest merit, and whose success in the treatment of anchylosis is world-renowned:

1. Use always the greatest gentleness in handling an affected joint; let the pressure be gradual and steady.

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* Elements of Surgery, p. 60, 1837. † P. 310.

‡ Connor describes a remarkable case in which there was general anchylosis of all the joints; and a still more curious case is recorded of a child only twenty-three months old, whose joints were unusually stiff.

§ Diseases of the Joints.

2. As a general rule, the sensation of solidity, in bony anchylosis, is unmistakable in grasping the limb above and below the articulation. Bony consolidation in the movable articulations is so rare, however, that an examination should always be instituted after the full effect of chloroform has been obtained.

3. False anchylosis is the rule, and it is so common, that adhesions should always be held to be fibrous, until they are proved to be bony.

4. Immobility alone is not a sign of synostosis ; it not unfrequently exists where the adhesions are fibrous.

5. Immobility will frequently exist until muscular action is entirely subdued by the anæsthetic.

6. Whenever muscles can be thrown into action so as to render the tendons prominent or tense about a joint, the adhesions are not bony.

These rules are of the greatest possible service to the surgeon when called upon to give an opinion as to the state of a limb which has a stiffened joint, for very frequently upon his decision, in a case of the kind, the happiness of after life may depend.

Treatment.—In spurious anchylosis, much service may be rendered by passive movement of the joint, together with massage, and the internal administration of graph., rhod., rhus tox., sepia, or sulph., and in some instances, cham., bry., lyc., and staphis. ; very frequently by the early use of these remedial agents, together with passive movement of the joint, the disease may be cured. When we have reason to believe that bony union is about to occur, phosph., phosph. ac., mez., nit. ac., silic., staphis., and sulph., may be employed with advantage. When rigidity of muscles and ligaments produce immobility of the joint, bry., rhus tox., ruta, lyc., sulph. should be employed. The patient may also be placed in an anæsthetic condition, from the inhalation of ether, and the limb flexed and extended, even if considerable effort is required.

In several instances I have succeeded in restoring motion to the elbow by an apparatus represented in Fig. 212. It consists of padded bands, a,

FIG. 212.

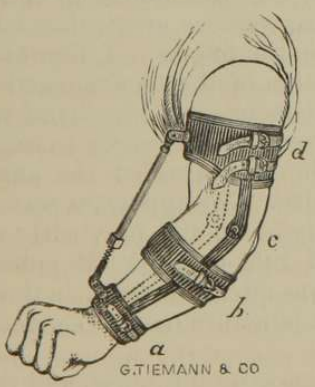
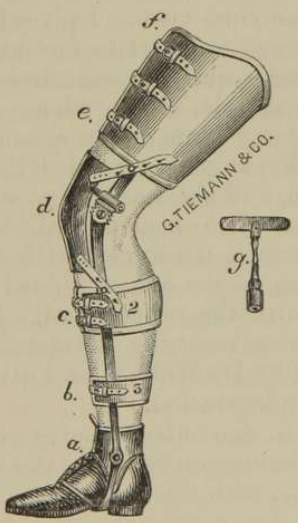


FIG. 213.



b, c, d, which are buckled around the arm, forearm, and wrist, having a steel bar on each side of the arm, with a joint at the elbow. A screw works into a cylinder on the anterior face of the arm, which regulates the amount of both flexion and extension. Fig. 213 shows a similar apparatus

for the knee; it consists of metal troughs 1, 2, 3, with two lateral bars attached to the shoe, a, with a joint at the knee worked with a key, g. The knee-cap, d, fits well over the patella. The whole is held by buckles as seen at c, d, e, f.

The methods may be exemplified in the following cases:

A young woman, aged twenty-seven years, was brought to me with partial anchylosis of the temporo-maxillary articulation from long-continued rheumatic inflammation. She was of a strumous habit, and the disease had existed for some considerable time. Having had under my care a case of complete anchylosis of this joint—which I reported some years since in the *North American Journal of Homœopathy*—I was prepared with the necessary appliances, and immediately resorted to forcible extension. Having placed her fully under the influence of chloroform, I introduced the jaws of the instrument (which, when closed, resemble an iron wedge, but which are forcibly separated by means of a screw and lever) between the teeth on the affected side, and putting the instrument in motion, succeeded in opening the mouth to its fullest extent. As is usual in such cases, the adhesions gave way with a loud snap, and freedom of motion resulted. Swelling and inflammation followed, during the height of which perfect quiet of the affected parts was enjoined, the jaws being rubbed constantly with camphorated oil. So soon as the swelling subsided, a wedge of hickory wood was placed between the teeth during the day, thus keeping the jaws forcibly separated, but she was allowed during the night to have it removed. After two weeks of this treatment the foreign substance was dispensed with, and she was ordered to talk as much as possible—not a very difficult thing for a female—and to chew constantly through the day portions of hard cracker. By these means motion was perfectly restored.

A young healthy girl, of about twenty years of age, a seamstress by trade, had received a very deep burn in the palm of the left hand. During the healing process, the index, middle, and ring fingers were drawn over the palm, rendering them not only useless to her in her avocation, but a source of constant mental irritation from their unsightliness. She could not wear a glove, and generally, in the presence of company, concealed her hand from view. I placed her under the influence of chloroform and endeavored to resort to forcible extension; but the adhesions of the palmar fasciæ, and the contraction of tendons, were so great, that I found it was impossible, with prudence, to straighten the fingers. I, therefore, with a tenotomy knife made subcutaneous section of the tendons, and also in two different places divided the palmar aponeurosis. Her hand was then covered, and she was told to return in a week. At her second visit I found the punctures healed, and, having again administered the anæsthetic, straightened the fingers with little difficulty. No apparatus was used in this case, as she was requested to constantly move the previously stiffened joints with the other hand. It is a good rule to allow all punctures to heal before resorting to extension, else, as was often the result in those cases, treated by Dieffenbach and others, a slight puncture may be converted into a severe laceration.

A boy, aged about twelve years, was thrown from a horse, and fractured the superior extremity of the ulna. After three months he was brought to this city, with his arm at an obtuse angle, and with slight motion at the joint. The parts were swollen, sensitive, and painful, and therefore I resolved upon the gradual extension plan. An instrument was applied, consisting of two plates of German silver united by a hinge, and both plates bent in such a manner that the superior would embrace the lower part of the humerus, and the inferior the upper part of the forearm. These were

connected by a screw, by turning which the plates could be brought to any angle required. This apparatus was placed upon the arm, and the parents ordered to turn the screw in one direction in the morning, and the contrary direction at night, with strict instructions, however, that *flexion* should be made first. This is also an important rule. By resorting first to flexion, the vessels of importance are not so likely to be injured as when extension is used. The case proceeded well, and the father informed me that after a couple of months perfect motion was restored.

A German boy, aged about nine years, received a severe wound with an axe across the lower part of the condyles of the femur and the upper part of the tibia, involving also the patella. After the wound healed, anchylosis resulted. When I saw the boy, his leg was bent at nearly a right angle; he could not move without his crutches, and his parents were in the greatest state of despondency regarding the deformity. I examined him very carefully, and following the rules already enumerated came to the conclusion that the case could be, at least, much benefited. Here, I resolved to resort to *forcible flexion*, and if this proved impracticable, to divide the tendons and fasciæ, and afterwards endeavor to restore the limb. I placed him fully under the influence of chloroform, and began to put the tendons on the stretch. When the boy was not entirely insensible, the voluntary muscles would prevent all motion; but so soon as the anæsthesia was complete, very slight mobility was observable. As the flexion was continued, I could distinctly feel the minor adhesions giving way. I still continued the pressure, when suddenly, with a report so loud as to alarm the bystanders, the joint became flexible in my hands. Great sensitiveness, and pain, and swelling followed; symptomatic fever also was induced, which, however, was controlled by the appropriate medicines. Every day for a week the limb was moved, the patient always having to be placed under the influence of chloroform. An apparatus similar to that used in fractures of the femur, to graduate extension and counter-extension, was put on the boy's limb, and he then came under the care of other physicians of the hospital. The treatment was continued, the flexion and extension being graduated from time to time, and the boy, without his crutches, runs and plays as other children.

Dr. Reiss relates a case in which kali iod. cured spurious anchylosis. The patient had suffered considerably, and had been under the care of Lutze for a year. The least motion of any limb caused her violent pain, with complete anchylosis (spurious) of the knee and ankle-joints. The prescription was kali iod., grs. v to ℥ij of water, a teaspoonful twice a day; the dose was gradually increased, and in a short time a perfect cure was effected.

Subcutaneous Osteotomy.—In the treatment of synostosis much may be done to relieve the patient, by an operation similar to the famous one of Dr. J. Rhea Barton, of Philadelphia; an angular limb, totally useless or worse than useless, from its constantly incommoding the patient and its great unsightliness, may be rendered useful, straight and of comely aspect. This operation was performed by Dr. Barton on the hip in 1826, and on the knee in 1838. In the one instance a crucial incision, seven inches in length and five in the horizontal direction, was made, and the bone divided transversely between the trochanters; and in the other, the excision of a wedge-shaped piece of bone above the patella with gradual flexion succeeded in restoring usefulness to the limb. Dr. Gibson also successfully resorted to it in complete synostosis of the knee. Other surgeons have also been successful in the operation. Dr. Buck reports a case of Barton's operation in the *American Journal of the Medical Sciences* for October, 1845.

A similar operation was performed by D. J. Kearney Rodgers, and Dr. Sayre modified it in 1862,* by making "a curved section of the femur above the trochanter minor, and a straight section a few lines below the first curved cut, thus removing a block of bone."

Dr. William Adams, however, has the credit of systematizing and perfecting the operation of subcutaneous osteotomy for bony anchylosis of the hip. He says,† "It occurred to me, however, that in these cases of bony anchylosis of the hip-joint, with extreme distortion, a much more simple operation might be performed by the subcutaneous division of the neck of the thigh-bone, about its centre, within the capsular ligament, and on the 1st December, 1869, I performed this operation successfully."

Mr. Adams goes on to describe, to what particular varieties of anchylosis the operation is applicable, and finds that in rheumatic anchylosis, or in anchylosis after pyæmic inflammation, in which the bone is rarely diseased, or after traumatic inflammatory action involving the soft parts only, or in strumous disease of the joint itself which has been arrested at an early stage, that the operation should be performed. Where, however, caries and necrosis of the joint have resulted, and there are fistulæ, with discharges of portions of bone, the operation is not justifiable.

The operation is performed as follows: A tenotomy knife is entered a little above the top of the great trochanter, and must be carried straight down to the neck of the bone, dividing the muscles, and freely opening the capsular ligament. A small saw must then be carried down in the track of the wound, and the bone sawn through from before backward. The leg is then to be moved freely in all directions; if this cannot be accomplished, those muscles offering the most resistance should be subcutaneously divided. The rectus, the adductor longus, and the tensor vaginæ femoris may have to be cut before the leg can be restored to position. So soon as this is accomplished, the limb must be put into a straight splint, and retained, or a weight and pulley may be applied.

Mr. Brodhurst‡ makes an incision of one inch in length, and severs the bone by means of a saw immediately above the trochanter. He believes that the free incision is less liable to be followed by suppuration. In the Clinical Society, to which he related his views, there was much difference of opinion upon the relative value of the saw and chisel, some advocating the use of the saw, and others that of the chisel. The name was thought to be a misnomer, and it was suggested that the operation should be called "valvular," instead of subcutaneous section.§

Chronic rheumatic arthritis is characterized by pain, weariness, and rigidity of the larger joints and surrounding muscles, increased by motion, relieved by warmth. The limb spontaneously and easily becomes cold; the fever and swelling are slight, and generally imperceptible. A difference of opinion has existed as to the nature of this affection; some considering it as a sequel of acute rheumatism, others as a distinct disease. No doubt it is often either, and in either case distinguished by its own symptoms.

This affection, when it attacks the hip-joint, is so peculiar and so marked that surgeons have given special attention thereto. It has received the title of *morbus coxæ senilis*, by Mr. Robert Smith; Mr. Benjamin Bell describes it as interstitial absorption of the neck of the thigh-bone. Sandifort, Colles, Hamilton, and others consider it as a distinct disease.

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* Lectures on Orthopædic Surgery, p. 423.

† A New Operation for Bony Anchylosis of the Hip-joint, London, 1871, p. 9.

‡ Month. Abs. of Med., March, 1877.

§ Lancet, Feb. 3d, 1877.

Chronic rheumatic arthritis has not nearly so many varieties as ordinary arthritis. It becomes fixed in the loins, hips, and knee, but seldom in the thorax. It differs from other rheumatic affections by the absence of the slight degree of fever, or the body preserving its natural temperature and the pulse rarely exceeding eighty beats in the minute. The joints are not much swollen, are pale, cold, stiff, and seldom perspire, and are always relieved by warmth. Some individuals are scarcely ever free from pain; others only suffer before or during damp and changeable weather. The pain is sometimes in the muscles between the joints, as well as the joints themselves.

The disease continues for an indefinite period, and sometimes is incurable. The affected joint is greatly debilitated, and resembles in some respects the condition produced by paralysis. Inveterate cases give rise to disease of the tendons, bursæ, and muscles; the ligaments also become rigid and thickened; and the joints stiffen. Sometimes a jellylike effusion is poured into the articular cavity. This disease affects especially the hip-joint, and in this form is more common in males than in females, and is seen more in the laboring than in the higher classes. The symptoms, when the hip is affected, are dull heavy pains extending down the thigh; there is weakness in walking. Pressure upon the great trochanter, or forcing the head of the bone into the acetabulum does not aggravate the pain. As the disease progresses the efforts of rotation and flexion are more and more impeded. Stooping becomes painful, the body is bent forward; gradually, as changes take place in the joint, the limb shortens, the foot is everted, there is great lameness, and the patient has frequently to rest himself.

The buttock of the affected side loses its natural prominence; gradually the gluteal fold disappears, the muscles are absorbed; there is pain back of the trochanter major. In the aggravated form of this distressing malady, the capsular ligament becomes much thickened, the ligamentum teres disappears, and the notch in the cotyloid cavity is converted into a foramen by the deposition of bone. The acetabulum varies much in shape, becomes enlarged and porous, and osseous additions are made around the margin. The head of the femur no longer presents its spheroidal shape, and enlarges sometimes to a great degree, and is flattened. In some instances the caput falls to a right angle with the shaft. The neck of the bone is either partially or totally absorbed, and the patient, after a miserable life, dies, worn out with suffering. Cold is a common cause of chronic arthritis, even when there has not been pre-existing rheumatic trouble. Violent sprains, strains, and falls upon the trochanter are likewise causes. It may be distinguished from inflammation of the periosteum by the latter being usually seated in the *long or flat bones*, while chronic rheumatic arthritis is at or about the joints. The pains of periostitis are very violent during the night, which is the reverse of chronic rheumatic arthritis.

Treatment.—In the advanced stages of chronic rheumatic arthritis very little can be done by internal medicines. In the early stages, however, much good may be effected by the properly selected remedies; very great care must be taken in selecting the medicine and its administration persevered in for a length of time.

The following are among the medicines used:

Bryonia.—Its use is indicated by tearing, shooting, and tensive pains, much increased by motion, or shifting pains which affect especially the muscles, redness or paleness, tight swelling or rigidity of the affected part aggravated at night. Also coldness, shivering, and gastric disorder, peevishness and passion. A low attenuation should be given; the doses repeated every four, five, or six hours, or at longer intervals, will generally produce a favorable result.

Belladonna is specific, if the pains are erratic, and the brain and nervous system are in an irritable condition, and the burning and shooting pains are aggravated at night, and by the slightest contact.

Arnica.—If the pains resemble those produced by a sprain or bruise; great uneasiness of the part affected, with the sensation as if it were resting on something hard; pain aggravated by endeavoring to move the limb.

Chamomilla should be given if there is great agitation and tossing, hot perspiration about the forehead, redness of one cheek, desire to lie down, with shivering, drawing, or tearing pains, with sensation of torpor or paralysis in the part affected; partial and burning heat, the tendons and ligaments being more affected than the muscles. There is *no swelling*, the pains are much increased at night, and by the warmth of the bed.

Colchicum, in some cases, is advantageous, when the following symptoms are present: sudden breaking out of sweat and its sudden disappearance; lancinating pains in the affected parts, more violent at night, abating in the morning, when they wander to some other part which inflames rapidly, the parts abandoned being left pale and swollen, which swelling disappears in the course of the day. Also in affections of the joints, without swelling, or inflammatory redness with general painfulness of the whole body, and great irritability during the pain, which is frequently felt on one side of the body, most frequent during the evening and night, and is aggravated by motion and contact, particularly in persons much disposed to sweat, and liable to acidity of the stomach; also if the rheumatism is occasioned by wet and cold weather.

Mercurius is the remedy when there are constant alternations of chilliness and heat, or internal heat, with a continual chilly creeping over the affected parts, which either from internal uneasiness or on account of the drawing-tearing pains are obliged to be constantly moved.

Rhus tox.—If the attack has been induced by exposure to wet, and either the whole or part of the body has thus been exposed; rhus toxicodendron will be indicated, also, when the pains are tearing, drawing, or wrenching, with a sensation of crawling and paralytic weakness. The pains are more violent when the patient is at rest. When attempting to move the extremities there is a feeling of trembling or paralysis. This medicine acts especially upon the tendons, ligaments, and synovial membranes. It is also called for when the parts are rigid, shootings when touched, aggravated during wet or damp weather, accompanied by chilliness, alternating with heat; the pains are felt most during the chilliness. At night there is heat and drawing in the limbs when the patient feels a desire to stretch.

Pulsatilla for a chilly feeling and sensation of tingling in the part which has been lain upon, feeling as if it had gone to sleep; the chilliness continues after rising, with drawing, jerking, and tearing pains, now in one and then in another limb, especially in the long bones; about noon the patient feels relieved, but in the afternoon the chilliness returns with increased violence, the pains become more fixed, swelling of the parts commences which turn red; the patients suffer much from altering the position after having remained a long time in it The pains are aggravated by exposing the part to the air; paleness of the face and shivering, increasing with the pain. Drawing tearing in the knees, alternating from one to the other, and feeling as if broken, or the pains attack the (left) shoulder, hands and arms. The pain abates with the appearance of the swelling.

Nux vomica.—When the muscles palpitate and are cramped, with tensive-drawing pain, occupying especially the back, loins, chest, or joints; sensation of torpor or paralysis in the affected parts; aggravation from cold, and dread of it; gastric sufferings; irritability of temper.

Arsenic, when the pains are *burning*, insupportable at night, aggravated by heat; it is indicated when the pains abate, as the sweat appears, which is not the case when other medicines appear appropriate, when the sweats do not relieve It is the remedy, should a person be attacked with paroxysms of pain without any assignable cause, with pressure and burning in the pit of the stomach, hardness and tension of the abdomen with stitches in the side. Shivering, thirst, cold, accompanied with drawing and tearing burning in the limbs, preventing the patient resting on these parts, relieved by warmth and motion. After these symptoms the rheumatic pains increase, as also does the thirst; dry burning heat with anxiety appears.

Sulphur is called for when there are drawing, sticking, or tearing pains in the limbs and joints, the latter slightly swollen; motion relieves, as does external warmth; cold and rest increase the sufferings. Violent stitches in the small of the back, heat and chilliness. This medicine is adapted to cases of rheumatism in which

the pains are seated and the disease chronic, and also for the obstinate remains of acute rheumatism.

Phosphorus, for tearing, drawing, and tensive pains, excited by the *slightest chill*, with headache, vertigo, oppression of the chest, pain in the small of the back and limbs; feeling throughout the body as if bruised, with sensation of coldness. The open air is intolerable; indolence, drowsiness, low-spirited, apprehensive, and ill-humored.

Lycopodium.—If the pains be drawing and tearing, and experienced especially at night; painful rigidity of the muscles and joints, with sensation of torpor in the affected part.

Nitric acid, calc. carb., and perhaps argentum, are valuable medicines; veratrum pains are increased by the warmth of the bed and by wet weather. They resemble a bruise, and are lessened by walking; the part affected is weak and trembling.

By the careful selection of a medicine in chronic rheumatic arthritis, in its early stages, relief is certain, and a cure probable.

Hip-joint Disease.—There are certain indications which convey to the practitioner a knowledge of the existence of the disease commonly and properly called "hip disease," when it is fully established. Of the real nature of the disease there is a diversity of opinion, some considering the affection as scrofulous; Mr. Johnstone, in an essay contained in *Holmes's System of Surgery*, designates it "chronic or strumous inflammation of the joint." Gross speaks of it as "tuberculosis, as it affects the hip," and Dr. C. F. Taylor, in the first chapter of his work,* after giving carefully prepared statistics of both hospital and private practice, declares the disease to be "essentially traumatic." Sayre† entertains the opinion that the disease is more frequently local than constitutional in its origin, and remarks, "Out of the several hundred cases that I have accurately observed, and taken the trouble to take their history, the immense majority, I may say ninety per cent., occurs in the most vigorous, wild, harem-scarem children;" although he admits that a scrofulous child, if injured, would more likely be affected than one of a healthy constitution, which probably is the fact; scrofula, no doubt, being a predisposing cause of the malady.

The disease has likewise received the name of coxalgia, which term, however, should more properly be applied to the pains which are experienced during the progress of the disorder. The symptoms of hip-joint disease vary materially, especially in its early stages.

Signs have been laid down for ascertaining whether the inflammation has commenced in a true synovitis (arthritis); in the head of the thigh-bone (femoral arthritis); or in the cotyloid cavity (acetabular arthritis). Wherever it may commence, the symptoms are divided into three distinct stages.

The first stage of hip-joint disease is characterized by limping; the halt is more observable in the morning, almost disappears during the day, and is absent at night. Exercise or undue exertion may increase the limp, but it often passes away after a day's rest, or is so slight as not to attract attention. Even at this period there may be uneasiness in the knee-joint, though this symptom generally appears later in the progress of the affection. It is in this stage of the disease that more can be done by the surgeon than at any other, the main object in the treatment being *rest;* but, unfortunately, the patient, in the great majority of cases, is not seen by the practitioner until the second stage is developed.

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* Mechanical Treatment of Diseases of the Hip-joint.

† Braithwaite's Retrospect, January, 1872, p. 110.

The *second stage* is more pronounced than the first. In it there is intense pain, which frequently is located in the knee-joint and the inner side of the thigh, or sometimes in the posterior surface of the leg. The sufferings are materially aggravated by rotation and abduction. An examination should always be carefully conducted, the child being stripped and laid flat upon a table or mattress. There then will be perceived a slight lowering of the pelvis, and some flexion of the limb; the gluteal region somewhat flattened, and the gluteal fold sunken. There is likewise an apparent elongation of the extremity, together with *abduction* and eversion. Motion is much impaired or entirely lost. The pains during this stage are often excruciating at night, the limb becomes attenuated, and severe constitutional symptoms of fever, debility, perspiration, loss of appetite, emaciation, and hectic present themselves. It is during this stage that effusion, resulting from the previous inflammation, takes place within the capsule, and it is the hydraulic pressure that causes the limb to be abducted and rotated outward. This fact has been proved by injecting quicksilver within the capsule, and there retaining it; the limb in such experiments being flexed, abducted, and rotated outward.* The apparent elongation is also attributable to the same cause, for, says Bauer,† "The sole source of the symptom is the hydraulic pressure from existing intra-articular effusions. I was led to this view from the analogous position of the femur and the immobility of the joint produced by experimental injection."

In the *third stage* of the disorder the symptoms are very different from those just noted. Pus and the effused fluids find an outlet the muscles have not the resistance to overcome, and gradually the limb assumes a position directly opposite to that noticed in the second stage. It is rotated inward, shortened, and adducted. The toes only touch the ground, the pelvis projects somewhat forward, the vertebral column approaches the opposite side, and there is great amelioration of the pains; indeed, this latter change is often so marked that hopes of improvement are entertained by those ignorant of the nature of the disease, whereas the affection is steadily advancing. During this stage the pus finds an exit on the surface, either in the neighborhood of the joint or in the groin.

Very great structural changes go on in the articulation during the progress of hip-joint disease. The acetabulum enlarges, caries and necrosis of the head of the femur take place, particles of bone being mixed with the discharge. Finally the head of the bone is either entirely or partially destroyed, or is sometimes enlarged. The acetabulum may be pushed up, presenting an appearance somewhat similar to a dislocation on the dorsum of the ilium. This latter lesion, however, is only found in those rare cases, where the shaft, with perhaps a portion of the head of the bone, becomes pushed up through a rent in the capsular ligament. The similarity of dislocation caused Rust to attribute what was formerly supposed to be a *spontaneous dislocation* of the head of the femur to the action of the contracted muscles. An excellent method of ascertaining the relative position of the femur to the acetabulum is given by Nélaton, and recorded by Bauer, as follows:‡ "In drawing a line from the anterior superior spinous process of the ilium to the tuberosity of the ischium, it passes on its way from one point to the other the apex of the large trochanter in the normal position of the femur. It crosses the trochanter more or less below the apex in dislocation."

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* *Vide* Braithwaite's Retrospect, January, 1872, p. 109, Article on the Treatment of Hip-Joint Disease, by Dr. L. A. Sayre.

† Orthopædic Surgery, p. 266. ‡ Bauer's Orthopædic Surgery, p. 268.

If the patient still survive the disease, it may terminate in anchylosis, which, however, is generally spurious, sometimes being partly ligamentous and partly bony; in rare instances, a true synostosis may occur. Such a case recently came under my own observation; the disease had existed for sixteen years, the limb was short nearly seven inches, the toes inverted, and the thigh rigidly flexed and adducted. On cutting down upon this bone, the whole cavity of the acetabulum was gone, or rather there was such a complete blending of the head of the thigh-bone and the cavity, that after sawing off a triangular portion of the bone, it required great force to fracture the adhesions.

The *pain* in hip-joint disease varies in its character, and is caused partly by the unyielding nature of the tissues in which the inflammatory action is present, and later from the contraction of the muscles, which involuntarily takes place to prevent motion. I mean by this, that the very contraction and rigidity of the muscles, which have a tendency to prevent concussion of the diseased joint, become factors of continuous pressure, which helps to destroy the vitality of the joint and increases the pain. Dr. Charles F. Taylor* thus well puts it: "On the very first intimation of a diminished ability to bear pressure—which is the great obstacle to a spontaneous arrest of any morbid process within a joint—the exigency of arresting motion to save the joint from immediate pain, causes the muscles to take on a contraction of such a rigid and permanent character as to be a condition of perpetual wounding of the parts. Their own excessive action, as well as their elasticity, constitutes a continual source of severest injury."

Treatment.—In the first stage of the disease a cure may be hoped for. The paramount object in the treatment is rest, absolute and continued for a length of time. The patient, therefore, should be placed in bed, and kept there at least a fortnight after all traces of the disease have disappeared. If the patient complain of pain in the knee, belladonna is a medicine by the administration of which, in some instances, in alternation with mercurius, the disease may be entirely subdued. Aconite may also be used with great advantage in the commencement of the affection. If there is tension of the part, with severe pain, *colocynth* should be employed; and, if there are evening exacerbations, puls. is indicated. The chief medicine, however, is *belladonna*, which, according to Hartmann, is characteristic to the pain in the knee, though this symptom is only symptomatic of the disease of the hip. He has never used it below the 24th dilution, and speaks in the most unqualified manner regarding its action.

Rhus tox. should be employed when there are darting or dragging tearing pains in the hip-joint, increased by pressing the head of the femur into the acetabulum, accompanied with tension or stiffness of the muscles; painful while at rest, but increased when rising from a sitting posture.

Colocynth is particularly indicated when the pain extends into the knee, and the patient experiences a sensation as though the part were clasped with an iron band

Calc carb. removed the disease from a scrofulous child, who, without previous injury, commenced to limp; in walking, dragged one foot along the ground; complained of little or no pain, except when pressing the femur into the acetabulum. The diseased limb was longer than the other, and the foot always turned outward. In another case, tinctura aeris cured the affection.

Sulph., lyc., hepar, silic., zinc., mez., phosph., phosph. ac., bry., cham., puls., staphis., and sepia, should also be remembered in the treatment of this disease.

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* On the Mechanical Treatment of Disease of the Hip-joint, p. 13.

Likewise in the first stage, for the purpose of insuring entire rest, it is well to fit to the part a splint of leather, gutta percha, or wire gauze, and secure the limb with a bandage. Extension should also be used if there are evidences of the second stage approaching, which is best effected by the weight and pulley, as recommended for fractures of the femur; or with the anterior splint of Professor Smith of Baltimore, which latter I have employed with great advantage. If the weight and pulley be used, care must be taken not to apply greater extension than necessary—three to eight pounds being sufficient. In the second stage, when the pain is intense, relief may be afforded by puncturing the joint and evacuating the fluid which causes the pain. This, however, must be practiced with circumspection. If confinement to a recumbent position prove prejudicial to the health, a different plan of treatment must be adopted, which, thanks to the ingenuity of modern surgery, can be successfully used.

The splints of Barwell, or that of Hamilton (Figs. 214, 215) are excellently adapted for this purpose. A felt splint or one of sole-leather can also be

FIG. 214.

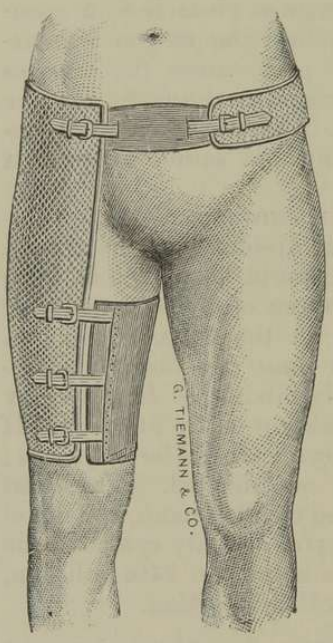


FIG. 215.

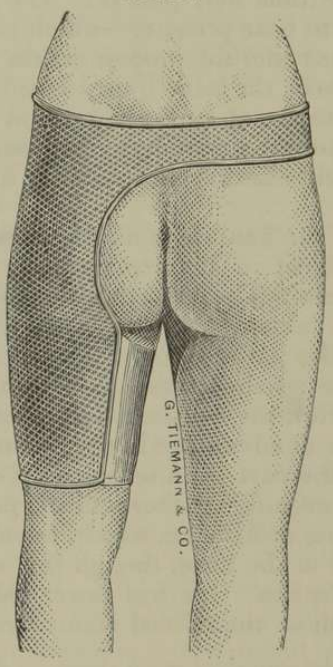
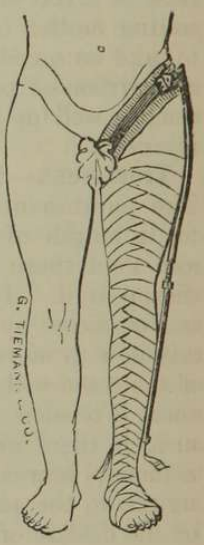


FIG. 216.



employed. Dr. Henry G. Davis, in 1855, conceived the idea of constructing an instrument (Fig. 216) which should allow motion at the same time that extension was kept up. Many modifications have since been made—some of the apparatus extending to the ankle; some being fastened to a shoe, as Bauer's, and some made with an iron extending beneath the shoe, and some distance below it, to prevent jarring the acetabulum.

In the mechanical treatment of diseases of the hip-joint, American surgeons stand pre-eminent. The names of Davis, Taylor, Sayre, Bauer, Knight, Shaffer, and many others, are of world-wide reputation, and the acknowledgment by most foreign surgeons of the superiority of our treatment of this affection above all others, is both satisfactory and encouraging. Occasionally, however, we find those who, having claims of their own to present, and not understanding how to apply our methods, condemn our practices *in toto*.

For instance, we read: "Our transatlantic brethren deserve praise for having studied diligently to improve the treatment of these joint affections, *but, by ignoring in all their designs* the fact that friction is a greater evil than pressure, *they have devised methods of less efficacy than those previously in use.*" Our treatment is also designated as "ridiculous malpractice;" or called an "irrational method;" or such criticism as this bestowed upon it: "The best commentary on this method is the remarkable frequency with which its principal advocate (Dr. Sayre) has had to perform excision of the joint."*

These complimentary phrases are from the pen of Dr. Thomas, of Liverpool, who has a method of his own, viz., "fixation," to introduce. He seems to be in perfect ignorance of the inclined plane, the abduction screw of Taylor, the lateral screw of Shaffer, the platform screw of Sayre, by which "friction" (on which he lays so much stress) is avoided. Had he paid more attention to the literature, and especially the *statistics* of the treatment of hip joint disease by the gentlemen whose treatment he ridicules, he certainly would have been more sparing in the use of such harsh and uncalled for criticism.

In the mechanical treatment of hip-joint disease a great deal of care must be exercised, or the application of the extension-apparatus will do positive harm.

Dr. Newton M. Shaffer, surgeon to the New York Orthopedic Dispensary, thus writes on this important subject: "If we apply extension, for instance, to a diseased hip-joint, where flexion of the thigh exists, in a line which corresponds with the long axis of the trunk, we create a lever, where the fulcrum (insertion of the flexors) lies between the power (extension) and the resistance (joint surfaces). It is for the purpose of avoiding joint pressure in this condition that the limb is placed on an inclined plane, the patient being in a recumbent position. The extension is then exerted, so far as the conformation of the hip-joint will permit, directly upon the joint, and the contracted muscles yield as the cause of the contraction is modified."† Now this is a most important point to be remembered in the commencement of the treatment of hip-disease, wherein there is much flexion and adduction. For after the splint is applied properly, the limb must be placed on an inclined plane and raised sufficiently high to bring the lumbar vertebræ to their proper curve, and then gentle traction made by turning the elongating screw, hereafter to be described. The following is the description of Dr. C. F. Taylor's splint and its method of application, as taken from his excellent monograph on the subject:

It consists of a hollow rod of steel, reaching from ankle to hip, with a foot-piece, fitting in its lower end and movable up and down, for lengthening and shortening, by a key, which works in a rack on the outside of the inside bar (or top of the foot-piece). The upper end is solid and very strong, and is used, except in special cases, fastened to the pelvic band by a simple bolt at the end. The pelvic band is made of steel, sufficiently strong to support the patient's weight without yielding in the least, and is about two-thirds of the circumference of the pelvis, measured over the trochanter major. It terminates in a strap, which fastens into a buckle. From two points in front to two points in the back, perineal straps pass along the perinæum and under the ischii. These are made of rolls of flannel, covered with kid or some non-irritating material, and terminating in pieces of

* Diseases of the Hip, Knee, and Ankle Joints. By Hugh Owen Thomas, M.R.C.S.L. Liverpool.

† Archives of Clinical Surgery, vol. ii, p. 82.

leather, strong enough to hold in the buckles. They should be near together in front and far apart behind. At the knee-joint there is a leather pad to steady and support the knee, which fastens to a movable cross-piece. A stout leather sole is fastened to the lower part of the foot-piece, to prevent jar in walking on the instrument. A leather strap, passing under the foot, through apertures at each end of the horizontal part of the foot-piece, turns up an end on each side of the ankle and fastens to the buckles in the ends of the adhesive strips. (Fig. 217.)

The first important object is to seize the leg in such a manner as to exert against it an unyielding force. This should be done in such a way as will not interfere with the circulation, or injure the knee, by unequal strain either below or above it. In other words, the whole leg should be

FIG. 217.

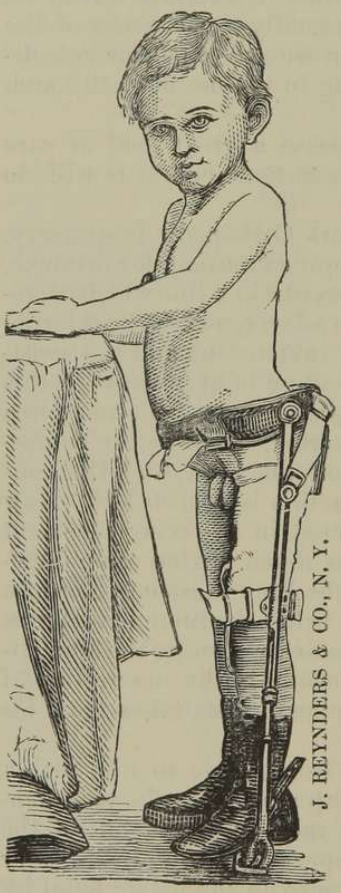


FIG. 218.

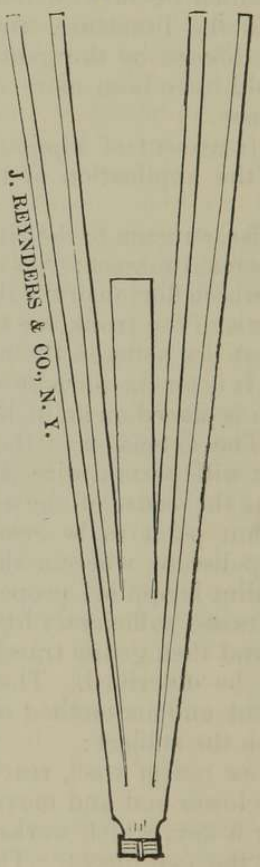
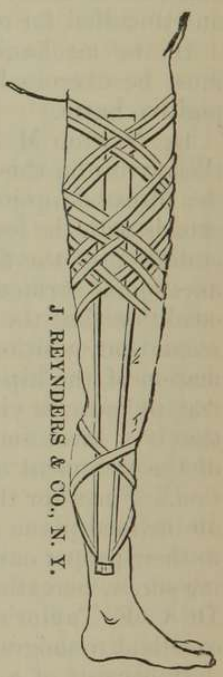


FIG. 219.



grasped in such a manner that the knee will be supported. It may be done as follows: A strip of adhesive plaster, long enough to reach from the waist to the foot, and from three to five inches wide at the upper, and about one-third that width at the lower end, is taken and cut in five tails as shown in accompanying illustration. (Fig. 218.) A piece from four to six inches long is cut from the centre-tail and added to the lower end, to strengthen it; and, if the patient be strong, one or two more similar pieces are laid on the same place, where a buckle is attached. Two similar straps are prepared, one for the inside and one for the outside of the leg, and laid against the lateral aspects of the leg, the ends with the buckles beginning about two inches above the internal and external malleoli, and the centre tails reach-

ing the entire length of the leg and thigh, to the perinæum inside and the trochanter on the outside. The lower strips or tails are then wound spirally around the leg to the pelvis, and afterward the other two pairs of tails, which are cut down to just above the knee, are also wound about the thigh in the same manner. When complete, the thigh is encircled with a network of strips of adhesive plaster (Fig. 219), which act equally and without pressure on the whole surface. The leg has about one-fourth of the attachments, and the thigh three-fourths, which is found to be the right proportion to protect the knee equally from compression or strain. A few turns of the roller-bandage are then made around the ankle just under the lower ends of the straps, which serve as a protection to the flesh under the buckles, and then it is continued over the straps on the whole leg, as shown in the other figures. Thus prepared, the patient is ready for the splint.

The instrument should always be applied with the patient lying on his back, and great care ought to be taken that the pelvis is not inclined forward by contractions of the flexor muscles. If such should be the case, the leg should be elevated till the lumbar vertebræ come near the couch; or, in other words, the spinal column should be made to take its normal shape by elevating the leg till it can do so. The instrument is then applied as first described. But the pelvic band ought not to embrace the pelvis tightly, but there should be room enough for the latter to move freely in it. The anterior superior spine of the ilium ought to be above the pelvic band. When all is adjusted, while the patient still lies on his back, the key should be turned to the right and the instrument elongated, when the whole leg will be gently but strongly drawn downward and the pelvis lifted up with a direct yet easy force, from which there is no escape. In any variation of position or muscular action, the direction and amount of force employed are entirely under the surgeon's control. Nor is this all. The instrument should be so adjusted that there is a little space between the foot and the foot-piece, so that in standing or walking the weight does not rest on the leg, but the whole weight of the body should rest directly on the instrument. The patient sits firmly upon the padded straps, which, passing under the ischii and perinæum, are attached to the pelvic band in front and behind.

This arrangement for supporting the patient on the instrument—besides its independent provisions for extension and counter-extension and abduction—increases the length of the affected leg, when it is fully extended, about one inch. The unaffected leg should have the same amount or a little more added to its length, by means of increasing the thickness of the sole of the shoe worn on that foot. The patient can then progress comfortably and without any danger of either lessening the traction on the muscles, pulling off the adhesive straps, or producing pressure or concussion in the joint. The foot is dressed with the shoe in the ordinary manner.

The splints of Dr. Sayre are provided with a screw for abduction and rotation, and are productive of most excellent results; Dr. Shaffer has invented "a lateral screw," which allows extension in any direction, and can be made to *adduct* or *abduct* the limb as occasion may require. This screw is made for application to Dr. Taylor's splint.

If the patient's health improve, and caries of the bone still continue, excision of the head of the femur is not only practicable but proper. In cases in which I have operated, great deformity was rectified, and the patients restored to health, although sometimes with considerable shortening remaining.

The fracture-bed of Dr. Morgan, of Ithaca, which can be found in the Chapter upon Fractures of the Femur, answers all the indications. Dr. Mor-

gan has cured several cases by the extension and rest which are admirably secured by his apparatus.

The question of *excision of the hip* in morbus coxarius, is still under consideration by the profession; men of large experience taking opposite sides. As yet the exact position of the operation in the domain of surgery cannot be settled. At a meeting of the New York Medical Journal Association, held in February, 1878, Dr. C. F. Taylor asserted that he could not see the advantage in the proceeding, though he was ready to perform the operation if he could be convinced of its efficacy, and considered that the argument that the disease was arrested and life prolonged, with a more useful limb to the patient, was a mere assumption. Dr. Sayre, who is an advocate for excision, and who has performed the operation over seventy times, declares that when the bone *is dead*, it must be cut down upon and removed. It appears to me, that with the proper internal medication, and the appropriate mechanical appliances, most of the cases of hip disease may be cured, but on the other hand, when cases are brought to us *in extremis*, when a large amount of diseased bone is found, and perhaps imprisoned by the involucrum, preventing its removal even by the disintegrating process, that excision should be resorted to. In the cases I have operated upon, I think half were not benefited, while some have been perfectly cured. The surgeon must satisfy himself on these particulars, and resort to the operation if his judgment so dictates. (The full directions for performing the operation will be found in the Chapter upon Excisions of Bones and Joints.)

Loose Cartilages in Joints.—These bodies vary in number—from one to twenty-seven have been found in the same joint; and in size, from that of a lentil to that of a large kidney bean. Their shape is quite as variable as their bulk—sometimes they are round or oval, or they may be smooth or irregular. Those resembling in appearance ordinary cartilage, consist chiefly of albumen; while those that are of a firmer construction contain a considerable proportion of phosphate of lime. The knee-joint is their most frequent location, although they are found in other articulations.

The etiology of this affection is very obscure; and, although many opinions have been advanced, as yet little positive information concerning the origin and growth of these extraneous bodies has been ascertained. However, certain it is that they commence as pendulous growths upon the synovial membrane; that the capsular ligament is distended with increased accumulation of synovia; that they increase in size; and, that they more or less impede motion. They appear after swelling of a joint, occasioned by a blow or fall; or they may arise without any assignable cause. In either case, their presence is known by the pain which is experienced by the patient, and by the tumefaction of the part, which increases during rest, but subsides during moderate exercise. Mr. Paget* gives credence to a suggestion of Mr. Teale regarding loose bodies which form in the joints, which is, that they may be sequestra: "Just as a blow on bone or tooth may induce necrosis and exfoliation without signs of destructive inflammation, so may it be with articular cartilage; and the characteristics of these cases will be, that after injury to a previously healthy joint, a loose body is formed in it, having the shape and general aspect and texture of a piece of articular cartilage, with or without some portion of subjacent bone, and with its cartilage corpuscles arranged after the manner of articular cartilage." This, however, is a very old idea, which has been reproduced among modern surgeons and pathologists. A century ago it was disproved by Morgagni, who,

* St. Bartholomew's Hospital Reports, 1870.

from frequent experiment, found the cartilage of the joint entire and perfectly healthy in those subjects in whose articulations these movable bodies were met with in the greatest number.

It often happens that, after a time, the pedicle which connects these abnormal formations to the synovial membrane, is ruptured; and, in such cases, they pass from one part of the joint to the other, and sometimes cause excruciating pain, by becoming impacted between the articular extremities of the bones. In the knee-joint, they are very liable to fix themselves between the posterior face of the patella and the pulley-like surface of the femur. In some situations, the foreign substances can readily be detected beneath the integument; and Dessault mentions a case in which they could be seized and twisted with the fingers.

Treatment.—In this affection I know of no medicine which is homœopathic, although Dr. B. L. Cleveland, of Saginaw City, Michigan, informed me that he had cured a case of this troublesome disease by the internal administration of rhus tox. The patient was a lumberman, exposed to all kinds of weather, his vocation requiring him to use violent exercise. He fell accidentally into the water, and was taken with severe pains in the joint. These existed for one year and a half, when all the symptoms of loose cartilage presented. Rhus tox. 30th was given for two weeks, and afterwards rhus, 200th, was used for two months, the patient being kept quiet. All the symptoms disappeared. The doctor saw the patient some months after and he still remained cured. The action of rhus in this case would go far to establish the suggestions of Mr. Paget, which have been recorded, and from the known efficacy of rhus in affections of the cartilage, it would seem to have especial affinity for the form of disease under consideration. I know of no other medicine. One case alone has come under my supervision, and this was radically cured by the operation described below. As a general rule, strictly surgical means are the only resort. Surgeons have advised to force the cartilaginous formation to a part of the capsule where it will not interfere with the motion of the joint, and there to retain it by bandages, straps, etc., to endeavor to excite adhesive inflammation; however, such result can scarcely ever be attained, and therefore the operation must be performed. The patient, however, before proceeding with any such means, should be candidly informed of the danger incurred in opening the cavity of the joint, should be told of the ratio of successfully performed operations, and should be allowed to determine what course to be pursued. If he consents to the operation, it should be performed in the following manner:

The patient having been placed on a mattress, or a table, with the leg extended in such manner that the integument of the joint may be relaxed, the surgeon should search for the foreign body, and, having found it, should bring it to the inner side of the patella, and retain it in that position. The integument immediately over it should then be drawn as tense as possible with the finger and thumb (this may be accomplished with the left hand of the surgeon, or by an assistant), and with a single incision the skin should be divided. The foreign body can then readily be pressed through the opening, and the wound immediately closed, to prevent the admission of air. If there is any connection with the surrounding parts, they may be divided with scissors or a sharp-pointed knife. Forceps, fingers, or any instrument likely to bruise the joint, should never be used.

The pain of this operation is trifling, unless a branch of the internal saphena nerve happen to be divided. The wound may be closed with isinglass plaster, and compresses moistened with solution of arnica or calendula applied. It is after the operation that medical treatment is the most im-

portant. To prevent inflammation of the synovial membrane, it would be well to immediately administer a dose of aconite, or if other symptoms are present, those medicines already mentioned in the treatment of synovitis must be employed. After the wound has healed, spurious anchylosis may follow, which may be relieved by the administration of arn., rhus, bry., or caust., together with moderate motion, which should be daily increased. If the patient recover with partial stiffness of a joint, the operation may be considered successful.

Fleshy and gristly tumors may produce symptoms similar to those related of movable cartilage. The treatment is the same.

The procedure of Mr. Syme is, however, the best that has heretofore been devised for the removal of movable cartilage, and the results published by those who have had opportunity of testing its efficacy, should lead to its immediate adoption in preference to any other mode. The cartilage is firmly fixed on either side of the joint, and while it is held *in situ* by an assistant, the skin is punctured by a long tenotomy knife, about two inches from the cartilage, and by a semicircular sweep, the areolar tissue is separated from the subjacent fascia, and the synovial membrane upon the cartilage freely denuded. The cartilage is now pressed through the opening in the synovial membrane, and slid along the subcutaneous tract, and there fixed with a pad of lint, adhesive plaster and bandage; a straight splint is applied along the back of the limb, which is placed at an angle of forty-five degrees, and generally a cold-water dressing is applied. At a proper time, the cartilage is excised, and the remaining portion of the wound heals without difficulty.

In the treatment of nine cases, the joint was opened thirteen times, and neither pain, inflammatory action, or any serious symptom occurred in a single case.

Talipes—Club Foot.—Talipes, which is generally a congenital affection, although, in some instances, may be acquired, is divided by writers into four varieties, *equinus*, *varus*, *valgus*, and *calcaneus*. There are also other names given to deformities of this class, as there may appear to be a combination of two of the above varieties, thus, *equino-varus*, *calcaneo-varus*, etc.

There is also a variety known as *talipes cavus* or *plantaris*, in which the deformity is occasioned by the contraction of the plantar fascia.

The deformity may be either congenital, or it may be acquired; in the majority of cases being caused by paralysis of one set of muscles, which allows the antagonizing ones by their normal traction to displace the position of the foot. The disorder is also thought by some authors to be hereditary, males being more liable to the affection than females.

Then again, we find when one set of muscles spasmodically contract, whether the action be rapid or progressive, and not under the control of the will, similar deformity results. Such cases are denominated *spastic* or *spasmodic distortions*. With reference to the degrees of severity with which patients are affected, Mr. Little writes:

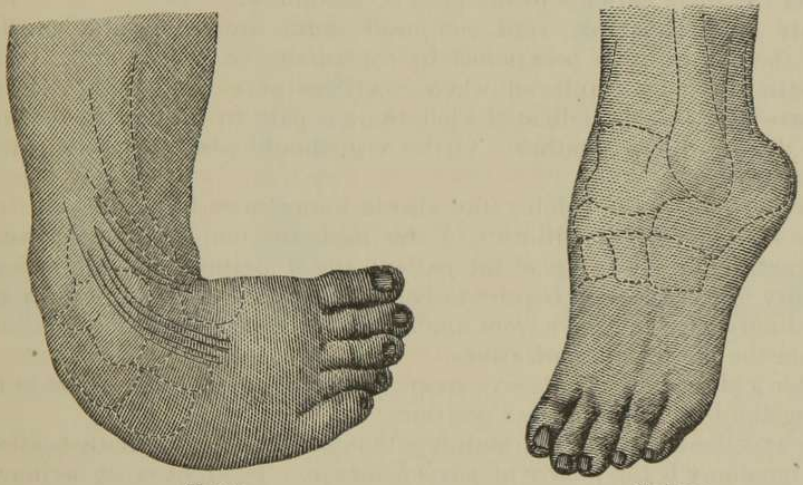
"It is convenient, for practical purposes, to divide congenital club foot into three degrees of severity: the *slightest*, that in which the position of the front of the foot, when inverted, is such that the angle formed by it with the inside of the leg is greater than a right angle, and in which the contraction is so moderate that the toes can easily be brought temporarily by the hand of the surgeon into a straight line with the leg, and the heel be depressed to a natural position. The *second* class includes those in which the inversion of the foot and elevation of the heel appear the same or little greater than in those of the first class, but in which no reasonable effort of

the surgeon's hand will temporarily extinguish the contraction and deformity. The *third* class comprises those in which the contraction of the soft parts and displacement of hard parts reaches the highest degree, so that the inner margin of the foot is situated at an acute angle with the inside of the leg, sometimes, or even almost in contact with it. Cases of the first and second grades may be respectively converted into the second and third grades by delay in the application of remedies, and by the effects of improper locomotion."

That variety which is most frequently encountered, is *talipes varus*, which is generally accompanied with drawing upward of the heel, and receives the name *equino-varus*.

Talipes Varus.—In this variety of the affection, the foot is turned inward

FIG. 220. FIG. 221.



Varus. Equinus.

(*vide* Fig. 220), and the patient walks upon its outer edge, the sole looking inward; it is produced by contraction of the tibialis, or the adductors, and when partaking of the equine variety, by the gastrocnemius, and also by the strong contraction of the *fascia plantaris*. This variety is often congenital.

FIG. 222.

Valgus.

Talipes Equinus.—In this class of the deformity, there is extension of the foot, more or less complete, the heel is drawn up, the points of the toes touch the ground, which position is caused by contraction of the tendo Achillis, in addition to which there is flexion of the toes (*vide* Fig. 221).

Talipes Valgus—The foot in this form of the affection turns outward to a greater or less degree, in some instances the entire sole looking outward, in others, there being but slight eversion; the arch of the foot is lost. In slight cases, the malformation known as *flat foot*, is T. valgus in a modified or slight form. The peroneus longus and the peroneus tertius are the muscles chiefly at fault in this deformity, together with the fascia (*vide* Fig. 222).

In *Talipes calcaneus*, which is the reverse of equinus, the foot rests upon the heel, the sole looks forward, the toes are pointed upward. The deformity is very rare, and is

generally of the congenital variety, and is caused by a contraction of the tibialis anticus and the extensor muscles of the foot, the tendons being protuberant under the skin.

One or both feet may be affected with this deformity. If but one, the affected limb is found thinner and more flabby than the other, and from arrest of development or imperfect nutrition, the limb is weakened and shortened.

Treatment.—The treatment of club foot should be commenced as early as the deformity is noticed; frictions and motion in the right direction—early employed, skilfully adapted, and duly persevered with—are alone sufficient to effect a normal relation of parts. Daily and for hours together the distorted foot should be held as nearly as possible in a normal position. Many such cases occur; and in many instances it is quite unnecessary to subject the little patients to the pain of tenotomy.

Natr. mur., rhus tox., ruta, con., and caust. are serviceable medicines, when the deformity is occasioned by contraction of the tendons. Nit. ac. and silic. may be employed when cicatrices give rise to the deformity; they are particularly indicated when there is pain in the contracted integument during damp weather. Carbo veg. should also be remembered for such symptoms.

Nux, graph., dulc., colch., may also in many cases be indicated.

The selection of the dilution of the medicine employed must rest with the practitioner. The age of the patient, the constitution, the duration and intensity of the affection require to be carefully considered, and the potency accordingly chosen, either from among the triturations and lower dilutions, or from the higher dynamizations.

After a short period adhesive straps properly applied will assist in maintaining the foot in the proper position.

An excellent method of retaining the foot in position both before and after tenotomy is the *plaster of paris bandage*. The foot must be placed as nearly as possible in its normal position, and over the inequalities should be placed layers of cotton batting. The bandage should then be carefully applied, and the limb held in position until the plaster has "set."

In *talipes varus*, provided both feet are affected, Professor Hamilton places the feet in Scarpa's shoes or in common laced boots. To the sole of each shoe, immediately under the ball of the foot, is placed a steel loop. The heels are then tied together with a tape, a steel bar four or five inches in length, and fitted with a shoulder at each end, is fitted into the loops, and thus keeps the toes well apart and the feet on the same plane.

Fig. 223 represents the shoes of Dengler. In this apparatus the heels are connected by a chain, to allow some motion. The bar in front is connected with short chains, as substitutes for steel springs. The shoes are constructed with coiled wire bands or elastic rubber, which, with a joint at the sole, allows considerable lateral motion.

Fig. 224 shows Tiemann's modification of Scarpa's shoe. A spring, *a*, draws the foot outward, which tension can be increased by fitting the spring into sockets, *c*. There is a single outside steel bar fitted around the leg by a belt, *d*, to this is attached a spring which passes around a wheel fastened to the outside bar above the ankle, and is fastened near the toes on the outside of the foot. The action of this instrument tends to elevate the toes, and put the tendo Achillis on the stretch. This apparatus also, with reversed action, answers for talipes valgus.

Dr. L. A. Sayre has introduced a shoe for both varus and valgus, and I have used it many times with excellent results. It consists (Fig. 225) of: A, cushioned iron cup to receive the heel, the leather covering of which is

carried over the instep and ankle, and fastened by lacing. N, Elastic tubing to go in front of the ankle-joint, to further secure the heel in position, and fastening at C, an iron hook on outside of heel cup. D, Sole of

FIG. 223.

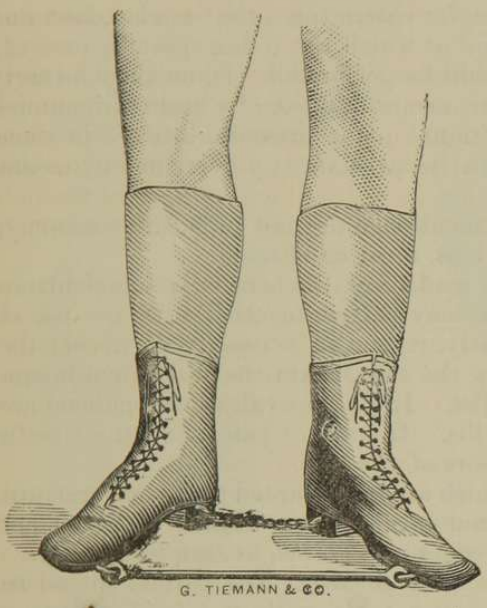
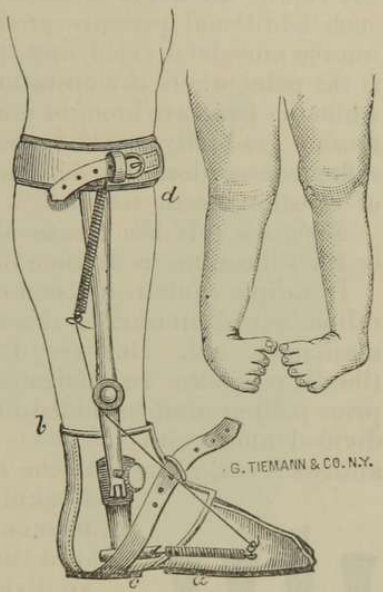


FIG. 224.



shoe, cushioned and laced securely in front of the medio-tarsal articulation. E, Ball and socket-joint connecting sole with heel. F, Elevated plate of iron, properly cushioned, to make pressure against base of first metatarsal bone. G, Steel bars connecting the shoe with H, strap to go around the calf. K, Joint opposite the ankle. L, Stationary hooks, opposite the toes

FIG. 225.

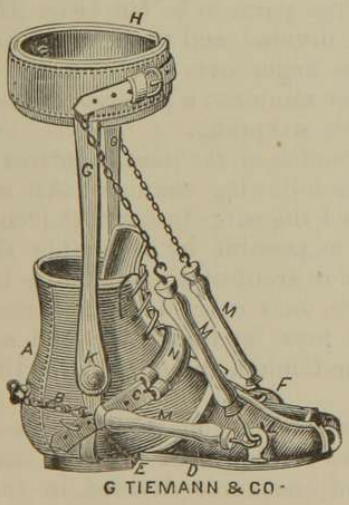
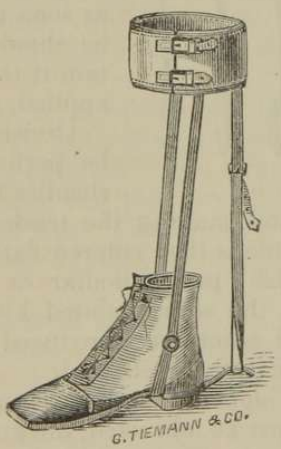


FIG. 226.



for attaching the india-rubber muscles, M M M. These india-rubber tubes have chains attached, for the purpose of making flexion and eversion."

Fig. 226 shows apparatus for talipes calcaneus.

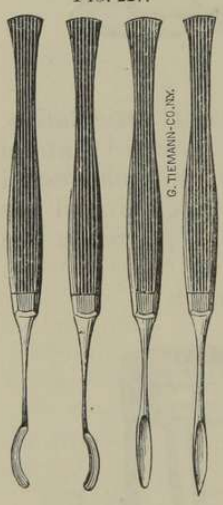
Dr. Sayre lays down the following rule for ascertaining whether the ten-

dons or fascia should be divided. He says:* "Place the part contracted as nearly as possible in its normal position, by means of manual tension gradually applied, and then carefully retain it in that position; while the parts are thus placed upon the stretch, make additional *point pressure*, with the end of the finger or thumb, upon the parts thus rendered tense, and if such additional pressure produces *reflex contractions*, that tendon, fascia or muscle must be divided, and the *point* at which the reflex spasm is excited, is the point where the operation should be performed. If, on the contrary, while the parts are brought into their normal position, by means of manual tension gradually applied, the additional point pressure does not produce reflex contractions, the deformity can be permanently overcome by means of constant elastic tension."

Tenotomy.—If the means above mentioned are not sufficient, tenotomy, or the subcutaneous division of tendons, must be effected.

In talipes equinus, division of the tendo Achillis is usually sufficient. In talipes varus, division of this tendon may suffice, together with the use of mechanical aid. But, very frequently, it is also necessary to divide the tibialis posticus. In confirmed cases, the tibialis anticus and extensor proprius pollicis must be added to the list. In talipes valgus, the peronei are divided along with the tendo Achillis. In talipes calcaneus, the tibialis anticus is cut, along with the extensors of the toes.

FIG. 227.



The knives which are best adapted to the performance of tenotomy (tenotomes) are thin-bladed, with different shaped cutting edges and points, as seen in Fig. 227.

To divide the *tendo Achillis.* The patient should be placed prone upon a table, with the foot extending beyond the edge. An assistant should then render the tendon tense, and the surgeon, feeling for the margin of the tendon, should enter a sharp-pointed tenotome flatwise beneath the skin, and pass it behind the tendon; the cutting edge should then be turned backward and with a slight sawing motion the cord divided. The surgeon, during the division of the tendon, should keep his finger on the parts to be cut (Fig. 228), and as soon as they are divided and the knife withdrawn, he should place his finger over the opening, and retain it there for some minutes; a pledget of lint is then applied, and fixed by strapping.

Division of the *tendon of the tibialis anticus* should be performed in the following manner: An assistant steadies the knee and the surgeon takes the foot in his left hand, making the tendon as tense as possible by abducting the foot. The knife is then entered flatwise, about in front of the malleolus internus (Fig. 229) perpendicular to the surface, and carried down through the fascia; the sharp-pointed knife should now be laid aside, and a probe-pointed tenotome introduced behind the tendon, the edge turned forward and the division effected.

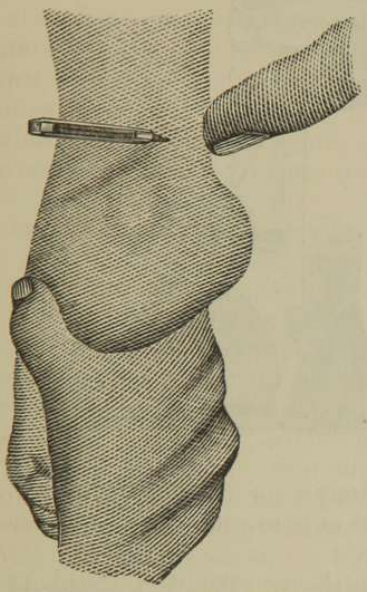
In *Valgus* it may be necessary to divide the *tendons of the peronei.* The foot must be adducted, the knife introduced behind the external malleolus, between the fibula and the tendons, and the cords divided in the same manner as before.

The *posterior tibial tendon* is cut by entering the knife perpendicularly

* Lectures on Orthopedic Surgery, p. 27.

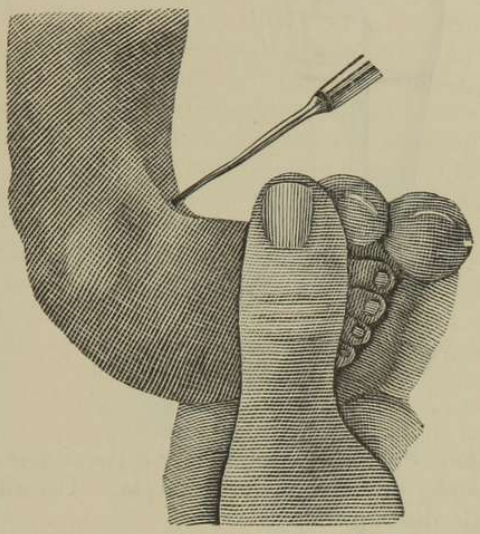
midway between the anterior and posterior borders of the leg on its inner aspect, and penetrating down to its tendons. A probe-pointed tenotome should then be substituted for the sharp-pointed, and carried close to the

FIG. 228.



Division of the Tendo Achillis.

FIG. 229



Division of the Tendon of the Tibialis Anticus.

bone, between it and the tendon; the edge is turned outward, and division effected by a sawing motion.

Attention has lately been directed to excision of the bones of the tarsus for the cure of congenital talipes. The opinion of the profession is yet divided upon this subject.

L. Verebelyi* records a case of congenital club foot affecting both limbs, in which after tenotomy and the plaster of paris bandage had failed, the astragalus was removed by subperiosteal resection, and by the application of proper retentive apparatus a cure was effected. Mr. Davies Colley† removed almost the entire tarsus with success. The operation was performed on both feet.

Spurious Talipes—Weak Ankles.—There is a variety of deformity known as *weak ankles*, or spurious talipes, which generally partakes of the valgus variety, and is found in rapidly growing children. The ligamentous structure gives way, the arch of the foot is lost, and the peronei muscles contract. This deformity is also known as *flat foot*. The affection may be confined to either one or both feet, and if neglected, gives rise to serious deformity as well as lameness.

Treatment.—In the milder cases, rest, and a steel arch placed in the sole of the shoe, are of great service; but in most cases a shoe giving support to the ankle should be used. As seen in the cut (Fig. 230), a steel bar passes under the shoe, which has a joint, *a*. The bar is attached above to a band, *b*, and the ankle is supported by a broad strap and buckle, *c*. If there should be tendency to contraction of the tendo Achillis, a strap, *e*, is affixed, Fig. 231.

Genu Valgum—Knock-Knee.—This affection is caused by a weakness of

* London Medical Record, Nov. 15th, 1877

† Archives of Clinical Surgery, vol. i, p. 266.

the muscles and ligaments affecting the knee-joint, in which the internal hamstring tendons have a tendency to contract; or it may be occasioned

Fig. 230.

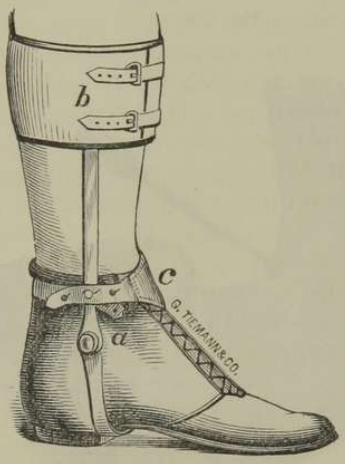
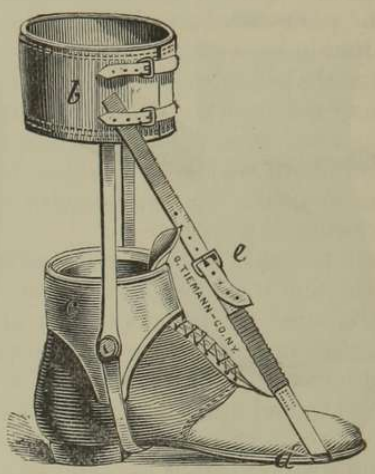


Fig. 231.

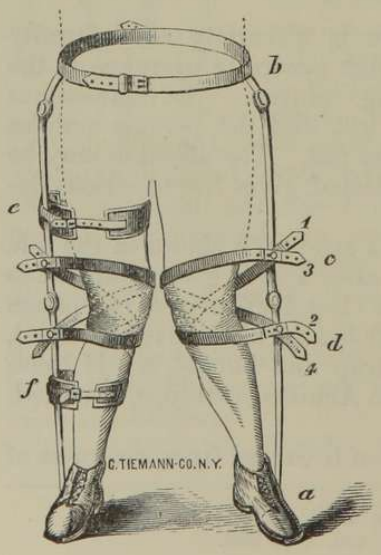


either by an enlargement of the inner condyle of the femur, or by an atrophy of the external condyle. The affection is so well known as to need little description.

Treatment.—The first thing to be done in the treatment of knock-knee, is to take the child off its feet, allow it to exercise but a certain period of time each day, and then to rest. It is not necessary to put on irons, unless the case is far advanced and the patient cannot be kept in bed. Then an appropriate apparatus, very light and carefully made, may be used. When the tendons are very much contracted, and the patient several years of age, it is necessary to divide the rigid and contracted cords, which I have done in many cases, with most excellent result. Fig. 232 represents Tiemann's apparatus.

It consists (if the deformity be double), of two lateral stems, with joints at the ankles, knees and hips, extending from the heel of strong shoes, *a*, to a well-padded pelvic band, *b*. The pelvic band is made in two halves, in order to admit of adjustment; the tightening of the posterior buckle everts the toes, that of the front buckle inverts them.

Fig. 232.



A pair of padded straps, secured to each other crosswise, act in the following manner:

End 1, is buttoned to the thigh-stem, *c*, carried from behind, below the inner condyle to the front, terminating in end 2, which is buttoned to the leg-stem, *d*.

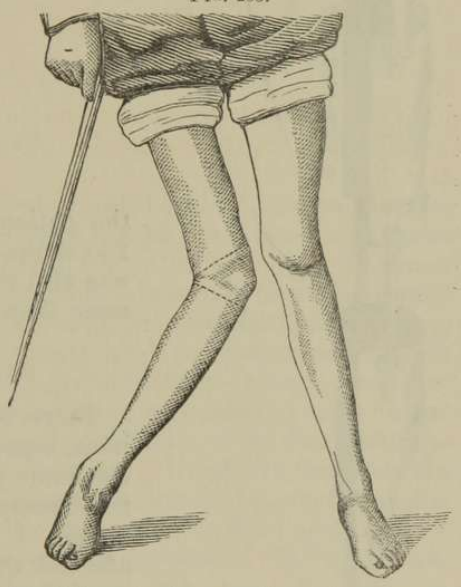
The end 3, buttons to *c*, is carried to the back of the knee, passing over the inner condyle, and secured to the button, *d*. In this manner they support both the head of the tibia and femur, whilst their combined direction of force being outwards, gradually corrects the deformity.

In aggravated cases the internal condyle of the femur may be sawn off, as practiced

by Mr. Ogston.* Mr. Chiene operates in the following manner:† "Taking the tubercle into which the tendon of the adductor magnus is inserted as a guide, a vertical incision is made through skin and fascia; then, on drawing these aside, the oblique fibres of the vastus externus can be seen in front, and the periosteum exposed. The internal articular artery is next secured by a double ligature, and divided. Lastly, the periosteum is raised up, and a wedge-shaped piece of bone is cut, by chisel and mallet, from the substance of the internal condyle. By gentle pressure the leg is now brought to its normal axis. The knee-joint is not opened. In the case exhibited, the wounds in each leg healed in a fortnight, but splints were kept applied for two months. Esmarch's bandage and careful antiseptic measures were used during the operation. The immediate after-treatment is not stated." In some cases, it may be necessary to take wedge-shaped portions of bone from the femur and tibia, as is well illustrated in the following case.

F. B., aged thirty, came from Minnesota, with a deformity of the leg, which was daily growing worse, was giving him considerable pain, and rendering him incompetent for any business. He had suffered when about fourteen years of age, with a softening and disintegration of the cartilages of the knee, and the articular extremities of the bone, especially the external condyle, which had finally left him, but in the condition as shown by Fig. 233. All appearance of disease had disappeared, and there was not even tenderness of the parts remaining. I first endeavored to relieve the deformity by the application of an iron splint, with screws, having previously divided the hamstring tendons. This produced no effect whatever, and he begged that an operation might be performed. The accompanying cut, taken from a photograph, illustrates the amount of deformity and the peculiarity of the ankle-joint, the patient being able to set the foot flat upon the ground.

FIG. 233.



Dotted lines showing a portion of bone removed with the saw.

Accordingly, on the 16th of October, 1869, in the presence of several medical gentlemen, the patient was brought fully under the influence of chloroform and the H incisions made; the two lateral being four inches and a half in length, the tranverse uniting the two below the patella, and exposing the joint. A triangular portion of bone was then sawn away from the head of the tibia and the condyles of the femur, the patella removed, and the limb brought into a straight position. A gutta-percha splint, moulded to fit the leg, and one to fit the thigh, secured together by straps, was then applied. The apparatus was intended to keep the cut surfaces of the bone in close apposition. The accompanying illustration (Fig. 234) represents the apparatus in full. A, body belt; B, thigh support; C, leg support; D, strap for the sole of the foot.

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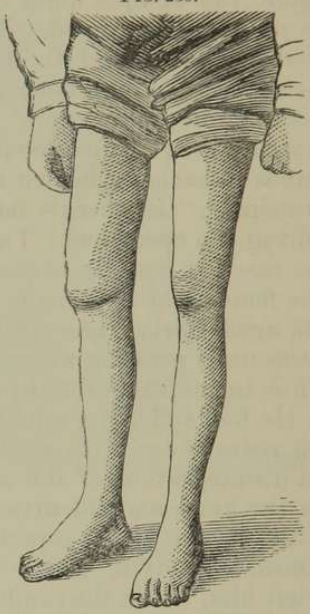
* *Vide* Archives Clinical Surgery and Hospital Gazette, Oct. 1877.

† Loc. cit., Dec. 1877.

The anterior splint was then bound firmly upon the limb, which was placed in a straight fracture-box, with hinged sides. After several months

Fig. 234.

Fig. 235.



the patient made an excellent recovery. Fig. 235 shows the patient after the operation. There was also considerable motion of the joint, much more than could have been anticipated.

HYSTERICAL JOINTS—GONALGIA.

There is a variety of nervous disease of the joint, especially noticeable in the knee (to which the name *gonalgia* is given) which is often very troublesome to treat. From the cases I have observed, I think females are more liable to be affected than males. I have seen it twice in young men, in one of whom I am quite sure it arose from prolonged masturbation. It is often, though not always, accompanied by hysteria, but is usually connected with uterine symptoms. It is not an uncommon attendant upon the menstrual period, some females suffering intensely during that time. The pains are often aching and boring, and are apparently unbearable, confining the patient to bed during the period. The pains also sometimes attack the wrist, the ankle, the shoulder, and other joints, and intermit or pass away during any mental excitement.

In some cases, especially in the knee, a cracking sensation is noticed, giving the idea that the joint has given way, with accompanying weakness of the joint. In one of my cases I noticed a peculiar rubbing or grating sound similar to that found in arthritis. Together with these symptoms, there is generally apprehension and fear of moving the joint, from which cause alone stiffness may result.

Treatment.—It is better that patients with hysterical joints should rest them, and that constitutional treatment should be adopted, such as is de-

manded by the symptoms. Of the medicines I have used, ignatia, macrotin, caulophyllin, bryonia, and bromide of potash have done most service, which combined with electricity will often suffice. Relapses are frequent, and must be guarded against.

DISEASE OF THE SACRO-ILIAC SYNCHONDROSIS.

This is not a common disease, and is often, from its symptoms and its similarity to other joint affections, very difficult to diagnose. Dr. Charles T. Poore* has written a valuable treatise on the subject, having collected fifty-eight cases, two of which were from his own practice. He finds that

		Males.	Females.
Under 10 years of age,		4	3
Between 10 and 20,		4	3
" 20 and 30,		9	9
" 30 and 40,		3	4
" 40 and 50,		2	3
Adults,		7	5
Over sixty,		1	0
Sex not given,	1		
	1	30	27

The symptoms vary somewhat. There is lameness, and pain on pressure of the sacro-iliac synchondrosis. The limp gradually increases, and shows but little alteration either in the morning or in the evening. If direct pressure is made on the great trochanter, pain, of more or less aggravated nature, is experienced, which is also increased by striking the sole of the foot while the leg is extended. It is not necessary, however, that the pain should be confined to the affected part, for, in the most extreme case that came under my observation, most of the suffering was referred to the knee. Another point which makes the diagnosis often difficult, is the flexion of the limb, which therein simulates morbus coxarius. Dr. Sayre believes the disease to be essentially traumatic, and says, with reference to examination for diagnosis, that when the wings of the ilia are held firm, and then an examination of the hip is made, no pain is experienced. In hip disease the different rotatory motions with abduction or adduction give pain; in sacro-iliac disease these motions do not; while pressing the ilia together against the sacrum, and making pressure along the sacro-iliac synchondrosis always gives rise to suffering. Again he says:† "In sacro-iliac disease, the lengthening of the limb is absolute, while in hip-joint disease it is only apparent."

Abscesses, both *intra-* and *extra-pelvic*, are found in the advanced stages of the disease, in which case there may be flexion of the thigh, which will add also to the difficulty of diagnosis.

In Dr. Poore's article, already mentioned, the following diagnostic points are mentioned, which I have arranged in a tabular form:

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* American Journal of the Medical Sciences, January, 1878, p. 63.

† Orthopedic Surgery, p. 330.

SACRO-ILIAC DISEASE.	HIP-JOINT DISEASE.
Pain *behind* hip-joint, or may be referred to knee or thigh.	Pain in the joint, or in the knee.
No flexure of thigh, or, if it appears, it comes after the formation of intra-pelvic abscess.	Flexure of thigh early, without abscess.
No lordosis.	Early lordosis.
Motion of hip-joint *smooth*, *free*, and *painless*.	Limited and painful.
Pelvis does not move with thigh.	Pelvis moves with thigh.
No pain on pressure, either below Poupart's ligament, in front or behind the trochanter.	The reverse.
Pressure on ilium, at right angles to body, or attempted rotation of this bone, causes pain.	Contrary.
Tenderness over joint.	None.
No sudden pain at night.	Sudden attacks of pain at night.
No shortening.	In advanced hip disease always shortening.
Intra-pelvic abscess may come early.	Intra-pelvic abscesses come late.
Locomotion more painful.	Not so painful.
Attitude different, body thrown to sound side.	Thigh flexed and pelvis twisted.

In the treatment of this affection a good deal may be accomplished with medication, but the essential requisite is *rest*. There must be immobility of the joint. This may be effected by a well-fitting wire cuirass, a plaster bandage, or perfect rest in bed. Dr. Sayre recommends the patient to use crutches, and to wear on the sound side a shoe with the sole of sufficient thickness to allow the affected limb to swing clear—thus making extension and counter-extension.

CHAPTER XXVIII.

DISLOCATIONS OR LUXATIONS.

General Considerations—Varieties—Diagnosis—Treatment—Extension and Counter-extension—Manipulation—False Joint—Ancient Dislocations.

Surgeons have divided dislocations into different kinds, according to the degree and extent of the injury. Thus we have the simple and compound, complete and incomplete, primitive and consecutive, recent and old. The latter terms carry with them their own explanation.

A *simple dislocation* is when the articular surfaces are separated, the adjoining soft parts or bones being but slightly injured.

A *compound dislocation* is when the dislocation is accompanied with contusion of soft parts, laceration of bloodvessels, fracture, a wound penetrating into the joint, or reaching as far as the dislocated bone.

A *complete dislocation* is where the head of the bone is separated entirely from its natural position; the head of the humerus, for example, driven

down into the axilla and resting upon the edge of the scapula. In an *incomplete luxation* the parts still are partially in contact, as when the head of the humerus touches the coracoid process of the scapula.

In a *primitive dislocation* the displaced part remains in the place into which it was first forced; while in a consecutive *dislocation* it leaves its original seat and passes into another.

Congenital dislocations are very rare, and these dislocations have, in most instances, been confined to the shoulder, wrist, and hip; sometimes at different joints in the same infant. Instances go to establish the fact of their being, at times, hereditary. Of their cause no satisfactory reason has been given. Probably it may be the result either of internal or external force, or disease of the embryo's joints.

The bones farthest from the body are considered as those dislocated, those of the ankle excepted, in which case the foot is regarded as the fixed part.

Besides violence, *undue muscular action* may produce displacement, especially if the parts adjoining the joint are in a relaxed or unhealthy condition. Parts subjected to frequent and extensive movement are most liable to be luxated, therefore the accident is more frequent with the ball and socket joint. The middle-aged and those advanced in life are most liable to the accident. The dislocated part may be thrown either *backwards*, *forwards*, *upwards*, or *downwards*, according to the formation of the joint and the direction of the force applied.

General Diagnosis between Fractures and Dislocations.—In fracture there is increased mobility, crepitus, and when the broken extremities are placed in apposition, they will not thus remain without external support, while with luxations there is unnatural rigidity, and the displaced part remains fixed. These differences are, for the most part, true; at times, however, exceptions present themselves. The rasping sound and sensation produced by dislocated bones have by the inexperienced been mistaken for the real crepitus of fractures. There is likewise discoloration, pain, and swelling; at times temporary paralysis. The limb is shortened, very seldom lengthened. When the dislocated end of the bone can be felt, it will be found in an unnatural location, and a depression be detected in the place that the extremity of the bone occupied.

General Treatment.—The sooner the bone is replaced the better. The replacement is then most easily effected, and in a majority of instances can be accomplished without the aid of other means than the hands. To do this with certainty requires an accurate knowledge of the ligaments and muscles. The adverse action of muscles may at times be overcome by diverting the patient's thoughts, especially at the moment when the final effort is made to replace the bone. He may be startled by having communicated to him intelligence which would be deeply interesting; or suddenly attracting his attention to surrounding objects, or otherwise interesting him, that his thoughts may be diverted from the accident and his muscles thereby be somewhat relaxed.

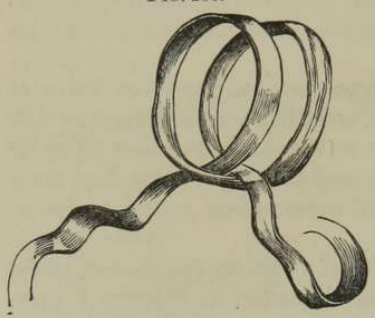
Unless a dislocation is reduced soon after the accident, a partial or complete inability to move the part may continue during life. Even if the replacement has been accomplished in a short time after the occurrence, the movements of the joints may for a considerable period, sometimes for years, be constrained.

The two forces employed to reduce dislocations are *extension* and *counter-extension*. The former is applied to the extremity of the dislocated bone, the latter by retaining firmly and immovably the upper parts nearest to the dislocated extremity.

If the hands alone are not sufficient to effect reduction, a handkerchief

with a clovehitch (Fig. 236), or a French knot or bandages, must be employed. In dislocations of large bones, compound pulleys or the rope windlass may be required. In the treatment of individual dislocations, the proper mode of application of these different means will be explained.

Fig. 236.



If an anæsthetic is employed during the operation, the method of administration may be found by referring to the chapter upon that subject.

Reduction of dislocations, even of the larger joints, by *manipulation* alone, is now attracting much attention. It has been ascertained that shoulder and hip luxations, which were formerly supposed to require a great degree of force for their reduction, can, by proper handling, be brought to their natural positions. This, however, requires a perfect knowledge of the mechanical action of the muscles and ligaments surrounding the joints, in order that those which offer the most stubborn resistance be made to relax.

Among those who have made this subject a specialty are found the names of Prof. Nathan Smith, the father of Prof. Nathan R. Smith, of Baltimore, who, as far back as 1824, testified under oath: "I do not think that the mechanical powers, such as the wheel and axle, or the pulleys, are necessary to reduce a dislocated hip *or any other dislocation.*" Also Kluge, Rust, Reid, Markoe, Hamilton, and Bigelow, the last named having recently given to the profession a treatise on *The Mechanism of Dislocation and Fracture of the Hip*, reference to which will be found in the section on Dislocations of the Femur.

After a dislocation has continued for a length of time, various pathological changes ensue, the functions of the muscles are altered, tendons form new attachments, plastic effusions take place, and adventitious formation of bone often results, the head of the bone has changed its locality, and gradually taken to itself a new resting-place, and a cavity is formed for its reception. A species of cartilage caps the surfaces, and a *new* or *false joint* is the result. In some cases it is extremely difficult to diagnose whether such formation has taken place, or if the case is a chronic rheumatic arthritis.

While these adventitious growths are taking place, the bloodvessels and nerves of the parts are imbedded in them, or incrusted with new formations, rendering them brittle, and therefore in attempting the reduction of these chronic dislocations, too much force is not to be applied. *Fatal hæmorrhage* has followed such forcible endeavors.

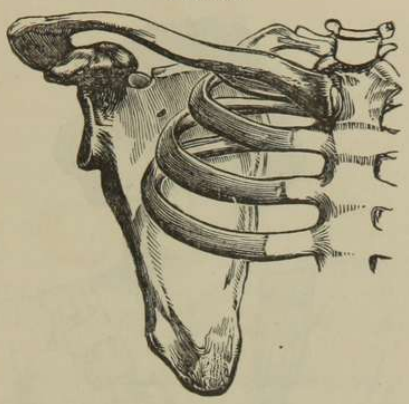
It would be a source of great satisfaction to the surgeon if more light penetrated a subject now unfortunately enveloped in much obscurity, especially if he knew the required time for the formation of false joints, or those plastic effusions, the presence of which renders the reduction of dislocations dangerous. This varies so much in different cases, that no specific time can be mentioned. Perhaps it may be admissible to attempt reduction within three months after the accident. The operator, however, must be the judge.

Dislocations of the Clavicle, Lower Jaw, Pelvic Bones, Ribs, etc.—The luxation of the sternal extremity of the clavicle is rather an uncommon accident, and is occasioned by great violence applied to the shoulder.

When the scapula is fixed, the directions are *forward*, *upward*, and *backward*.

Dislocation forward. (Fig. 237.) This luxation is sometimes incomplete, as has been noticed by myself on two occasions in children. In such instances, the prominence is well marked, and in the majority of cases the luxation may be reduced by pressing back the shoulders and forcing the end of the bone into its place. When the dislocation is complete, the symptoms are:

Fig. 237.



1. Head of the bone forming a tumor on the articulation.
2. Head of bone depressed and generally pointing downward.
3. Shortening of shoulder from its prominence to sternum.

The *upward* dislocation is very rare. Malgaigne, Hamilton, and Mr. Bryant mention such cases, the latter gentleman having seen both clavicles dislocated upward.

In this accident,

1. The shoulder is shortened.
2. The head of the bone rests on the top of the sternum.
3. The tumor moves with the shoulder.
4. The injury is generally apparent from the exposed situation of the bones.

Dislocation *backward* is generally caused by direct force, or violence forcing the shoulder forward, or more infrequently it may be produced by diseases, as in the instance reported by Sir Astley Cooper, in which it was occasioned by curvature of the spine. In these cases the principal symptoms are,

1. Difficulty of respiration if the bone presses on the trachea, or,
2. Difficulty of deglutition if the pressure is made upon the œsophagus.
3. Head generally inclines forward.
4. Shortening from middle line to the acromion.

Treatment.—In the dislocation *forward*, by drawing the shoulder outward and pressing down the head of the bone, *reduction* may be effected, or by placing the knee between the scapulæ as a fulcrum, and drawing the shoulders backward, the bone can be pushed to its place. After reduction the apparatus of Levis for fractured clavicle (see Fig. 165) will answer extremely well, and to keep the head of the bone in position an ordinary truss, as recommended by Nélaton, with the pad on the projecting bone, and the end of the spring in the axilla or on the shoulder, will prove satisfactory. The pressure should be kept up seven or eight weeks.

In the *upward luxation*, by drawing back the shoulders, reduction is, in the majority of instances, readily accomplished, but it is a very difficult matter to keep the bone *in situ*. The best that can be done is to apply to the shoulders a figure-of-eight bandage, and apply a compress over the head of the bone, holding it as firmly in place as possible with broad adhesive straps crossing each other at right angles, or the hernia truss, as already mentioned. It is, however, satisfactory to know that both Malgaigne and Hamilton found the function of the clavicle perfectly restored, excepting when an attempt was made to lift weights above the head.

In the *backward variety* the same method of drawing back the shoulders must be tried, and, as is recorded in Mr. De Morgen's case,* a splint should be placed across the shoulders with a pad between it and the spine, the shoulders being drawn to the splint by a bandage.

Fig. 238.

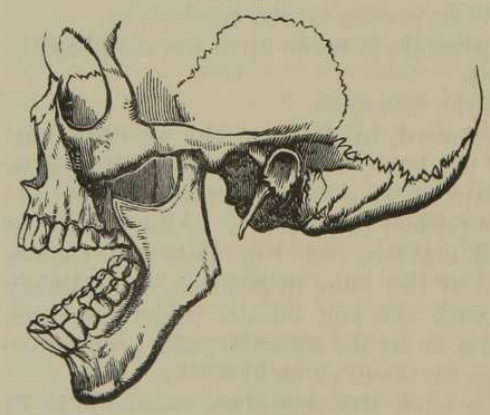
The apparatus of Mayor for dislocation of the clavicle is seen in Fig. 238, *a* representing sling; *b* and *c* shoulder belts.

Dislocation of the Lower Jaw.—Luxation of the inferior maxillary bone is the effect of direct violence upon the chin, or it may be produced by muscular action, as laughing, yawning. From the peculiar formation of the joint, the direction *forward* is the only one in which the dislocation occurs:

1. Open mouth.
2. Condyles rest in front of the base of the zygoma.
3. Condyloid space vacant.
4. Prominence beneath zygoma.
5. Articulation painful and indistinct.

Treatment.—Having enveloped the thumbs in a piece of stout cloth, they must be placed upon the molar teeth, while the fingers and hand are placed beneath the chin and base of the bone. Pressure must now be made with the thumbs whilst the chin is elevated, by the fingers (Fig. 239); the moment the bone is slipping into place, the thumbs, protected by a pair of thick gloves, are slipped from the teeth upon the gums. If there be difficulty in reducing both condyles at the same time, one should be reduced before the other is attempted; this generally is successful.

Fig. 239.



In persons disposed to spontaneous dislocation of the jaw from gaping, etc., a return of the displacement may probably be prevented by the exhibition of a dose of staphis., ten drops of the 3d attenuation every night and morning for three months. Should this medicine not accomplish the desired object, rhus tox., from its known specific action upon ligamentous tissue, might be tried, in like manner. A successful preventive treatment of this accident is much to be desired; its frequent repetition in some individuals, especially females, is a source of considerable annoyance as well as pain.

Dislocation of the Pelvic Bones.—Dislocation of the pelvis is the result of great violence, the nature of the force being generally that of crushing.

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* Holmes's System of Surgery, vol. ii, p. 805.

In the majority of instances these dislocations are of serious import, as the force required to separate the bones is very great, internal organs being more or less involved. The danger is to be estimated from the amount of injury sustained by the abdominal organs. In some cases very severe injuries of this kind have been followed by recovery.

Dislocation of the Pubis.—It appears that the separations of the symphyses, or, as they may be called, dislocations of the pelvis, especially those occurring at the symphysis pubis, are those which are most likely to be followed by favorable results, especially those that occur during parturition, of which I have known three instances, all of which recovered. In Malgaigne's cases, seventeen of which occurred during labor, ten died and seven recovered ; and of the four cases attributed to accident, two died and but one recovered. Dr. Bryant* relates the case of a female, aged 30, under his care, in which the pubic bones were displaced on the right side for more than an inch, leaving a curious deformity, the pubic bone, with the adductor muscle attached, being curved out, leaving a hollow on the inside of the thigh.

The same author reports a second case in that of a female child, in whom there was great separation of the pubic bones, the contents of the pelvis being pressed out through the opening, a foot of the large intestine, the uterus and bladder, all being outside. This patient also recovered.

It is quite proper to mention here, that an accident of this character, viz., separation of the pubic bones, may occur during a labor, without either the patient or the practitioner being aware of the accident at the time. A suit lately occurred in Brooklyn, in which I was called upon to testify, where just such an occurrence took place.

The separations which occur from violence are much more liable to implicate the pelvic viscera, and therefore are much more serious. Dr. Lente, of the New York Hospital, reports, in the *New York Journal of Medicine* (also quoted by Hamilton), the case of a man, æt. 18, crushed between two cars: there was a separation of the symphysis, and the patient died in two days. The post-mortem revealed a rent in the apex of the bladder large enough to admit a man's thumb.

Sir Astley Cooper gives, also, a case of separation of the symphysis of about two fingers' breadth, which recovered after a considerable period. (See Cooper's and Travers's *Surgical Essays.*)

The most marked case of separation of the symphysis which I have seen, occurred in the practice of Dr. Lewis Grasmuck, now of Kansas, and was reported by Dr. S. B. Parsons, in the *Western Homœopathic Observer*, for March, 1866. His description of this case shows so well the symptoms of such a condition that I shall quote therefrom, particularly as I was cognizant of many of the facts, and also had the satisfaction of examining the woman myself.

The patient was the mother of four children ; was married at the age of fourteen. Her first child was born during her fifteenth year. The labor lasted nine days, and finally to facilitate the process, large quantities of a decoction of ergot (" half a saucerful every two hours") were administered. " The pains then became intense and constant, and severe local suffering was felt at the symphysis pubis, growing more and more aggravated at each effort of the uterus. So agonizing were the labor-throes that consciousness was lost three hours before delivery, and did not return for some time thereafter, consequently she knew nothing of what transpired during those oblivious moments."

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* Practice of Surgery, p. 944, English edition.

Her recovery was slow, and the following were the symptoms noted, which I have numerically arranged:

1. Strangury. 2. Irritation and inflammation of the labia. 3. Constipation. 4. Abscesses above the mons veneris, which opened above the clitoris. 5. Inability to walk without severe pain at the symphysis pubis, and also at the right sacro-iliac symphysis. 6. Shooting pains along the pubic bone, extending down the thigh whenever movement of the pelvic bones was attempted. 7. *Crepitus* was distinct, and remained for four months, and then disappeared, to return at the second, third, and fifth labors. The above-mentioned symptoms were all present, except the abscess, on each of the occasions. 8. The pains in the symphysis were intolerable, and confined her to her bed during the later months of gestation. In the recumbent position the symptoms were much relieved. 9. When I saw her the arch of the pubis was contracted; there was considerable swelling of the entire vulva. On the anterior surface of the mons veneris a groove could be readily detected, showing the separation of the pubic bones. 10. The extremities of the bones were sensitive to pressure. 11. The right pubic bone was found also projecting a little anterior to the left. These were the symptoms that were especially noticeable, and I have condensed them as showing what peculiar manifestations may be present, in order to assist in pointing out the true nature of the case, which might be obscure, especially in the hands of the inexperienced.

The second case of separation of the symphysis which came under my care was congenital, and occurred in that remarkable case of extrophy of the bladder, with one kidney and one ureter, which I have fully recorded elsewhere.

The treatment adopted was, first, the constant use of the catheter if necessary; second, perfect rest in the supine position, a pad on each side of the symphysis, and a wide roller bandage applied around the hips. This appliance is not difficult to put on, but very troublesome to keep in position. It must be secured by perineal bands, which must be fastened at the pubis and the sacrum, to keep the bandage from riding upward. A well-padded leather belt, with appropriate straps and pads, would, in my judgment, answer the indications better than any other apparatus. During the period that the patient is in the recumbent position, appropriate homœopathic treatment (I mean internal medication) must be adopted. Symphytum is highly recommended by some surgeons of our school, as well as by Dr. Ruddock, of England. My preference is for one of the preparations of lime or phosphorus, or both in combination, as the symptoms may indicate.

Separation at the Sacro-iliac Symphysis.—There are not very many examples of this accident upon record. In the memoir of M. Viluysken on the subject, which I find condensed in *Ranking's Abstract*, vol. vi, 1848, there are five cases reported, and in the *Provincial Medical and Surgical Journal*, for November 17th, 1847, also quoted in the eighth volume of the same compendium, two others. Besides these cases there is one reported by Phillipi, at Chartres; another in 1731, by Bassius; the case by Enaux. Hoin, and Chaussier; that of Baron Larrey; that of Harris, in the *Journal of the Medical and Physical Sciences*, of Philadelphia, vol. xv, and two cases by Heidewreide, in 1839.

I have condensed the symptoms of several of these cases, as they are especially instructive. In one instance the separation was caused by a fall from a height of six feet upon the left tuber ischii; the patient was a woman aged 24, and the accident occurred on the 7th of May, 1798; the suffering at first was horrible at the tuber ischii; there was no crepitation; the limbs were found to be about the same length. After eight days the

pain gradually disappeared, and she was allowed to cautiously exercise. In thirteen days the pain returned; the left limb grew *shorter* than its fellow, and the more she walked the more perceptible became the shortening, it amounting to nearly two inches. Every time she endeavored to support herself on her left foot, the body was so suddenly flexed laterally toward the left side, that it might be said that the superior edge of the ilium approached with violence towards the false ribs. The form and motion of the left leg were unimpaired, but the iliac crest of the left side was higher than that on the right side, but upon steady pressure the elevation could be made to descend to its proper level, the limbs being then brought to their proper length.

The treatment of this case was extension and counter-extension, the patient in the horizontal position, and the parts rendered immovable by an apparatus resembling the splint of Dessault; an elastic band eight inches wide was so applied that its upper border corresponded with a line drawn about an inch above the crests of the ilia, and its inferior edge with the lower parts of the sacrum. The apparatus was put on on the 13th of June, and removed on the 15th day of September, the patient being perfectly cured. In another case the limb was shortened after several days; the coxo-femoral motions, however, being executed with freedom and without any pain. The posterior part of the ilium was movable and painful, and the crest of the ilium on the injured side was more elevated than the other. A similar apparatus was applied and a cure resulted.

In another case, besides the above-mentioned symptoms, there was paralysis of the rectum and bladder, and the crests of the ilia nearly touched the false ribs. No attempt was made to reduce the bones, and the patient recovered by being merely kept in the horizontal position.

From these cases, to which I have briefly alluded, and from the study of the few others I have been able to find, we may infer that in separations of the sacro-iliac symphysis, there is not immediate shortening, but that from eight to ten days after the injury this condition may occur; in this particular resembling the intra-capsular fracture of the neck of the femur; the diagnosis, however, may be readily made out by remembering that in the latter there is eversion of the foot, inability to raise the heel from the bed, and inability to perform the usual movements of the coxo-femoral articulation. The shortening in the dislocation may be relieved by extension, and pressure upon the elevated crista ilii. In the separation of the bones there may be a sudden falling of the body to one side, when the patient endeavors to stand on the affected limb. The crest of the ilium is also more or less elevated, and may reach almost to the cartilages of the false ribs. There may be crepitus and preternatural mobility at the seat of the joint, and paralysis of the bladder and rectum may also be present. For these cases the *treatment* consists in extension and counter-extension; pressure on the elevated crest of the ilium; a broad belt with appropriate pads around the pelvis, and extension maintained either by Buck's, Hamilton's, or Hodgen's extension apparatus, or perhaps by the anterior splint of Nathan R. Smith.

Dislocations at the junction of the pelvic bones in the acetabulum, may be considered under the head of fractures of those bones.

Dislocation of the ribs from their cartilages sometimes occurs, and may be recognized by an unnatural protuberance.

Treatment.—These cases are managed by placing a compress upon the extremity of the rib, and passing a roller around the chest, to secure the compress, and control in a measure the action of the muscles.

Dislocation of the vertebræ can hardly occur without fracture, and is the

result of such violence that other symptoms demand our attention. Absolute rest is the most important object of treatment.

Dislocation of the Lower Extremity—Coxo-femoral Dislocations—Dislocation of the Hip-joint.—As ordinarily described, there are four dislocations of the head of the femur. 1. *Upward and backward* on the dorsum of the ilium (Fig. 240). 2. *Upward and backward* into the ischiatic notch

FIG. 240.

Iliac Dislocation.

FIG. 241.

Sciatic Dislocation.

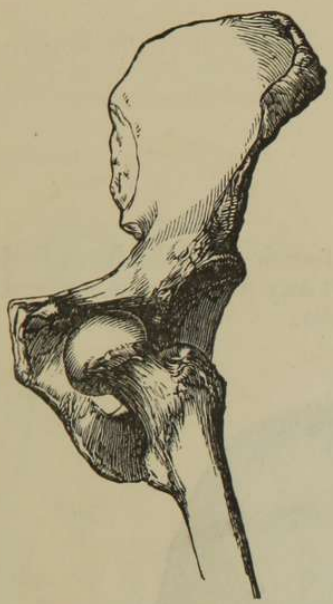
(Fig. 241). 3. *Downward and forward* into the thyroid foramen (Fig. 242, see next page). 4. *Upward and forward* upon the pubes (Fig. 243, see next page). Besides these there are other or *irregular* dislocations of the bone which vary according to circumstances.

The difficulty in the reduction of hip-joint luxations, and the powerful means often unavailingly employed, for many years, have been subjects of careful investigation by many distinguished surgeons. The fact that, in some instances, after considerable mechanical force has been unsuccessfully applied, a dislocation has been reduced by accidental manipulation, has given rise to many experimental researches on the best methods of reducing luxations of the hip. The additional fact that complete muscular relaxation produced by anæsthesia does not overcome either resistance or deformity, plainly evinces that some force other than myotility is exercised to hold the bone so obstinately in its unnatural position. To the capsular ligament this power was attributed by Prof. Gunn in 1853. Prof. Green also was of the same opinion; but Dr. H. J. Bigelow, of Boston,* has lately, in a satisfactory manner, shown that it is the *ilio-femoral ligament* and the *obturator internus muscle*, which offer the chief impediments to the reduction of the hip, and in maintaining the deformity. It will be necessary here, for a proper understanding of the subject, to give the anat-

* The Mechanism of Dislocation and Fracture of the Hip, with the Reduction of the Dislocation by the Flexion Methods.

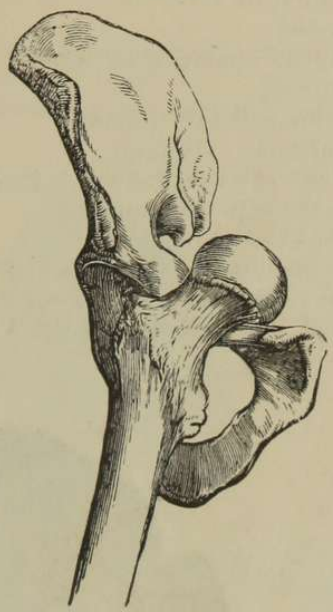
omy of the ligament to which such important agency is ascribed, and likewise that of the internal obturator muscle.

Fig. 242.



Thyroid Dislocation.

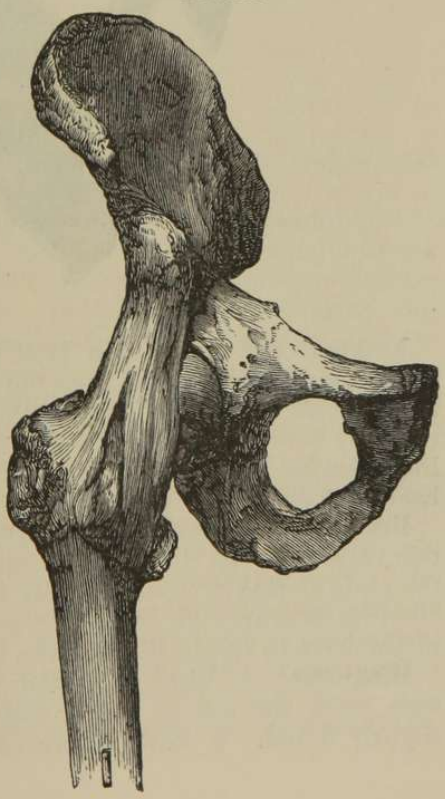
Fig. 243.



Pubic Dislocation.

The ilio-femoral ligament (Fig. 244) arises from the anterior inferior spinous process of the ilium by a strong adhesion, passes downward and slightly outward, and is attached to the anterior inter-trochanteric line. The fibres separate slightly as they reach their point of insertion, thus making the ligament somewhat resemble the inverted Y. In many subjects, however, this ligament is so closely adherent to the capsular, that it is difficult to separate the two. Dr. Bigelow names this structure the Y ligament.

Fig. 244.



The *obturator internus* muscle arises for the most part within the pelvis, its attachments being the inner surface of the body of the ischium, the ascending ramus of that bone and the descending ramus of the pubis; the fibres converge from tendinous bands, which, leaving the pelvis by the small sciatic notch, pass horizontally outward to be inserted by a strong tendon into the upper border of the trochanter major (Fig. 245, see next page). By keeping these anatomical relations well in mind, the further description of the mechanism of the dislocation will be readily understood.

Dr. Bigelow maintains that in the so-called regular dislocations the Y ligament remains unbroken, and that in the irregular varieties either one, or both branches of it are torn asunder. He states that both branches remain entire, in

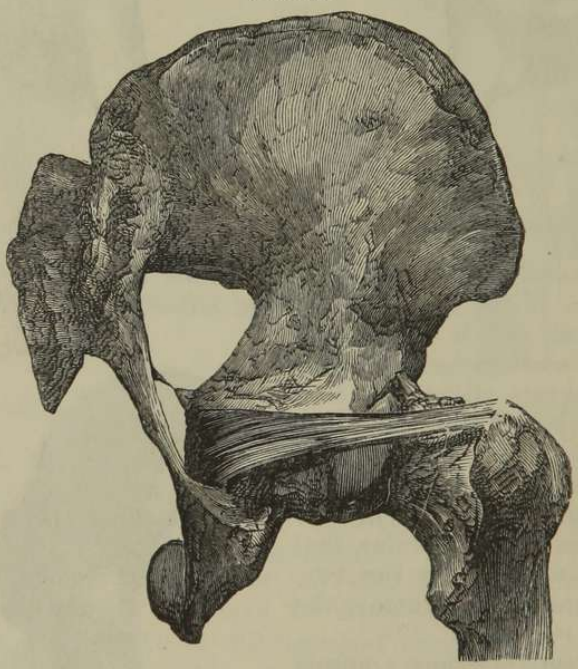
1. Dorsal.
2. Dorsal " below the tendon."
3. Thyroid.
4. Pubic and sub-spinous.
5. Anterior. Oblique.

That the external branch is broken :

1. In the supra-spinous.
2. The everted dorsal.

Thus making in all seven regular dislocations of the bone, besides the irregular ones, which may occur in almost any direction on account of the rupture of the capsular and the Y ligament.

FIG. 245.



Nélaton's test, which is a most excellent one for dislocation of the hip, consists in drawing a line from the anterior superior spinous process of the ilium, to the most prominent portion of the tuberosity of the ischium. If the bone is not dislocated, the top of the trochanter, in all positions of the limb, touches the lower border of this line. In all dislocations, especially backward ones, the trochanter passes above it.

Dislocation Upward and Backward on the Dorsum of the Ilium.—In this variety, which is the most common, the triceps is put upon the stretch, the glutæus maximus and medius are doubled over, the capsular and ligamentum teres are torn, the former perhaps only sufficiently to allow the head of the bone to escape through the rent.

Diagnosis.—1. Limb shortened one and a half to three inches. 2. Toe rests upon the top of sound foot. 3. Limb rotated inward. 4. Limb slightly flexed. 5. Knee advanced upon the other. 6. Trochanter major

is nearer the anterior superior spinous process than usual. 7. Adduction of limb. 8. Abduction almost impossible. 9. Body bent forward. 10. Roundness of hip lost. 11. In the absence of swelling, by rotating the knee, the head of the femur may be felt moving on the dorsum of the ilium.

Fig. 246 represents position of patient suffering from this dislocation.

Fig. 240, page 554, shows the position of the bone.

Fig. 247 shows the dislocation of the bone, and the relations of the ilio-

FIG. 246.

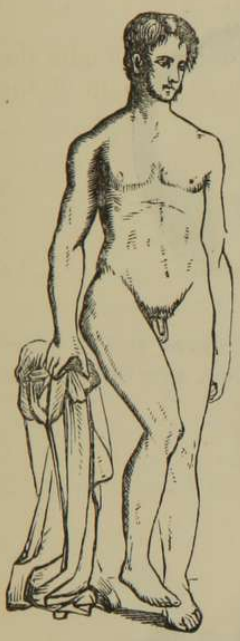
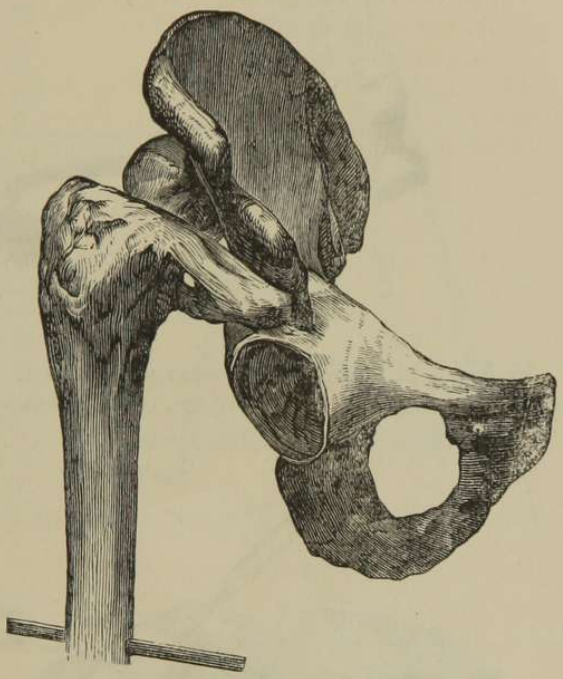


FIG. 247.



femoral ligament, holding the greater trochanter to the pelvis, and thereby inverting the limb.

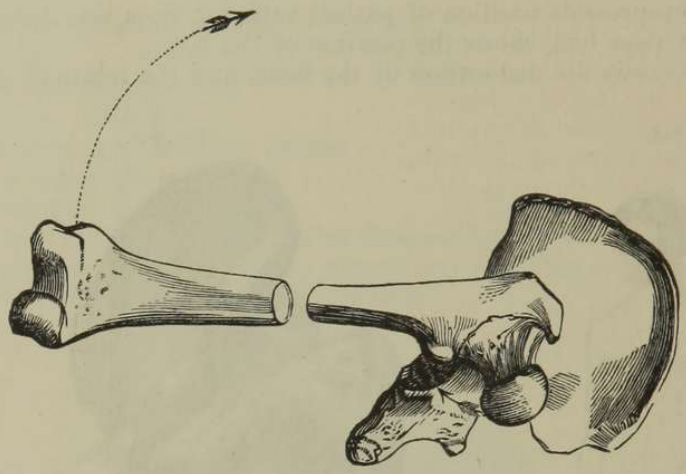
In some instances there happens to be what is termed "*everted dorsal dislocation*," in which case the limb is everted and may also be abducted. This condition is believed by Dr. Bigelow to be owing to a rupture of the outer fibres of the ilio-femoral ligament. In such cases the luxation must first be reduced to an ordinary dorsal dislocation, and then reduced completely.

Treatment—*Manipulation.*—As long ago as 1815, Nathan Smith taught reduction of the dorsal dislocation by manipulation, and it has been practiced frequently by many surgeons.

The patient should be etherized and placed either upon the floor or upon a hard couch. The surgeon grasps firmly the knee of the affected side with one hand, and the ankle in the other. The leg is then flexed on the thigh, and the thigh on the abdomen, which relaxes the ilio-femoral. The knee must then be carried upward across the opposite thigh as high up as the umbilicus, if possible, when it should be rotated across the abdomen to the injured side. The next procedure is to bring the thigh gradually down by abducting the knee, the foot being carried across the sound limb. Fig. 248 represents the mechanism, the dotted lines showing the rotation of the head of the femur and the knee.

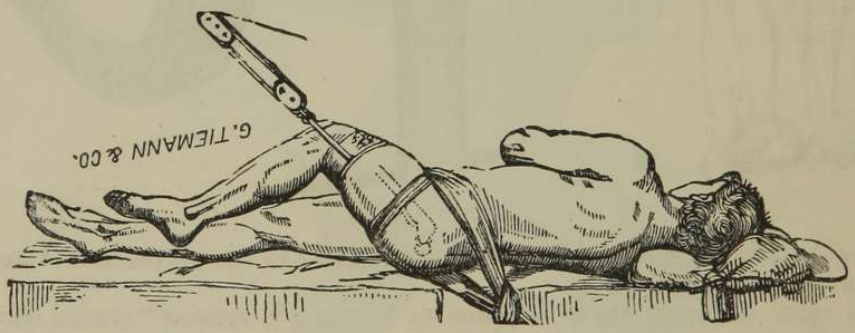
Dr. Bigelow asserts that all regular dislocations can be reduced by flexing the thigh on the abdomen to relax the ilio-femoral ligament, and making extension directly forward.

FIG. 248.



Method with Pulleys.—A strong band well padded is placed in the perinæum and made to pass over the outer surface of the pelvis, and then made

FIG. 249.

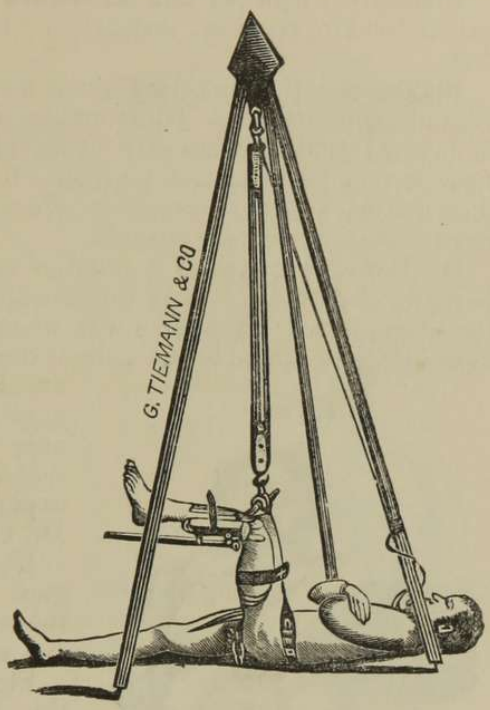


fast to a fixed point. A roller is then wetted, and bound above the knee; over this a towel is placed, made into a clovehitch, to which is attached, by means of a hook or otherwise, the pulley, which must be in a direct line to the perineal band. The knee must then be flexed at a right angle, and steady and continuous traction put upon the muscles by the pulleys; as the head of the bone draws near the acetabulum, the surgeon should rotate the limb inward, and the bone will slip into the socket (Fig. 249). It may happen that the elevated margin of the acetabulum acts as a barrier to complete reduction; in such an event, a towel passed around the thigh near the groin, and drawn outward, will lift the head of the bone over the ridge and thus facilitate its reduction. After the limb has been reduced it should be laid parallel to the other, and several towels or a roller passed around *both limbs*, and the patient kept quiet for a fortnight. Care must be taken in all these efforts, whether by manipulation or extension by pulleys, that the bone be not fractured.

Fig. 250 represents the "Tripod" for vertical extension as recommended

by Dr. Bigelow; or if this be not at hand the foot, unbooted, should be placed on the pelvis, and the leg lifted from the knee.

Fig. 250.

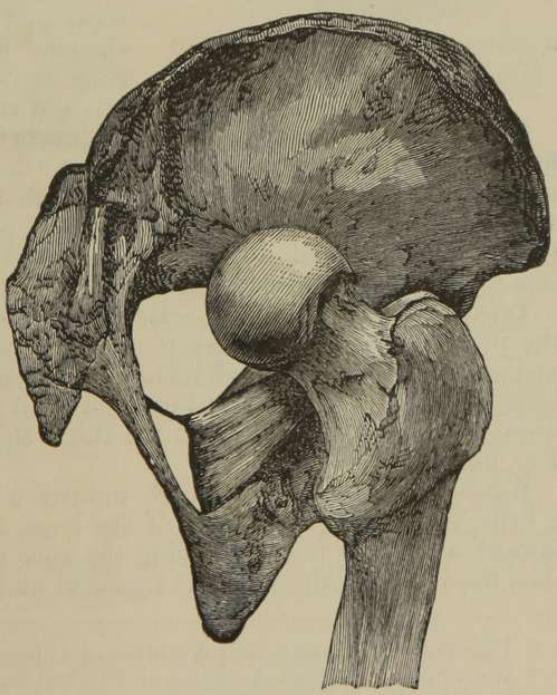


The so-called "automatic method" of reduction of dorsal hip-joint dislocations consists of placing the patient on his back on the floor (having him fully anæsthetized), and flexing the legs at right angles with the thighs, and the thighs at right angles with the pelvis. This relaxes the ilio-femoral ligament. The hands are then placed under the calves of the legs, as close to the knees as possible, and the pelvis raised from the floor, at the same time slight abduction being made. This method was accidentally discovered by Dr. S. J. Allen, of Vermont, who while endeavoring to get a patient suffering from hip dislocation in proper position for reduction, lifted him in the manner described above, and had the satisfaction of seeing the head of the bone slip into its place. Dr. Allen mentioned the method of reduction to the late Dr. A. B. Crosby,

Fig. 251.

Position of patient with Ischiatic Dislocation.

Fig. 252.



Internal obturator in Sciatic Luxation (Bigelow).

who practiced the method with success in the wards of Bellevue Hospital, and published the same to the profession in the *Philadelphia Medical Times*.*

Dislocation Upward and Backward into the Sciatic Notch, or, as it is called by Dr. Bigelow, dislocation "below the tendon" (Fig. 241, page 554).

Diagnosis.—1. Shortening about an inch. 2. Thigh flexed, more so in recumbent position. 3. Thigh adducted and rotated inward. 4. Great toe of luxated limb touches ball of toe of the sound one. 5. Head of the bone felt in its abnormal position. 6. Knee and foot inward. 7. Heel does not reach to the ground. 8. Knee in advance of the other. 9. Limb fixed; rotation scarcely possible.

Dr. Dawson† speaks of a peculiar symptom, hitherto not spoken of, in ischiatic dislocation. It is the shortness of the affected limb, when the thighs are flexed; in other words, when the patient lies on the back with extended limbs, there is but a slight degree of shortening; when the thighs are flexed upon the trunk at a right angle, then the affected knee is considerably shorter, say two inches, than the sound one. This same symptom with its explanation has been noticed earlier by Dr. Oscar H. Allis.‡

FIG. 253.

Recumbent position of patient with Ischiatic Dislocation (below the tendon).—Bigelow.

Fig. 251 shows the general appearance of a person with dislocation into the sciatic notch, or ischiatic luxation, as it is sometimes called.

Fig. 252 is a correct representation of this dislocation, with the position of the *obturator internus* muscle.

Fig. 253 shows the recumbent position of patient affected with dislocation upward and backward, in which there is extreme flexion and rotation of limb from the action of the obturator internus and the capsular ligament.

Dislocation Downward into the Foramen Ovale—Thyroid Dislocation—Symptoms.—1. Limb two inches longer. 2. In thin subjects, head of the bone felt towards the perinæum. 3. Limb advanced, toes point forward. 4. Body bent forward. 5. Trochanter less prominent. 6. Head of thigh-bone below and a little anterior to the axis of the acetabulum. 7. Depression below Poupart's ligament. 8. Limb abducted (Fig. 254).

Treatment—*Manipulation.*—Bearing constantly in mind the relations the ilio-femoral ligament has to this dislocation, flex the thigh upon the abdomen in a state of abduction, the limb being moved inward and brought down in an abducted position until the knee comes within a short distance below the pubes, when the thigh should be rotated inward. (See Fig. 255.)

Bigelow says: "Flex the limb towards a perpendicular, and abduct it a little, to disengage the head of the bone, then rotate the thigh strongly inward, adducting it and carrying the knee to the floor. The trochanter is then fixed by the (ilio-femoral) ligament and the obturator muscle, which

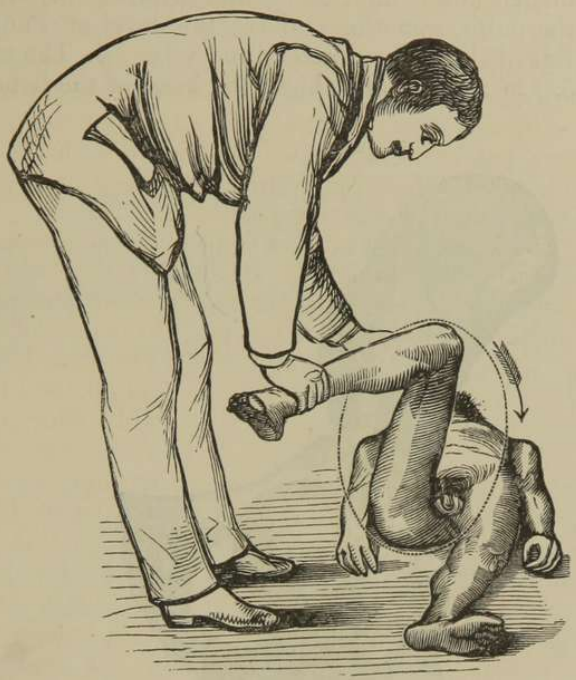
* *Vide* Hospital Gazette and Archives of Clinical Surgery, Nov. 1877, p. 269.
† Hospital Gazette and Archives of Clinical Surgery, Jan. 1st, 1878.
‡ Philadelphia Medical Times, March 28th, 1874.

serve as a fulcrum. While these are wound up and shortened by rotation,

FIG. 254.

Appearance in Thyroid Dislocation.

FIG. 255.

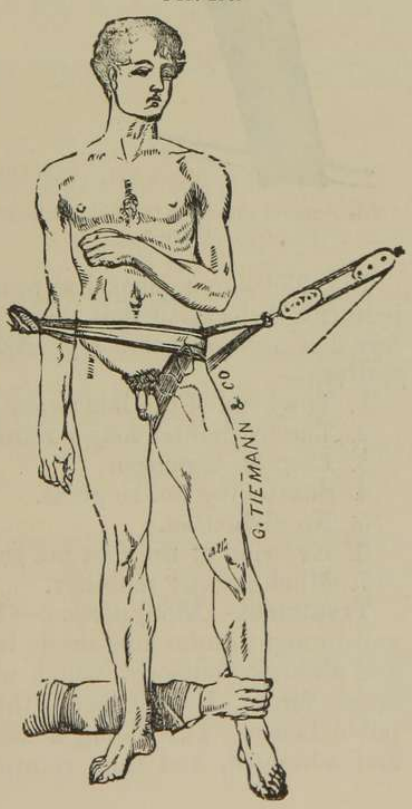


the descending knee raises the head upward and outward to the socket."

Extension.—Patient to be placed on the back. A band is placed around the injured thigh so as to embrace the perinæum. This band should be hooked to a pulley made fast to a point obliquely above the hip. In addition, a counter-extending band or girth must be placed around the ilium and fastened to a point opposite the injured hip. A gradual strain is then made upon the part with the compound pulley, and as the head of the bone moves from the foramen ovale, the surgeon should firmly grasp the ankle and draw it towards the median line of the body, when the head of the bone will pass into the acetabulum.

This method is seen in Fig. 256.

FIG. 256.

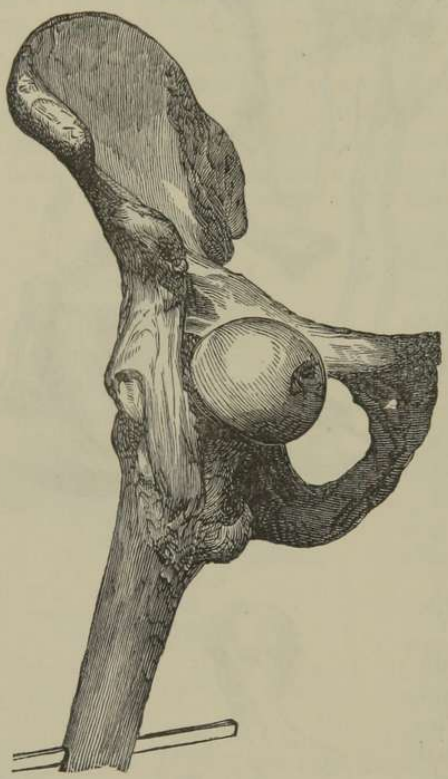


Dislocation Forward upon the Pubes.—This variety of luxation is rare, and may be caused by the same forces as occasion the thyroid dislocation. By referring to the wood-cut (Fig. 257), it will be seen what relation the ilio-femoral ligament bears to this variety of

dislocation, which being borne in mind, its relaxation by flexion in the manipulation method will be understood.

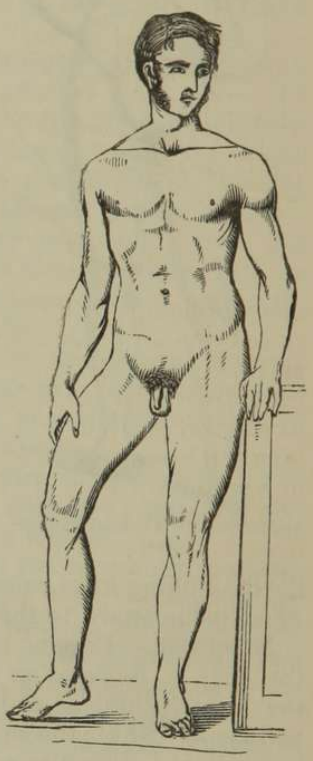
Symptoms.—1. Limb an inch or more shortened. 2. Knee and foot abducted and cannot be rotated inward. 3. The head of the bone felt upon the pubis, sometimes above the level of Poupart's ligament, at the outer side of the femoral artery and vein. 4. The trochanter major is nearly lost. 5. On rotating the thigh, the head of the bone is felt to move with it.

FIG. 257.



The Femoral Ligament in Pubic Dislocation. Bigelow.

FIG. 258.



Appearance of Patient. Pubic Dislocation.

Fig. 258 shows general appearance of patient with this dislocation. It is in this dislocation that there is both *shortening* and *eversion*, and therefore it is necessary that a good deal of care be taken in the diagnosis. *In fracture*—

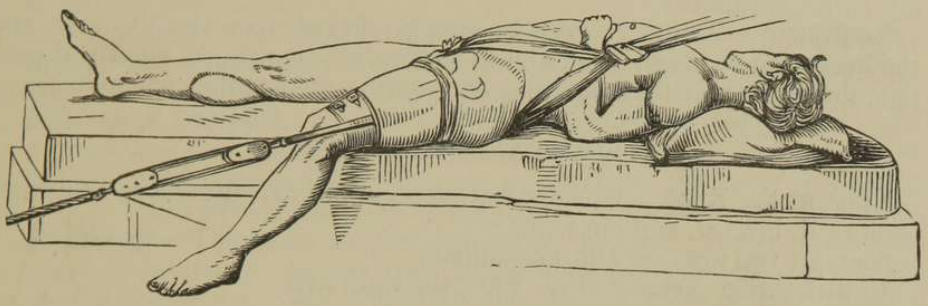
1. The head of the bone cannot be felt.
2. The trochanter major rotates on shorter radius.
3. *Crepitus* is present.
4. Shortening not so great.
5. No abduction.
6. Eversion of the foot not so great and more easily overcome.
7. Much greater mobility.

Treatment—*Manipulation.*—The patient must be placed upon the back, and brought under anæsthetic influence. The thigh then must be rotated and abducted outward, which will in the majority of cases require considerable force. By this means the head of the bone is thrown forward on the pubic bones. This being accomplished, the limb must be forcibly flexed and adducted, and then rotation inward performed. In some cases, by

simply carrying the limb to an extreme abduction, rotating the thigh inward, and pressing upon the head of the bone, the reduction may be effected. In this dislocation the surgeon may try various methods of manipulation, according to the presenting symptoms.

Pulleys.—The patient is placed on the sound side or half on his back and half on his side, a perineal band, well padded, applied over the pelvis and fixed to a point in front of a line with the body. (Fig. 259.) The band is

FIG. 259.



then applied, as before directed, above the knee, to which, by means of the clove-hitch, or other appliance, the compound pulleys are attached, which must be made fast to a point behind the axis of the body, that the bone, when traction is made, may be drawn backward. As the bone approaches its natural position, it must be assisted over the pubes and edge of the acetabulum by means of a band or towel. The subsequent treatment consists in rest and a bandage to keep the legs in a horizontal position.

Dislocation of the Patella.—The patella is luxated laterally, outward or inward, the former being the more common of the two. An upward dislocation can only occur from a rupture of the tendon of the quadriceps. The signs of the outward variety are—

1. Patella lies at external face of joint; the inner edge being directed forward.
2. Depression in front of the knee.
3. Prominence on outside of knee.
4. Inner condyle of the femur can be felt under the integument.
5. It is impossible to flex the leg.

In the inward dislocation the symptoms and appearances are the reverse of the above.

Treatment.—The patient should be placed supine, and the thigh flexed upon the abdomen. The surgeon then sitting on the side of the bed, places upon his shoulder the lower part of the leg, when, by pressure made with the thumbs from without inward, in the outward dislocation, and from within outward in the inward variety, the bone will slip to its place.

It is not always necessary to use this manipulation, as any movement having a tendency to completely relax the tendon of the patella will answer equally well.

In some instances the patella may be *vertically* dislocated, by a sudden and forcible twist of the joint. In these cases the leg is straight, the outer edge of the bone is prominent, and there is a deep depression upon each condyle.

Dr. A. N. Dougherty, of Newark, N. J.,* relates a "singular" accident of this kind, which came under his treatment. It occurred to a young man who was painting a house, and seemed to be caused by a sudden wrench of

* N. Y. Med. Record, Dec. 30th, 1876.

the knee in turning the body, while a foot was lodged in the gutter of the roof. The left lower extremity was in a state of extreme extension, and the patella was tilted up on its inner edge, the posterior surface of the bone looking directly upward, and the extensor tendon correspondingly tilted up and stretched. Reduction was effected in a few minutes by manipulation, which consisted in depressing with a joggling motion the projecting edge toward the outer condyle. Contrary to the recommendation of Gross, the thigh was not flexed; next day, the patient was walking about, and suffering no inconvenience.

Treatment.—The thigh must be strongly flexed upon the abdomen, and the knee then suddenly bent, and as suddenly brought into a vertical position, the surgeon at the same time endeavoring to turn the bone to its place.

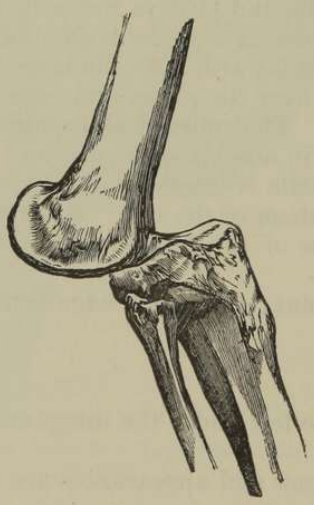
DISLOCATION OF THE LEG.

Tibia at the Knee.—This dislocation occurs in four directions—forward, backward, inward, and outward.

The last two are rare and incomplete.

In dislocation *forward* (Fig. 260), the signs are:

FIG. 260.



Dislocation Forward of Head of Tibia.

FIG. 261.

Dislocation of the Head of Tibia Backward.

1. Patella prominent in front of the joint.
2. Tibia and fibula prominent in front.
3. Condyles of femur project posteriorly.
4. Pain from pressure in popliteal space from stretching of parts.

Treatment.—Place the patient on his back, make extension (sometimes the pulleys may be necessary), and alternately flex and extend the leg, at the same time making a slight rotary motion, with pressure upon the head of the dislocated bones. The parts must then be placed in splints, and passive motion made for several days.

Dislocation of the Head of the Tibia Backward.—(Fig. 261) Signs are:

1. Leg bent forward.
2. Depression of the *ligamentum patellæ.*
3. Shortening of the limb.
4. Projection of the condyles of the femur anteriorly.

The accident is easily recognized.

Treatment.—Place the patient in the recumbent posture, and make extreme and forcible flexion. This will in the majority of cases produce the desired result. If not, extension combined with pressure on the dislocated extremity of the bone will reduce the luxation.

In the dislocation *inward*, the following are the marks of the accident—

1. Tibia projects on the inner side of the joint.
2. Inner condyle of femur rests on the centre of the head of tibia.
3. Joint increased in breadth.
4. Patella pushed outward.
5. Outer condyle of femur presents a tumor on the outer side of the joint.

Treatment.—Extension for a short time, with pressure in the proper direction, generally effects reduction without difficulty.

Dislocation Outward.—1. Tibia projects on the outer side of the joint. 2. Outer condyle of the femur rests on the articulating surface of the tibia. 3. Inner condyle of the femur presents a tumor on the inner side of the joint. 4. Increase in the breadth of the joint. 5. Patella pushed outward.

Treatment.—The same as for dislocation inward, excepting that the pressure is reversed. As has been before observed, these dislocations are generally incomplete. When they are complete, they are in most instances accompanied by fracture and other injury demanding immediate amputation.

The head of the fibula may be dislocated, and generally this takes place *backward*. In some of the cases which have been noticed, the misplacement was occasioned by muscular action.

The signs are:

1. Head of the bone felt on the outer and posterior side of the leg.
2. Fatigue from walking or exercise.

Treatment.—The bone is readily reduced but almost immediately slips from its position. After having reduced the luxation, a solution of arnica should be applied to the part; this may have the effect of producing absorption of the superabundant synovia; or ledum may be used, as this medicine acts powerfully upon the knee-joint, and also upon the absorbent vessels generally. After this, a compress should be placed behind the head of the bone, which should be bound tightly to the tibia, either by a bandage or strap buckled round the upper part of the leg.

Dislocation of the Tibia at the Ankle-Joint.—There is sometimes a confusion of ideas, especially among students, regarding the nomenclature of these dislocations. It should therefore be remembered that a dislocation of the lower end of the tibia *inward* is a dislocation of the foot *outward*, and that a dislocation of the tibia outward at the ankle-joint is the same as a dislocation of the foot inward.

A majority of these dislocations are accompanied with fracture. They are caused by falls and twists of the foot, and are often very serious accidents. The direction of that dislocation which is most frequent is *inward*.

Dislocation of the Foot Outward.—The symptoms are:

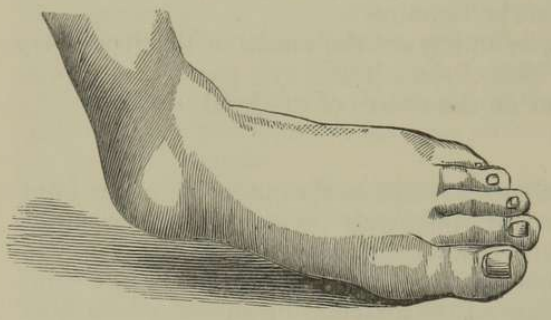
1. Internal malleolus very prominent.
2. Foot everted. (Fig. 262.)
3. Foot rotates on its axis.
4. Generally a depression is found three to five inches above the external malleolus, indicating a fracture of the fibula at that point.
5. Preternatural mobility in a lateral direction.
6. Patient cannot move the foot.
7. Very severe pain.

In this dislocation there is a rupture of the internal tibio-tarsal ligament, and sometimes a fracture of the internal malleolus.

Treatment.—The patient should be placed in a recumbent position, and

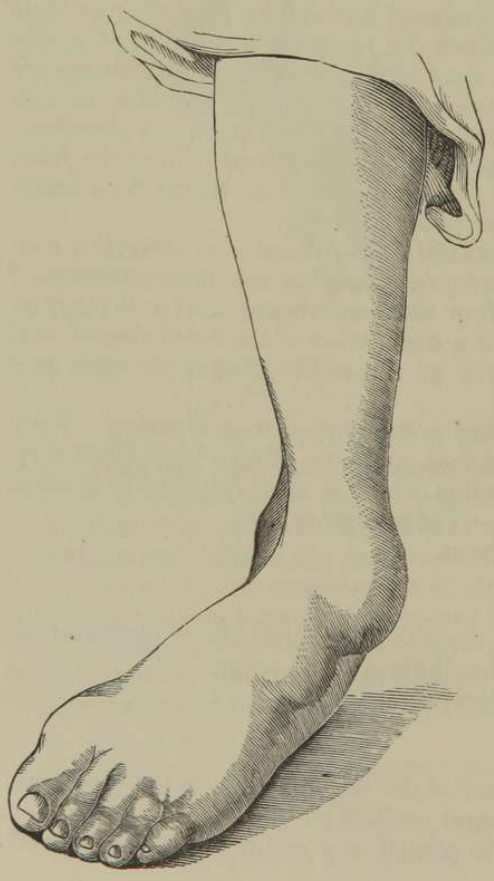
the leg flexed at a right angle with the thigh. An assistant should then fix the thigh firmly, either by grasping it with his hands or by passing a towel or folded sheet beneath the lower extremity of the thigh. Extension should then be made, either with the pulleys or with the hands, lateral pressure being made on the projecting bone in the direction of the joint, and thus the deformity is removed. Dupuytren's apparatus for fracture of the lower part of the fibula is now to be applied, or splints and bandages, to keep the foot at rest and at a right angle to the leg, and the patient kept in bed five or six weeks. Ten or twelve weeks will have elapsed before the use of the foot is restored. After the eighth week, passive motion will be required to restore the mobility of the joint. Causticum, lycopodium, or rhus, will very much facilitate the latter object. First, however, the inflammation of the joint must be attended to, as in all other cases of dislocation.

FIG. 262.



Dislocation of the Lower End of the Tibia Outward (Dislocation of the Foot Inward).—This luxation is very serious, and demands the unceasing vigilance of the surgeon. It is caused by the same kind of accidents which produce the former. Fracture of the lower end of the fibula, or of the internal malleolus, or a rupture of the peroneo-tarsal ligaments takes place, and in some instances the astragalus is also broken. The symptoms are:

FIG. 263.



1. The foot is inverted. (Fig. 263.)
2. The tibia is thrown forward and outward upon the astragalus.
3. Great deformity of the joint.
4. Astragalus felt beneath inner malleolus.
5. External malleolus is felt and seen as a prominence on the outside of the ankle-joint.

Treatment.—The reduction is effected in a similar manner to that detailed for the treatment of the inward luxation, while pressure is made upon the luxated end of the bone.

After the reduction, a pad should be placed upon the outside of the leg, extending from above the ankle, several inches up the limb. Two side-splints are applied, with a foot-board, and the leg, having been previously

lightly bandaged, should be fixed securely in the apparatus. Care must be taken to prevent the tibia and fibula from slipping from the astragalus. The limb should then be laid on its outer side. After several weeks, passive motion and friction should be resorted to.

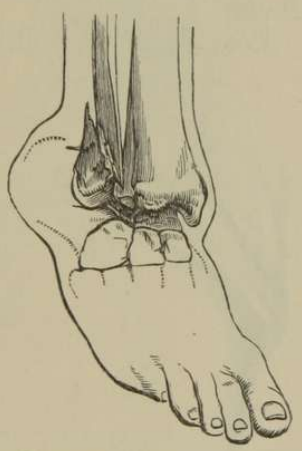
Dislocation of the Lower End of the Tibia Forward (Dislocation of the Foot Backward). (Fig. 264).—The causes of this accident are falls, with twists at the ankle, causing great extension of the foot upon the leg.

The symptoms are:

1. Foot fixed.
2. Foot shortened in front.
3. Heel projects.
4. Heel firmly fixed.
5. Toes point downward.
6. End of the tibia felt as a tumor on the tarsus.
7. Extensor tendons well defined in front.
8. Tendo Achillis rigid and curved.
9. Sometimes crepitus above the external malleolus marks fracture at that point.

In many instances there is only a *partial dislocation of the tibia* on the astragalus, in which case the fibula is broken, and the tibia appears to rest half on the scaphoid and half on the astragalus. The symptoms resemble those mentioned, but are not so precisely defined. The foot is shorter, and the toes point downward, while the heel is drawn up, and the foot is immovable.

FIG. 264.



Dislocation of Tibia Forward—Foot Backward.

In accidents about the ankle, when a fracture of the tibia and fibula has occurred, with laceration of the internal and external lateral ligaments, a dislocation of the tibia forward may result from the contraction of the calf muscles.

Treatment.—This dislocation is in most instances quite readily reduced, but, according to my own experience, there is the greatest difficulty in keeping the parts *in situ*. This is more especially the case when there has been severe contusion and laceration, the tumefaction and ecchymosis rendering every touch insupportable. When in connection with this, as happened in a case of my own, the patient is of a rheumatic diathesis, and of a phlegmatic temperament, the treatment is often very unsatisfactory.

The leg should be flexed upon the thigh, and the foot extended, while pressure is made in front of the tibia. When the reduction has been effected, the leg should be placed in a fracture-box, with a foot-board at a slightly acute angle to the base of the box. The leg should be supported by cushions, and dilute arnica constantly applied. Side splints or carved splints, or those made of wire, afford satisfactory support and keep the foot in proper position.

Dislocation of the Lower End of the Tibia Backward—Dislocation of the Foot Forward.—This accident is rather rare, but the symptoms are well marked.

1. Foot lengthened.
2. Heel shortened, or obliterated.
3. Astragalus felt in front of the tibia.
4. Leg shortened.

5. Malleoli nearer the ground.

6. No space between the tendo Achillis and the posterior surface of the tibia.

In the majority of cases, this luxation as well as others near the ankle-joint is accompanied by fracture of either tibia or fibula, or both, in the vicinity of the malleoli.

Treatment.—The patient should be placed upon his back, thigh flexed on abdomen, and the leg placed at right angles with the thigh. Counter-extension is to be made by an assistant holding firmly the thigh in its position. The surgeon takes the foot in his hand and draws it gradually though firmly downward, at the same time carrying it backward to restore the astragalus to its proper position. A compress is placed on the heel and splints applied. Some surgeons, after reduction, place the limb over a double inclined plane.

DISLOCATIONS OF THE FOOT.

Dislocations of the tarsal bones are occasioned by great violence. The astragalus may be dislocated in several ways,—outward, inward, forward, and backward. Sometimes the bone is either partially or entirely rotated on its own axis, or it may be forced like a wedge between the tibia and the fibula.

Fig. 265 shows a dislocation of the astragalus outward, with inversion of the foot. If the bone is dislocated backward, the tibia is slightly thrown to the front, although there is not much alteration in the position of the foot.

FIG. 265.

Dislocation of Astragalus Outward.

Sometimes there is a shortening of the leg, but in most instances, the unusual prominence of the bone and the position of the foot are the main indications.

The prognosis in these dislocations is bad, gangrene often results, and amputation may be necessary. In other cases resection may be required.

Treatment.—To reduce forward dislocation, flex the leg at right angles with the thigh; an assistant grasps the thigh above the knee; a second extends forcibly the foot; the surgeon pressing the dislocated bone upward and backward. In the backward dislocation, the greatest difficulty is often experienced in effecting a reduction, and in some cases it has been found impossible. The foot must be extended, the leg being in the same position as above. The heel must be drawn forward and downward by the assistant, making the extension, and the surgeon pushes the bone forward and upward. In the outward and inward dislocations the extension and counter-extension are made in the same manner, the foot always being forcibly held in an opposite direction.

Dislocation of the os calcis and astragalus from the other bones of the tarsus may take place. The foot will then be turned inwards, as in talipes varus.

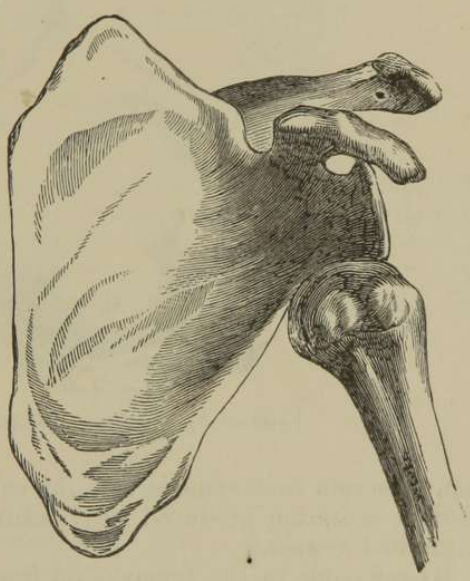
Reduction is easily effected by extension and direct pressure. The limb should then be supported by splints and bandages.

Dislocations of the toes, one from another, occur occasionally, and are with facility recognized and easily reduced by extension and counter-extension.

DISLOCATIONS OF THE UPPER EXTREMITY.

Dislocation of the Shoulder-Joint.—The humerus may be dislocated from the glenoid cavity in three directions: *downwards* into the axilla, also called the *subglenoid; forward* beneath the pectoral muscle, also receiving the names of *subcoracoid* and *subclavicular; backward* on the dorsum of the scapula, to which the term *subspinous* is also applied. In some cases we find that the humerus is pushed inward on the coracoid process. This is called the *subcoracoid.* I have met with one such case; the majority, however, of dislocations of the shoulder being the so-termed *downward luxations.* Violence, falls, blows, etc., applied to the superior extremity of the humerus, or falls upon the hand and elbow, are generally the causes of this dislocation, in which the scapular ligament is ruptured by violence—the long head of the biceps separated, the supra and infraspinatus, as well as the coraco-brachialis and subscapularis, all being involved to a greater or less degree. It is well to remember here the test of Dr. Dugas, of Georgia, who demonstrates that it is a mechanical impossibility, for any one suffering from either of the dislocations of the humerus, to *bring the elbow of the affected arm down to the thorax and place the fingers upon the sound shoulder.* The position of the bone is seen in Fig. 266, and the general appearance of the patient in Fig. 267, next page.

FIG. 266.



Dislocation of the Humerus Downward.

The symptoms are:

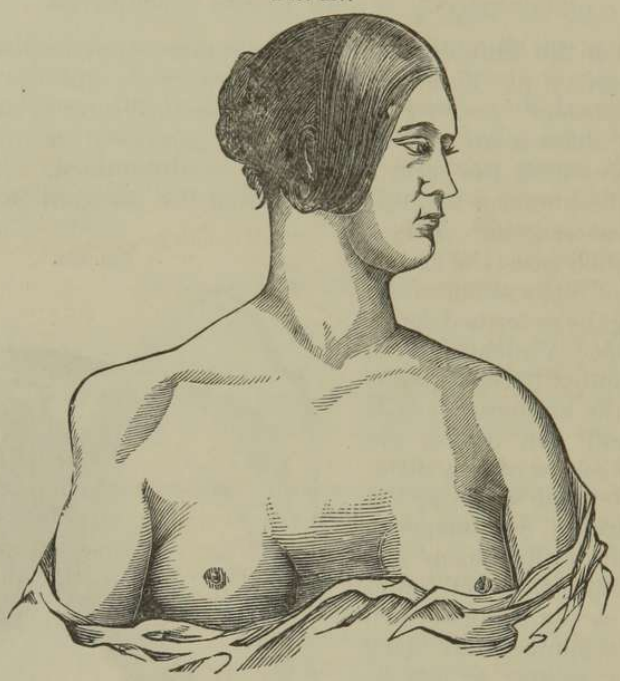
1. Depression beneath the acromion.
2. Flatness of the shoulder.
3. Slight depression at the point of insertion of the deltoid.
4. Arm somewhat lengthened.
5. Elbow stands off from the side of the thorax.
6. Patient supports the elbow and forearm of injured side with the hand of the opposite side.
7. If the elbow is moved off from the thorax, the head of the humerus is felt in the axilla.
8. There is a change in the axis of the humerus, it leading toward the axillary space, and not to the glenoid cavity.
9. Inability to bring the elbow to the side and place the fingers on the sound shoulder.
10. Inability to raise the hand to the head.
11. Rotation lost.

12. Forward and backward motion generally retained.

13. Considerable pain from pressure on the brachial plexus.

Added to these signs, it must not be forgotten, that at times on moving the limb a species of crepitus may be felt, which is occasioned by the effu-

FIG. 267.



External Appearance of Dislocation of Shoulder Downward.

sion of serum and synovia into the cellular tissue; it is not, however, that distinct sensation produced by fracture, and disappears for the time by continued motion.

By referring to the remarks on fracture of the acromion process of the scapula, the differential diagnosis between that injury and dislocation of the humerus downward into the axilla, will be found.

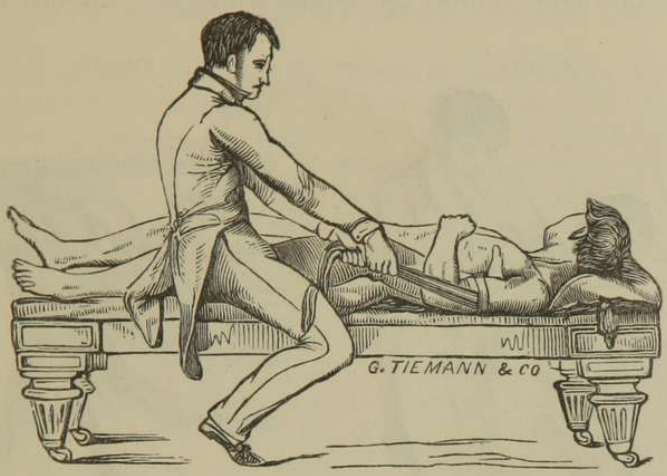
The diagnosis between fractures of the surgical neck of the humerus and the dislocation now under consideration, may be found chiefly in the absence of crepitus and the position of the elbow, which in fracture may be placed upon the thorax.

Treatment.—The treatment by manipulation is as follows: The patient should be seated in a chair, and, if there is very severe pain, an anæsthetic should be given. The surgeon flexes the forearm on the arm, and raises the latter to a right angle (or as nearly as possible to that position) with the chest; using now the forearm as a lever, the surgeon, having the wrist and elbow well in hand, depresses the hand and forearm, which causes forward rotation of the head of the humerus. Many dislocations may be thus reduced.

Extension.—The patient is placed upon his back, a ball or pad should be placed in the axilla, and the surgeon, sitting on the side of the couch, and facing the patient, places his unbooted heel upon the ball, and taking hold of the wrist and forearm, makes gradual and steady traction. If this does not effect reduction, a wet bandage may be applied to the arm, and over this a

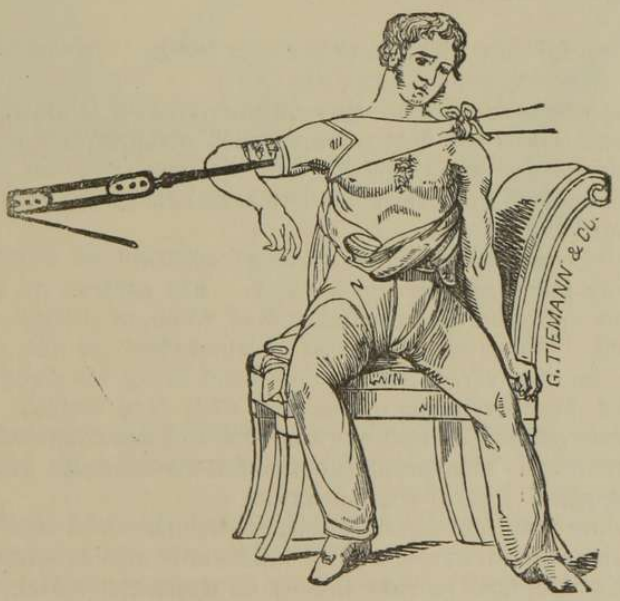
clove-hitch, to which an extending band must be applied, and one or more assistants draw steadily upon the arm (Fig. 268).

Fig. 268.



Another method is that which is seen in Fig. 269. The patient is seated in a chair, and a bandage passed around the upper portion of the thorax, having an opening through which the arm will pass. This band is tied over the sound shoulder, and given in charge to steady assistants. The wet roller and clove-hitch are then placed just above the elbow, and the

Fig. 269.

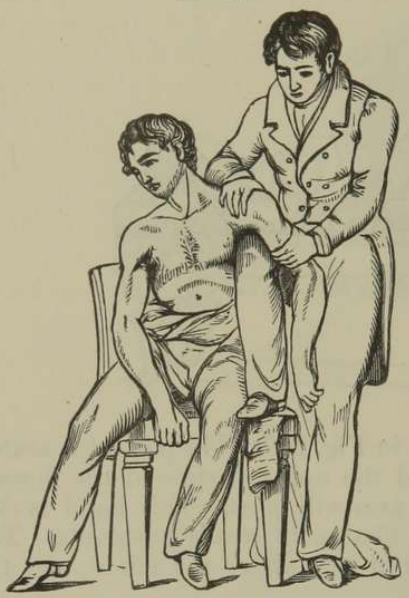


pulleys applied. After steady traction has been made for some minutes, the surgeon places his foot upon the chair and his knee in the axilla. The acromion must now be pressed downward and inward with the hand while pressure is made with the knee, by raising the heel. The head of the bone will often enter the glenoid cavity with quite a noisy report.

In most instances the pulleys are not necessary, and the bone may be

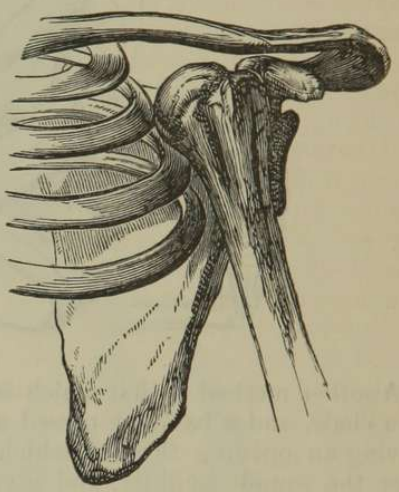
replaced in the following manner: The surgeon, having the patient in the same position as described in the last method, stands a little behind the patient, places his foot on the chair, his knee in the axilla, and fixing the scapula with one hand, rotates the humerus inward. In this method the

FIG. 270.



Sir Astley Cooper's Method of operating with the Knee in the Axilla.

FIG. 271.



Dislocation of the Humerus Forward.

knee acts as the fulcrum, the humerus as the lever. This method is known by the name of Sir Astley Cooper (Fig. 270).

The *vertical extension* method may be practiced as follows: The patient is laid upon the bed or the floor; the surgeon seats himself on the injured side of the patient and above the shoulder, he then forces the scapula down by pressure made with his heel or his hand, and raises the arm in a vertical direction toward the head.

M. Tillaux* gives an account of a case of subcoracoid dislocation of the shoulder taking place several times a day. The patient, æt. twenty-eight, was subject to epileptic fits; during one of these, occurring at night, he fell out of bed. When he recovered consciousness, at the end of about half an hour, he discovered that he could not bring his right elbow to the body, and that the movements of the arm were very limited. After some efforts, the arm resumed its position and function accompanied by a crackling in the shoulder. The same dislocation occurred again and again, ultimately taking place several times a day.

Generally, the luxation was involuntary, but he could produce it at will by bringing the arm outwards, a little backwards and upwards.

M. Tillaux proposes to remedy this by an apparatus which will place an obstacle in the way of the great abduction of the arm.

Dislocation of the Head of the Humerus Forward.—The symptoms are: 1. Depression beneath the acromion. 2. The head of the humerus forms a tumor below the clavicle (Fig. 271). 3. Slight shortening of the limb. 4. Axis outward and backward. 5. Elbow outward and backward. 6. In-

* Gazette des Hôpitaux, August 12th, Abstract Med. Science, vol. iii, No. xi.

ability to place hand on opposite shoulder while the elbow touches the front of the chest. 7. Forward and backward movements are much impeded.

Treatment.—In reducing this variety of dislocation, the same means may be employed as have already been mentioned for the axillary luxation, with this difference, however, that the extension must be made in a backward direction.

Dislocation of the Head of the Humerus Backward.—1. Depression under outer end of the acromion. 2. A protuberance on the dorsum of the scapula below the spine. 3. Rotation of the head of the bone in its new position by moving the arm. 4. A space between the coracoid process and the head of the humerus. 5. Arm and forearm carried in front of the chest. 6. Rotation of the humerus inward. 7. Inability to place the hand on the opposite shoulder while the elbow touches the front of the thorax.

Treatment.—The same methods are employed as have already been given, with the exception of the direction in which extension must be made. In the backward variety, the bone should be pulled downward and forward, while an assistant endeavors to push the head of the bone to its place. Sir Astley Cooper succeeded in reducing this dislocation by exactly the same methods as he employed for the axillary dislocation.

As a general rule, after a luxation of the shoulder has remained unreduced for twelve or fourteen weeks, attempts at reduction should not be made, although ancient dislocations have been reduced after having existed for a much longer period of time.

FIG. 272.

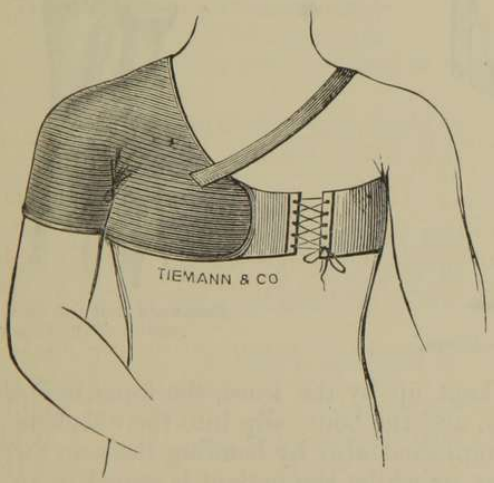


FIG. 273.

Partial dislocations of the humerus have been described by some authors. Sometimes also the long head of the biceps is removed from the bicipital groove. These are rare cases, and the symptoms of each particular case must indicate the method of reduction, instructions for which will be found in more extended treatises on dislocations.

Fig. 272 shows an instrument well adapted to prevent partial dislocation, or to be worn by those persons who appear predisposed to a recurrence of luxation.

Dislocation of the Elbow-Joint.—In dislocations of the elbow, both bones may be thrown *backward* or *laterally;* the ulna may be dislocated *backward*, and the radius *forward.*

The *backward dislocation* of both bones (Fig. 273) occurs most frequently, and is known—

1. By the protuberance on the posterior face of the joint.
2. Lower extremity of humerus forms a hard tumor in the forepart of the elbow joint.
3. A depression is found on each side of the olecranon process.
4. The forearm and hand are in a state of fixed supination.
5. Inability to flex the joint.

Treatment.—The patient is seated on a chair or stool; the surgeon places his foot upon the seat, bringing his knee in the bend of the elbow; taking hold of the wrist (Fig. 274), he bends the limb, at the same time pressing on the radius and ulna with his knee, so as to separate them from the humerus, and throw the coronoid process from the posterior fossa of this

Fig. 274.

Reduction with the Knee in the Bend of the Elbow.

Fig. 275.

Backward and Outward Dislocation of the Elbow.

bone. Whilst the pressure is kept up by the knee, the forearm is slowly and forcibly bent upon the arm, and the bones slip into their sockets.

This reduction may be accomplished also by bending the arm forcibly, but gradually, around a bedpost, or whilst the patient is seated in an arm-chair, passing the arm through the opening in the back or side, thus fixing the body and limb, and reducing the luxation by forcibly bending the fore-arm, with one hand placed upon the olecranon process to lift the bones into their places. The reduction having been accomplished, the forearm must be placed in a sling, the elbow bent at an obtuse angle, and supported with a splint.

Dislocation of both Bones Backward and Outward (Fig. 275) is known by the following symptoms.

1. Coronoid process is found resting upon the external condyle of the humerus.
2. Great projection of the ulna backward (being more marked than when both bones are thrown back).
3. The radius forms a hard tumor on the outer side of the joint behind the external condyle.

4. A depression is seen above the head of the bone.
5. By rotating the hand, the head of the radius is felt to move.

Dislocation of both Bones Backward and Inward.—The symptoms are easily recognized. They are—

1. Posterior projection of olecranon.
2. Head of the radius lies in the posterior fossa of the humerus.
3. The ulna rests behind the internal condyle.
4. The external condyle of the humerus forms a large tumor on the outer side.

Treatment.—In both these varieties of dislocation, the treatment may be conducted upon the same principles as those already mentioned for backward dislocation; the pressure being directed inward or outward, according to the lateral displacement.

Dislocation of the Ulna Backward.—This variety of dislocation is often quite difficult to diagnose. Its distinguishing features are—

1. The olecranon can be felt projecting behind the humerus.
2. Forearm cannot be extended.
3. Forearm cannot be flexed to more than a right angle.

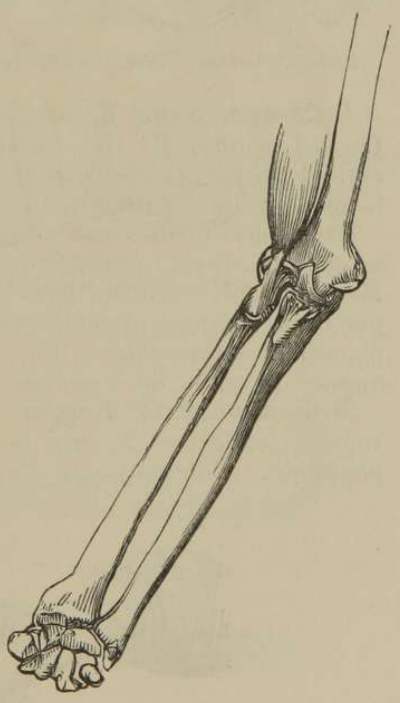
In this luxation, the chief marks are the contortion of the forearm and hand with the projection of the olecranon on the posterior face of the joint.

Treatment.—The surgeon grasps the wrist, places his knee in the bend of the arm (as already shown in Fig. 274, page 574), and drawing the forearm downward, the bone will slip into its socket.

Dislocation of the Radius Forward.—In this luxation, the head of the radius will occupy the hollow above the external condyle of the humerus (Fig. 276). The indications are—

1. Slight flexure of the forearm.
2. Inability to flex the forearm to a right angle.
3. When a sudden endeavor is made to flex the forearm on the arm, there is a sudden check.
4. Pronation of the hand.
5. The head of the radius may be felt by pressing the thumb in front and to the inside of the external condyle of the humerus.
6. By rotating the hand, the head of the radius moves also.

FIG. 276.



Forward Dislocation of the Radius.

Treatment.—The surgeon should make gradual and forcible extension, and, while so doing, should supinate the hand. With the thumb of the other hand, the head of the radius should be pressed down, and the arm placed in a sling.

Dislocation of the Head of the Radius Backward can be recognized by the partial loss of motion and the tumor formed by the head of the bone on the back of the external condyle. The *reduction* is effected on the same principles as the last-named dislocation.

Dislocation of the Carpus upon the Radius and Ulna.—This luxation may occur in two directions, backward and forward, and is occasioned by direct violence to the wrist.

The backward dislocation may be known—

1. Forearm is shortened when measured from the tip of the little finger to the olecranon.
2. Distance unchanged between olecranon and styloid process.
3. Prominence of carpus on the back of the forearm.
4. Prominence in front, caused by the projecting ends of radius and ulna.
5. Below the last-mentioned prominence is a depression.
6. Styloid processes are not on the same line as the carpal bones.
7. The wrist is thicker.
8. Fingers are semiflexed.

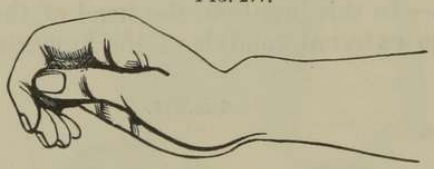
Treatment.—Extension is made at the wrist, and counter-extension at the forearm ; the surgeon then, with both thumbs, makes downward pressure on the carpus. Malgaigne prefers extension to be made at the fingers, by means of a band fastened around the metacarpus. In compound dislocations, amputation or resection may be required.

DISLOCATION OF THE CARPAL BONES FORWARD.

In this luxation the carpus is thrown forward on the anterior face of the radius—Fig. 277.

The symptoms and methods of reduction are the reverse of those last described. The appearance is well shown in the cut.

FIG. 277.



Dislocation of the Carpal Bones Forward.

Sprains about the wrist, from severe falls, sometimes assume the appearance of dislocation of the bones, but may be distinguished from it by there being but one swelling in sprain, and that having come on gradually ; also the relative position of the styloid processes of the radius and ulna with the carpus is unaltered in sprains.

Dislocation of the Ulna from the Radius at the wrist occurs oftener than the last mentioned. It is easily recognized by the altered position of the styloid process, the projection of the ulna above the level of the os cuneiforme, and the twisting of the hand.

Treatment in this case consists in replacing the end of the ulna by extension and direct pressure on the end of the bone, confining it there by means of splints on the back and forepart of the wrist and forearm, and placing a compress upon the end of the bone (which has a tendency to displacement, on account of the rupture of the ligament). A roller is then applied to retain the compress and splints.

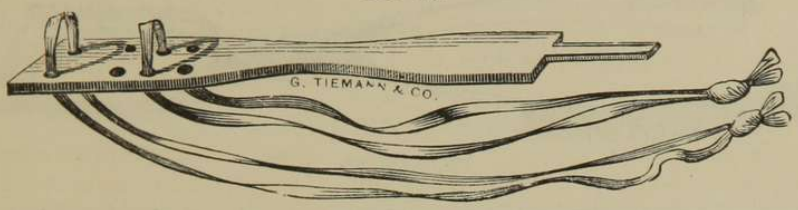
Dislocation of the Fingers.—The fingers may be dislocated at their various articulations, though more frequently between the first and second phalanges. The nature of the injury is apparent, and may be reduced by

FIG. 278.

extension (Fig. 278), made by the hand alone, with a bandage or tape applied by a clove-hitch.

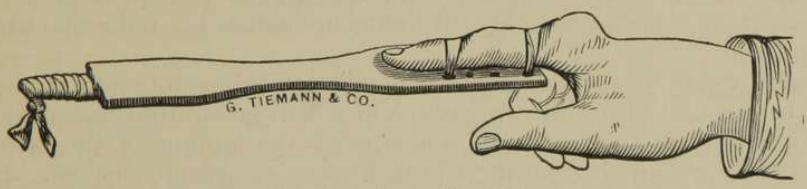
But a much more convenient apparatus is that of Dr. Levis (Fig. 279), which consists of "a thin strip of hard wood, about ten inches in length, and one inch, or rather more, in width. One end of the piece is perforated

FIG. 279.



with six or eight holes. The opposite end is cut away, forming a projecting pin, and leaving a shoulder on each side of it. Towards this end of the strip a sort of handle shape is given to it, so as to insure a secure grasp to the operator. Two pieces of strong tape or other material about one yard in length are prepared. One of these is passed through the holes at the end of the strip, leaving a loop on one side. The other tape is passed

FIG. 280.

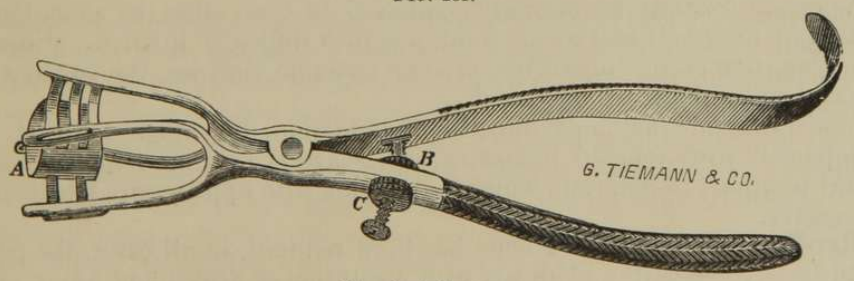


Levis's instrument applied.

through another pair of holes, according as it may be a thumb or finger to which it is to be applied, or varied to suit the length of the finger, leaving a similar loop. If a dislocated thumb is to be acted on, the second tapes should be passed through the holes nearest the first. The ends of each separate tape are then tied together."

Fig. 280 shows this instrument applied to the forefinger, though it is especially adapted for the thumb.

FIG. 281.

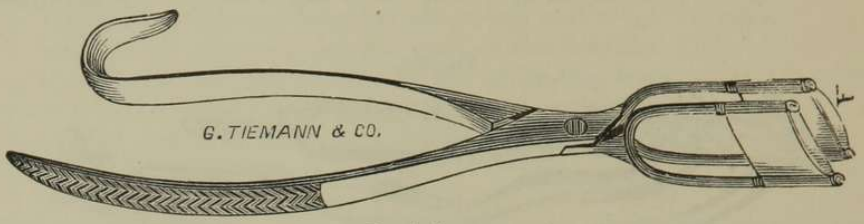


Charrier's forceps.

Fig. 281 shows Charrier's forceps used to reduce dislocations of the phalanges.

Fig. 282 represents Luer's, for the same purpose.

Fig. 282.



Luer's forceps.

Dislocation of the Thumb.—Luxation of the thumb backward on the dorsum of the metacarpal bone often takes place. Less frequently in the opposite direction.

The accident, though easily recognized, is difficult of management.

Treatment.—A clove-hitch, or the apparatus of Levis just described, should be placed upon the first phalanx, and continued extension employed. Strong and steady flexion must be made towards the palm of the hand, and, at the same time, firm pressure applied by the thumb of the surgeon upon the head of the bone. By these means the reduction is often accomplished. The luxation, however, is sometimes so unyielding as to require the subcutaneous section of one or both lateral ligaments before the reduction can be accomplished.

Before division of the ligaments is made, the following mode of action should be resorted to in difficult cases, and it will generally succeed, as one of the greatest obstructions to the reduction is the lapping of the extremities of the bones, which from their form become completely locked. Soak the hand in warm water; apply a piece of wet leather around the thumb, and over this a clove-hitch of strong tape. In dislocation upwards, a loop of tape embraces the upper end of the phalanx, and is drawn with great force, by an assistant, perpendicularly upwards. Another loop of tape embraces the lower end of the metacarpal bone, and is drawn downwards by another assistant. Whilst the extremities of the bones are by these means unlocked, the surgeon draws the thumb, by the clove-hitch, towards the palm of the hand, and the bone usually slips into its normal position.

The *metacarpal bones* are seldom luxated, except from extraordinary violence, the consequences of which, for the most part, are more serious than the dislocation.

The *carpal bones* being strongly connected to each other by short ligaments, and by a ball and socket joint, are with difficulty luxated. Either from relaxation of the ligaments, or from extreme violence, the cuneiform bone and os magnum are displaced.

These latter are not only difficult of reduction, but when reduced, if accompanied with relaxed ligaments, can scarcely ever be kept in their natural position; to maintain which, bandaging with appropriate treatment is necessary.

After-Treatment.—After a bone has been reduced, in all cases, the part should be covered with a cloth wet with a solution of arnica and water, and a bandage applied in such a manner as to prevent motion. In dislocation of the larger joints this rest must be maintained for days, and then motion gradually resumed. It is my custom, always after such reduction, to administer to the patient a dose of rhus tox. every three or four hours.

CHAPTER XXIX.

INJURIES AND DISEASES OF THE SPINE.

Concussion of the Spine, including "Railway Concussion"—Nervous Shock.

Concussion of the Spine is produced by the ordinary accidents of civil or military life; in the former, horseback exercise, gymnastics, falls, and especially railway collisions; in the latter, by blows from muskets, falling from horses, falling trees, blows from blunt instruments, etc. Dr. Otis* relates seventy-nine cases of this character, of which he says: "A few proved fatal from fracture or luxation, or from peritonitis, and in one instance, from the complication of small-pox."

It is an especially noticeable fact, that slight injuries of the spine, I mean those of apparently so trivial a nature that they may be forgotten by the patient, often produce the most serious ultimate results, and that the period which elapses between the receipt of such injury and the development of ulterior disease, varies from weeks to months and even years. But a few years since a great deal was said and written by the profession on injuries of the spine caused by railway accidents, and to the disease the name of "*railway spine*" was given. Careful observation, experience, and inquiry at the present time, show that the symptoms of this so-called "*new disease*" are nothing more nor less than those observable after any great and violent concussion of the spine and shock to the nervous system. It can readily be understood that in a railway accident, besides the actual force with which the person is thrown about, and the actual injury to the column, there is in addition the horror, the fright, the terrible apprehension, which stirs the entire nervous system to its very foundations. Then, again, there is a constant "vibration," or as it has been termed "*vibratory shock*," which may tear into splinters the car, and radiates to every fibre of the human body. The ordinary peculiarities of *concussion*, and may I not add in some cases *contusion* of the spine, which need careful attention are, first, the absence of evidence (external) of any injury of the column; the patient is aware that there has been a wrench, or a blow, or a twist, but there need not necessarily be a bruise or an ecchymosed spot; the patient in the majority of cases may be able to go about his ordinary business, with occasionally a stiff or sore feeling; after a time, however, the symptoms of paralysis of the parts supplied with nerves from the seat of the injury supervene. The symptoms are progressive and gradual, lasting with variations from months to years. Finally the sphincters become affected, a gradual decay of the entire body takes place, and death results. Again a severe injury to the back may produce an inflammation of the meninges of the cord, which will ultimately affect the brain itself.

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* Medical and Surgical History of the War of the Rebellion, vol. ii, part i, p. 426.

Dr. Purple reports a most remarkable case,* quoted also by Erichsen, in which a man was struck on the back of the head and shoulders by the bough of a tree which he was cutting; this was followed by such complete anæsthesia of the lower limbs that both his thighs were amputated without the slightest pain. Again, an injury to the spine may be communicated by a fall on the vertex. Generally, paralysis follows these cases, it may be hemiplegic or paraplegic, but is mostly of a fatal character. In patients who are paralyzed immediately the symptoms are, according to Mr. Erichsen: "1. A diminution or loss of motor power. 2. Rigidity and spasm of muscles. 3. Diminution or loss of sensation. 4. Perversion of sensation. 5. Loss of control over the sphincters. 6. Modification of the temperature of the limb." Besides these symptoms there may be also hæmaturia and intestinal hæmorrhage, hiccough, hypermetropia, impairment of the sexual functions, molecular changes in the cord itself, impairment of memory, myelitis, neuralgia, and a host of other affections of most serious import.

One very important peculiarity of shock and concussion of the spine is thus most forcibly laid down by Mr. Erichsen.† He says: "These symptoms of spinal concussion seldom occur when a serious injury has been inflicted on one of the limbs, unless the spine itself has at the same time been severely and directly struck. A person who, by any of the accidents of civil life, meets with an injury, by which one of the limbs is fractured or is dislocated, necessarily sustains a very severe shock; but it is a very rare thing indeed to find that the spinal cord or the brain has been injuriously injured by this shock that has been impressed on the body. It would appear as if the violence of the shock had expended itself in the production of the fracture or of the dislocation, and that a jar of the more delicate nervous structures is thus avoided. . . . . How the jars, shakes, shocks, or concussions of the spinal cord directly influence its action, I cannot say with certainty. We do not know how it is, that when a magnet is struck a heavy blow with a hammer, the magnetic force is jarred, shaken, or concussed out of the horseshoe. But we know that it is so, and that the iron has lost its magnetic power. So, if the spine is badly jarred, shaken, or concussed by a blow or shock of any kind communicated to the body, we find that the nervous force is, to a certain extent, shaken out of the man, and that he has some way lost nerve power."

Treatment.—The main feature in this treatment is *rest.* Dr. S. Weir Mitchell,‡ of Philadelphia, has given the profession some most valuable suggestions on the importance of rest in all forms of nervous disorders. I have known the great importance of this method of treatment for years; in fact I never have been an advocate for "early getting up" after any medical or surgical disease, nor have I been as prodigal in my advice "to go out and exercise in the open air" as many of my professional brethren. It is a mistake in the practice of medicine, it is a mistake in the practice of surgery to urge on the patient to exercise. It is like overloading a dyspeptic stomach with strong food, it does great harm. Rest after injury of the spine must be absolute, and must be prolonged; it is the factor in the cure, and is a most difficult thing to accomplish, because in many cases the injury appears so trifling that patients cannot understand what disastrous results may follow. *Arnica* internally, and *applications* of the same in solution to the spine will generally be of great service.

Frictions do harm. I am convinced of the fact from actual experience.

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* Eve's Surgical Cases, p. 90.

† On Concussion of the Spine, Nervous Shocks, p. 156.

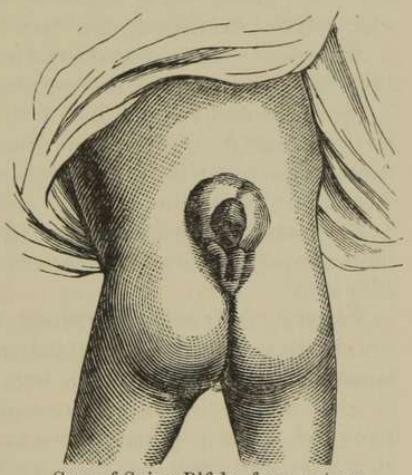
‡ Rest in Nervous Diseases. Blood and Fat, and How to Make Them.

The muscles must be rested and support taken away from the column. For such the plaster jacket, put on by an experienced hand, would no doubt accomplish much. I have never as yet had an opportunity of trying it, but would do so if a proper case were to present. When the secondary symptoms begin to manifest themselves, aconite, belladonna, phosphorus, nux vomica, strychnia, cicuta, plumbum, rhus tox, veratrum, cantharides, hyoscyamus, Calabar bean, chloral hydrate, opium, and camphor, should be used according to the presenting symptoms.

Spina Bifida—Cleft Spine.—This affection or deformity of the vertebral column consists essentially in an arrest of development of some portion of the bones of the spine, through which the membranes of the cord protrude; indeed, it may be said to be a hernia of the spinal cord. The affection is congenital, and very often it is accompanied by other deformities. In twenty-seven cases, twelve were found uncomplicated with any other deformity; in eleven there was incontinence of urine and fæces; paralysis of the lower extremities existed in four; hydrocephalus accompanied four others; nævus two, and talipes one. Of these cases, the lumbar region was the site of thirteen; there were four in the lumbo-sacral region, and nine in the sacral. These specifications approximate a correct estimate of the location and complications of the affection.

In some cases the integument is perfect at birth and afterwards ulcerates, showing the protrusion of the membranes or the cord itself. In other cases, at birth, nothing but a membrane appears to cover the parts. Fig. 283, taken from a photograph, represents a case which lately occurred in the practice of my friend, Dr. J. J. Youlin, of Jersey City, and of which he has kindly furnished me a description. The case gives an example of those met with. At birth, the child had in the lumbar region a dark-colored spot, having somewhat the appearance of a bedsore, at the base of which a thin membrane was seen. Upon pressure, the membrane was found to possess considerable elasticity. This membrane became more dense as the tumor developed itself, which rapidly advanced from the cleft, always retaining its dark color and elasticity. It likewise was moist. As it continued to increase, it divided into two parts, as seen in the figure, the lower being the larger. In the centre of the upper part a small orifice soon made its appearance, from which jets of arachnoid fluid were ejected during coughing, sneezing, crying, or any rapid movement of the body. The child lived six weeks and died in convulsions.

FIG. 283.



Case of Spina Bifida, from nature.

Treatment.—In most cases of cleft spine, death results early, but there are instances of recovery, and also cases in which the patients have reached adult life. Hamilton records a case of the latter kind coming under his own observation.* In ten cases coming under my supervision six died of convulsions in six to ten weeks. One was operated on by injection, and lived two years, the others survived from one to three years.

* Principles and Practice of Surgery, p. 454.

The first care should be to protect the tumor from injury. An excellent method of so doing is with a framework of wire filled with soft cotton-wool. In other instances, cotton applied and kept in position with a bandage answers well, the parts having been previously well painted with collodion. It must be borne in mind that a moderate amount of pressure is sometimes serviceable, and therefore the band securing the cotton may be drawn with moderate tightness around the protrusion. Tapping the sac and drawing off the fluid (the smallest-sized needle of the aspirator being used) I have also practiced, and as I have stated successfully. The proceeding is often, however, followed by convulsions and death. Gradual constriction of the neck of the sac, when there is but a slight pedicle, may also be tried. In the effort to draw off the fluid the puncture should be made at the side of the tumor, in order to avoid the spinal cord, and the whole amount of fluid should never be drawn off at once. If *injection* be used, after the partial evacuation, iodine, five or six drops to the drachm of water, may be employed, the strength of the injection being increased if sufficient inflammation is not excited.

Brainerd's injection, which has been successful, is composed of five grains of iodine, fifteen of iodide of potassium, and an ounce of water. Finally, immediate removal with the écraseur has been tried.

M. Mouchet has operated upon spina bifida with success by the elastic ligature,* puncturing the sac in one case before applying the ligature, and in another by immediately applying the ligature without previous puncture. Six cases have been reported as treated by this method, of which three succeeded, one failed, and two died.

Another case is reported by Dr. Baldassare, in which compression with the elastic ligature, lasting sixteen days, was successful.†

In two cases I have had a moderate degree of success by Brainerd's injection, that is, the lives of the children have been prolonged; both, however, ultimately died. In two other cases, death followed in a day or two after the evacuation of the fluid with the aspirator.

At best, the results of all these methods have not been favorable, but they are worth trial, as occasionally a case has been cured by their employment.

Rotary Lateral Curvature of the Spine—Scoliosis.—This affection, which appears to be rapidly on the increase in our midst, especially in large cities and among the wealthy and luxurious, is much more frequent in girls than in boys, and commences in a most insidious manner. Patients have informed me that they are certain the affection must have appeared in a very few days, because while "trying on a dress," or changing clothes, or bathing, the deformity was suddenly recognized, it having progressed for a considerable time without being discovered.

Lateral curvature is produced by a want of harmony in the many antagonistic muscles which are attached to the different portions of the spine. There is no disease of the internal organs; in fact, there is no disease anywhere. One set of muscles—from bad positions, contracted at school or at home, bad positions in bed, bad positions at table, bad positions in riding and walking—become weakened; while the other set acting, perhaps, more forcibly, draw the spine to one side.

There is a very great variation in the degree of this deformity, but great

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* Month. Abs. of Med. Sciences, October, 1876; Obstetrical Journal of Great Britain.

† Medical Times and Gazette, August 25th, 1877.

or small, there are two curvatures, the one balancing, as it were the other, the higher equalizing the lower portion of the column.

I have noticed great regularity and precision in the course of these curvatures. Examining the lumbar curve, the column is bent from its base to the left side in the great majority of cases, making the concavity to the right, then following the general rule, the dorsal curve is deflected to the right, having the concavity on the left side.

Patients suffering from lateral curvature seem more "dumpy" in their bodies, their arms are lengthened, there is a clumsiness about the waist, the hip is elevated and seems of greater size than its fellow, there appears to be a convergence of the ribs, as they pass from the vertebral column they expand and enlarge the intercostal spaces. The right shoulder is elevated and appears bulging and projecting backward; and, in some instances, the whole chest appears as though it were twisted entirely around. By passing the finger along the spinous processes, a certain amount of deformity can be recognized, but it must be borne in mind *that the spinous processes incline to the concave side of each curve*, giving the appearance of a tolerably straight column, so far as the tips of the spinous processes are concerned, whereas the bodies of the vertebræ are drawn far away in the lateral displacement, in other words rotated.

This condition may be readily explained. If we examine carefully the muscular and ligamentous attachments of the spinal column, it will be seen that the anterior portion of the bodies of the vertebræ are almost entirely free from such connections, while the spinous processes and the posterior portion of the bones are much more firmly fixed in the median line by these symmetrical supports. This fact was recognized, and as far as I am aware, first pointed out by Dr. A. B. Judson,* who attributes the rotation observed in cases of lateral curvature of the spine to the peculiarities above noticed. He states also that it is not the disparity of action of a *single muscle*, or even of sets of muscles, by which the rotation is produced, but to the combined action of all.

This most reasonable explanation would in a measure regulate somewhat the application of mechanical contrivances, and although difficulty will always be found in getting the direct pressure upon the bodies of the vertebræ, still a general support of the sides of the chest and thorax aids somewhat, if not entirely, in restoring the rotated bodies, or at least of preventing further motion in that direction. Dr. Sayre recommends for this reason the plaster jacket in rotatory lateral curvature.

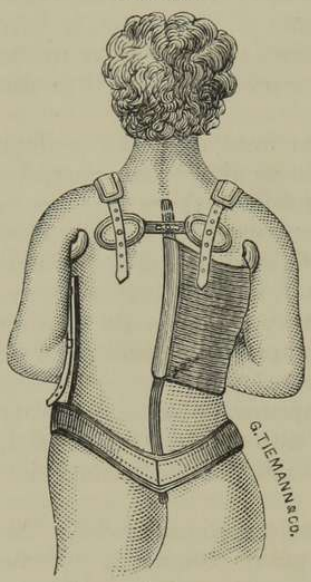
Treatment.—As there is no disease existing in lateral curvature, there need be no medicines given internally. If noticed early, the cases may be cured by proper gymnastic exercises, tending to bring strength to those muscles at fault. Dr. Roth, in the *British Journal of Homœopathy*, and Dr. C. F. Taylor, in the *North American Journal*, have described very minutely the exercises tending to such a result. The postures of the children must be rectified; they should be removed from school, and allowed exercise in the open air. Riding, walking, rowing (not boating), all should be practiced. Frictions of alcohol and salt, or whisky and water, should be briskly rubbed upon the spinal column, over the affected parts night and morning. The diet should receive the most minute attention. All unwholesome food, such as cakes, pastry, candies, etc., being strictly forbidden. A proper position in bed enjoined, a low pillow only being allowed.

Daily calisthenics are of great service, and the "movement cure," under

* Medical Record, April 22d, 1876.

the direction of judicious specialists, should be resorted to. In the later stages of the disease, appropriate supports are often beneficial, although they are often objectionable from the pressure and inconvenience to which they give rise. Of all the methods I have used, I prefer thus far the apparatus of Mr. Barwell, as modified by Dr. Sayre. I have made some excellent cures with it. At present, however, the application of the plaster of paris jacket, as described in the next article, is said to supersede all others.

FIG. 284.



Tiemann's Apparatus.

In some obstinate cases, section of the latissimus dorsi muscle must be resorted to. It was first performed by Prof. Lewis A. Sayre, in 1876.* The muscle was divided subcutaneously, with the effect of straightening the patient almost upon the instant, so far as the lateral curvature was concerned, the angle of the ribs upon the opposite side being about the only deformity left. The pain of the operation was trifling, and, by means of a suitable apparatus of bands and elastic straps, the body was afterwards retained in a perfectly straight position.

Angular Curvature of the Spine—Caries of the Spine—Pott's Disease, Spondylitis.—Dr. Sayre† objects to the term Pott's disease, and prefers the word *spondylitis* as being more applicable to the etiology, course, and termination of the disease.

Above it was remarked that in lateral curvature no distinct disease existed, but that the deformity of the column was occasioned by a lack of equalizing power of the muscles on each side of the vertebræ; not so, however, is it in angular curvature, a distinct disease being the cause of the deformity.

Pott's disease is usually developed in scrofulous children, its immediate cause being, in the majority of cases, some local injury; in other instances, no local origin can be found, and a slight protuberance in the line of the spinal column is the first indication of the approaching disease. It is said that, in the majority of instances, the affection commences in the intervertebral substance, the inflammation extending itself to the bodies of the vertebræ, which become carious and crumble, causing the head and trunk to fall forward and the posterior portions of the vertebræ to protrude.

In the earlier stages of the disease, and especially when the lumbar vertebræ are affected, there is a lateral curvature, together with the forward deviation. This fact must be remembered in making a diagnosis in the early stage of the affection, as an error at this period would probably be the source of disastrous results.

There are always some presenting symptoms, generally however obscure, before the "knuckle" is seen; these manifestations being of a nervous character and occasioned by irritation of the lateral portions of the vertebræ near the foramina giving passage to the spinal nerves. If the disease appears in the cervical region, there is cough and some difficulty of breathing; if in the dorsal, a catch in the breath and an inability to take full

* N. Y. Medical Record, January 22d, 1876.

† Medical News and Library, vol. xxxvi, p. 49.

respiration ; if in the lumbar, there are colicky pains, constipation, etc.: all these symptoms, together with the pallor and emaciation which belong to those children afflicted with Pott's disease, generally suggest that the patient is suffering from some verminous affection.

An important point also, as suggested by Dr. Lee, is this, that pressure downward on the spinous processes in many cases *does not* produce pain, but squeezing the sides of the thorax together in order to force the heads of the ribs upon their articular facets, will give rise to more or less suffering. In fact, if the patient is on the face in a recumbent posture, *pressure on the spinous processes may relieve rather than aggravate the pain.*

When it is necessary to examine a patient with Pott's disease, he may be suspended by an assistant holding him under the arms, or may be laid upon the lap, having the arms hanging over one knee and the legs over the other. By then separating gradually the knees, traction is made on the column and the patient will breathe better, and perhaps the "knuckle" will not be so well marked.

When a child affected with angular curvature attempts to walk, the tendency of the head is forward and there is a loss of the proper equilibrium, to remedy which the patient, as he slides carefully along, having a great liability to trip, places his hands upon the thighs. This position is also assumed when standing. There is likewise a backward inclination of the head and a tendency to carry the body back. By the continuation of these motions the angle also is carried back and the "humped-back" becomes more conspicuous.

When the affection is seated in the dorsal region, the whole thorax participates in the deformity ; its antero-posterior diameter is increased, and the sternum protrudes greatly, and the well-known "chicken breast" is produced.

After a time, a spinal abscess sometimes results, which increases the difficulties.

In many instances, however, even after the formation and evacuation of pus, solidification of the vertebræ takes place, and the patient recovers, with a deformity to be sure, but with good health. Many strong and sturdy humped-backed men are seen on the streets pursuing their daily avocations, and apparently in the enjoyment of unimpaired health.

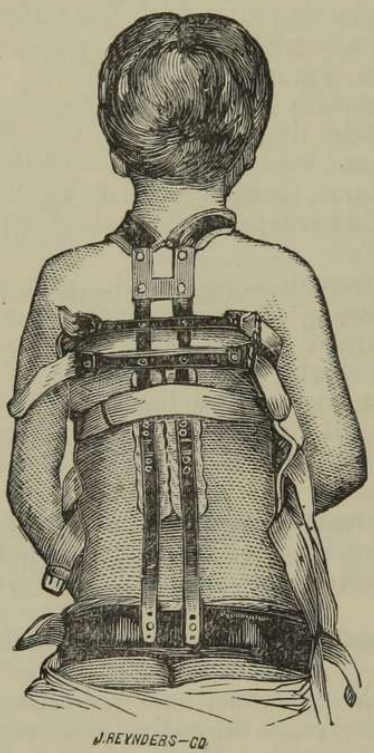
Treatment.—In the early stages of the disease, a great deal can be done by medication, by diet and rest. The great *desideratum* is to take the superincumbent weight off the diseased bone, and the best method to accomplish this is rest in the horizontal posture. This rest must be absolute and prolonged, and during it the patient steadily given proper medicine. Those which have proved very efficacious in my hands are especially silicea 30, asafœtida 30, mezereum 3, and calcarea 30. These I give in trituration, a powder every night. Great attention must be given during this period, to the bathing and diet of the child. The latter is often found especially difficult, as children affected with these diseases are generally much petted and spoiled, and are given cakes, sweetmeats and candies, without discretion and without judgment.

In the mechanical treatment of Pott's disease, I have been more successful with the brace of Dr. C. F. Taylor (Fig. 285) than any other. I have used also with very good success the plaster of paris jacket of Dr. Sayre, but have not had sufficient personal experience with it to exclude other methods, which Dr. Sayre has done. One thing is certain. It can be applied in any location. It costs nothing, I mean when compared to the other costly apparatus devised for the treatment of this disease, and the results

that have been recorded by Dr. Sayre and others in this country and in Europe bid fair to make it yet the apparatus for this deformity. It is to be applied as follows, according to Dr. Sayre's own directions:*

"When you wish to apply a jacket, the patient is to be suspended by means of an apparatus prepared for the purpose, consisting of a curved iron bar with hooks at either end, from which pass straps that are attached to pads, that go through the axillæ and also under the occiput and chin, and are capable of being made shorter or longer, according to the length of the patient's neck. The iron bar is suspended from the ceiling by means of a compound pulley, through which gradual extension can be made until the patient is drawn up so that the feet swing clear from the floor.

FIG. 285.



"Previous to the suspension, however, a thin flexible leaden strip should be laid upon the spinous processes for the entire length of the spinal column, and bent into all the sinuosities, so that it may take a perfect outline of the deformity. This strip is then laid upon paper and its outline marked with ink, and we have a perfect mathematical outline of the irregularities along the spinal column. After the patient has been suspended, the same leaden strip should again be applied along the spinous processes, as in the first instance, and another pattern made upon paper by the side of the first.

"Now we have a means by which comparison can be made, and we are able to determine exactly what changes have taken place in the curve. The shirt, which should be woven or knit without seams, and tightly fitting the body, is next pulled down, and an opening made in front and rear, through which a ribbon or piece of bandage is passed for the purpose of holding in place a handkerchief placed in the perinæum, and at the same time making the shirt fit the hips exactly; for the tighter the shirt fits, the less number of wrinkles there will be in it. The roller bandages, previously prepared, are now set on end in a vessel containing sufficient depth of water to cover them entirely, and, at first, bubbles of gas will escape through the water freely. When the bubbles cease to escape, the bandages are ready for use. Then taking a roller in the hand, and squeezing it gently so as to remove all surplus water, commence just around the smallest part of the body, going to the crest of the ilium and a little below it, and lay it around the body smoothly, but do not draw upon it at all; simply unroll the bandage with one hand while the other follows and brings it into smooth close contact with all the irregularities of the surface, over the ilium and dipping into the groin, over the abdomen and dipping into the groin again, and so on, from below upwards in a spiral direction until the entire trunk has been inclosed from the pelvis to the axillæ. After one or two thicknesses of

* Report on Pott's Disease, or Caries of the Spine; treated by extension and the plaster of paris bandage. By Lewis A. Sayre. 1877.

bandage have been laid around the body in the manner described, narrow strips of perforated tin are placed parallel with each other upon either side of the spine, from two to three inches apart, and in numbers sufficient to surround the body, and another plaster-roller carried around the body, covering them, in the manner in which the first bandage was applied.

"These few strips strengthen the bandage, and obviate the necessity of increasing its weight by the application of a larger amount of plaster. If there are any very prominent spinous processes, which at the same time may have become inflamed, in consequence of pressure produced by instruments previously worn, or from lying in bed, it is well to guard such places by means of little pads of cotton or cloth, or little glove fingers filled with wool which is elastic, which are to be placed upon either side of them before applying the bandage.

"Another suggestion, which I have found to be of practical value, is to take two or three thicknesses of roller bandage three or four inches long, and place them over the anterior superior spinous process of each ilium. These little pads are to be removed just before the plaster has completely set, and consequently leave the bony part free from pressure after the soft parts have shrunken under the influence of the continued pressure produced by the plaster dressing. It is also well, just before the plaster has set completely, to place one hand in front of the ilium and the other over the buttocks, and squeeze the cast together so as to increase this space over the bony prominences. In a very short time the plaster becomes set sufficiently so that the patient can be removed from the suspending apparatus, and laid upon the face or back on an air bed, where they are to remain until the hardening process is complete. A hair mattress answers a very good purpose, but the air bed is preferable, especially if there is much projection of the spinous processes or the sternum.

"If there are any abscesses present, they must be freely opened at the most dependent part, and their contents completely extracted by means of the wide rubber cupping-glass. Sometimes large masses of sloughing connective tissue will be found, which look like wads of wet cotton; all these must be removed. After the abscesses have been thoroughly evacuated, oakum should be placed over the opening, and then covered with a piece of oil-silk, before the shirt is pulled down over the body. A hole is then cut in the shirt, which is to indicate the size of the fenestrum subsequently to be cut in the plaster jacket, and in it is set a folded piece of pasteboard of the same size, and carrying a long, sharp pin thrust through its outermost leaf. Now each turn of the bandage can be carried over the pin without crowding it into the abscess below, and you also have a guide in making an opening that shall lead directly to it. When the plaster has nearly set, you can take hold of the pin, and cut around it until the pasteboard is reached, and an opening made sufficiently large to allow of its easy removal. The pasteboard removed, you come at once upon the oil-silk, which is to be starred, or cut from the centre into strips, so that when they are reversed, they will cover the edges of the opening in the plaster, where they can be glued down with gum-shellac, and now you have left a fenestrum for drainage that leads directly to the abscess."

When the disease attacks the cervical vertebræ, Dr. Sayre applies what he calls a "jury-mast," which suspends the head. This appliance is seen in Fig. 286, and is held firmly in place by the "plaster-jacket." It is applied after the body has been encased by the application of the bandage twice; it is then laid over and secured by repeated turns of the roller several times up and down the chest. In Taylor's splint the pressure is

made on the chin and the prominent vertebræ, thus lifting the weight from the diseased bodies. (Fig. 287.)

Fig. 286.

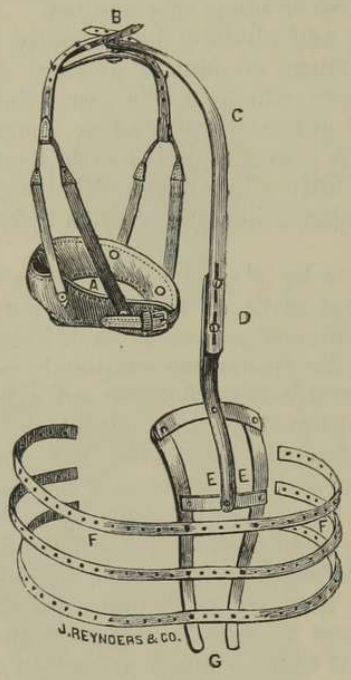
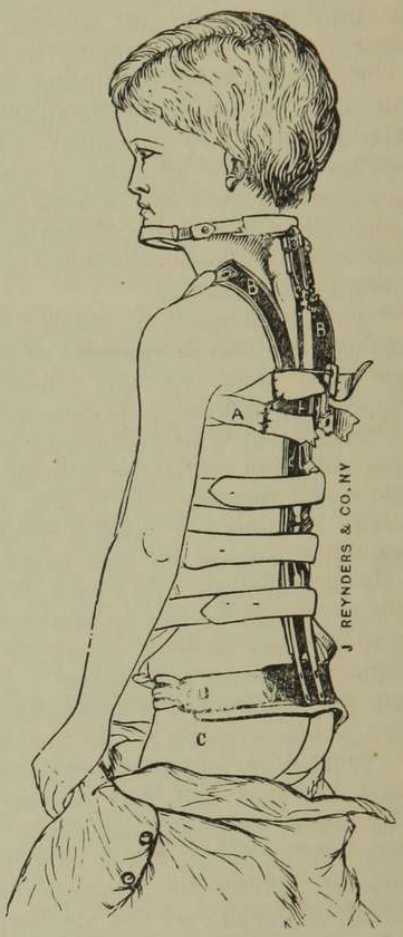


Fig. 287.



Another contrivance, which has been productive of satisfactory results, is that of S. A. Darrach, of Orange. Fig. 288 shows the wheel-crutch and chair, and it will be seen how the weight is taken entirely from the spinal column, while free exercise is allowed to other parts of the body. I have known most excellent effects from this crutch, in connection with the body-brace. This corset is made of hide prepared in a peculiar manner, and readily moulds itself to the parts. In the hands of the inventor this apparatus is a success.

Dr. Franklin makes, with a plaster bandage around the ilia, what he denominates an artificial sacrum, for a support to the upper dressings. He also has introduced a modification of the jury-mast, to give a firmer support to the entire dressing.

The student here must, however, be cautioned against forgetting, while in admiration of these newer methods, that there are other ways in which these deformities are cured. Rest,

Fig. 288.

Darrach's Wheel-Crutch and Chair.

homœopathic medication, the proper exercise of certain muscles, and proper braces, will cure the disease, and have so done, long before these admirable plaster contrivances came into general use. It must be also remembered that distinguished and successful specialists, by means of their own contrivances, are constantly producing good results.

The term *kyphosis* is given to a general antero-posterior curve, which is noticed in weakly children and in the aged. It is also occasioned in infants by allowing them to sit up too early. This can also be cured by the plaster of paris jacket.

Lordosis, or "*saddle-back*," is generally produced by congenital dislocation of the hip. It must be considered as a secondary affection. It will easily be seen that in the dislocation of the hip there is a backward displacement of the centre of gravity, which makes the forward inclination of the pelvis necessary to establish the equilibrium. In this variety the cause must be removed, the endeavor being made to reduce and fix in position the displaced bone, or if anchylosis exist, performing subcutaneous osteotomy at the neck of the thigh.

Psoas or Lumbar Abscess.—This disease is, in most instances, of a chronic nature, the collection of pus being very gradual. Instances, however, may occur in which the affection is acute, the matter making its appearance in a short time after the premonitory symptoms have been noticed by the patient.

The first manifestations of the disease do not, in many cases, receive sufficient attention, and are allowed to pass unnoticed, until the disorder is far advanced and the danger too proximate to escape attention. In the incipient stage, the patients are unable to walk with their usual facility, there is a degree of uneasiness experienced about the lumbar region, but there is little very acute pain; rigors are frequently present, the patients also being unable to use any violent exercise. As the disease advances, the testicle of the affected side is drawn up, and there is more or less pain extending along the course of the spermatic cord. Glandular enlargement takes place in the groin, and there is a slight protrusion noticed at that part; the swelling then appears on the inner side of the femoral vessels, beneath the pubic portion of the fascia lata. The precursory symptoms may continue several months, before rigors, loss of appetite, hectic and other symptoms which denote profuse suppuration, are developed. Mr. Cooper remarks: "The abscess sometimes forms a swelling above Poupart's ligament, sometimes below it, and frequently the matter glides under the fascia of the thigh; occasionally it makes its way through the sacro-ischiatic foramen, and assumes rather the appearance of a fistula in ano. When the matter gravitates into the thigh, beneath the fascia, Mr. Hunter would have termed it a disease *in*, not *of*, the part."

The swelling is more prominent in the erect position, and is also increased by exertion of the abdominal muscles; an impulse is also imparted to it when coughing. As the suppuration continues, fluctuation is perceived, generally in some portion of the groin, but large and neglected collections of pus may make their way towards the surface in two or three directions. Lumbar abscess most frequently arises from disease of the vertebræ, but, says a distinguished surgeon, "It must be confessed that we can hardly ever know the existence of the disorder, before the tumor, by presenting itself externally, leads us to such information."

The pus discharged from a lumbar abscess is generally thin, gleety, and mixed with cheesy flocculi, or with a curdlike substance; in some rare instances, however, the matter has been found to be laudable.

From post-mortem examinations made on patients who have died from this affection, we learn that the purulent secretion is completely inclosed

in a cyst, which is often very extensive. If the contents of such abscesses were not circumscribed by such boundaries, the pus would spread rapidly among the cells of the surrounding cellular texture, as does the water in anasarca. The cysts are lined with the pyogenic membrane, that, as has been before mentioned, appears to possess the property of secretion ; indeed, during the treatment of lumbar abscess, it is wonderful to observe the immense quantity of pus that is discharged.

This disease is often attributable to a sprain or wrench of the loins, or is induced by exposure to cold and overfatigue. Occasionally the mischief is confined entirely to the soft parts ; although the vertebræ, a portion of the os innominatum, or the sacrum, may be denuded and of irrregular surface, evidently the result of the pressure of the abscess. A strong example of this and of the extensive destruction of parts, which this affection sometimes produces, may be briefly stated. A very large lumbar abscess formed within a few weeks, in consequence of great and continued fatigue and exposure to bad weather. At first it had been trifled with. At last it was opened, in the usual situation in the thigh, and a large quantity of matter evacuated. Thirty-six hours afterwards the patient was suffocated with a flow of purulent matter into and through the air-passages. On dissection, the cavity was found to be a large opening through the diaphragm into the adherent lung, and communicating with the bronchi. The forepart of the lumbar vertebræ were exposed, and in some instances stripped of the theca ; but there were no cavities in the bone, and no disease of the interposed cartilages. Such cases are now and then met with, of abscess in the loins, not originating in any vice, either of the bones or of any other part of the apparatus of the spinal column. Most frequently, however, the collections have their foundation in disease of the bodies of the vertebræ.

The causes of this complaint are generally very obscure. It is most prevalent among the lower classes of society, who are scantily clothed and fed, and exposed to vicissitudes of weather, and extreme fatigue and other hardships. Individuals affected with scrofula are most obnoxious to the disease, and it is said to be more prevalent in Europe than on this continent. Dr. Gibson* thus writes : " I have seen only four cases of the disease during the last thirteen years, although professionally connected with extensive hospitals and almshouses during the greater part of the time."

Dr. Physick also stated, he never met with a case of psoas abscess in America, unconnected with disease of the spine.

In the *treatment* of lumbar abscess, the prognosis is always unfavorable ; the radical cure of the affection can scarcely be effected, even when the patient applies for relief at the earlier stages of the disease, which in far the greater majority of instances is not the case, because the pain in the loins, and other premonitory symptoms, are attributed to some other cause.

The following medicines, although they may not effect a cure of the disease, will greatly alleviate the sufferings of the patient ; indeed, there have been cases in which, by the careful administration of medicine, the abscess has been partially healed, and there is every reason to believe, that if the diagnosis is formed correctly, at an early period of the affection, a cure may be reasonably anticipated.

The medicines chiefly to be used are, ars., asaf., aur., calc. c., hepar., lyc., merc., mez., phosph. ac., silic., sulph.

Arsenicum is indicated in the first stages, when there is painful stiffness in the small of the back, or bruised sensation, with inability to walk as easily as usual,

* Institutes and Practice of Surgery, vol. i, p. 214.

with burning pain around the sacrum; or if, after the pus has been, or is being evacuated, there is great prostration, shivering, brown tongue, hot dry skin, constant unquenchable thirst, the secreted matter being thin and bloody, or consisting of a fetid ichor.

Asafœtida is called for particularly, when the abscess arises from diseases of the bones, when there is tearing in the lumbar region, or tensive sticking pains, which are aggravated by moving the body; when the pus is transparent and thin, or ichorous and fetid; when the skin is *cold* and dry, and the patients are scrofulous, with disposition to rachitis.

Aurum may be used, when there is pressure and pain in the lumbar region and os innominatum, when the pains in these parts are particularly aggravated at night, and when the patient has been formerly subjected to large doses of mercury; when the pus is thick, yellowish, and contains cheesy flocculi.

Calcarea carb. should be administered, when the disease arises from curvature or ramollissement of the vertebræ, with constant aching pain in the lumbar region, with stiffness of the whole spinal column, and heaviness of the limbs with inability to move them; when there is profuse discharge of pus, and the cavity shows no disposition to heal.

Hepar sulph., when the suppuration is profuse, and the skin surrounding the abscess presents an unhealthy appearance; excessive fever at night, at which time the pains are aggravated; tired sensation in the lumbar region, or violent pain in the small of the back, as though it would break or were being cut through.

Lycopodium is indicated by stiffness and aching in the small of the back, the patient being unable to maintain the erect posture; or when there is chilliness in the lumbar region, with large swelling of the psoas muscle and much heaviness and uneasiness of the lower extremities.

Mezereum, when there are dull, pulsative pains in the lumbar region, or drawing and aching extending to the groin, with intolerable burning pains, which are aggravated at night; when the periosteum of the vertebræ is affected and the abscess discharges a yellowish pus; excesssive failing of strength.

Phosph. ac, when there is smarting and burning in the abscess, with bruised sensation over the whole person, excessive prostration, with irregular pulse, profuse debilitating nightsweats, with intense pain in the lumbar region.

Staphisagria should be employed when there is reason to believe that the disease arises from caries of the bones or curvature of the spine; when there are burning or tearing pains.

If there are unhealthy granulations and disposition in the abscess to spread, silicea may prove beneficial. The treatment, in many cases, may be commenced with the administration of sulph., which will prove serviceable as an antipsoric.

There is frequently some difficulty in diagnosing a lumbar abscess, as it often points very readily at that region where an inguinal hernia would protrude; however, by carefully examining the patient, and inquiring particularly into the history of the case, the error of mistaking the one disease for the other may be avoided. In opening a lumbar abscess, the method recommended by Abernethy* should be resorted to. As the disease is chronic, and the matter has been secreting for some time, it must not be forgotten that the evacuation of a large quantity of pus at one time might be productive of serious consequences.

CHAPTER XXX.

EXCISIONS OF BONES AND JOINTS.

General Remarks.—Conservative surgery is one of the most interesting fields of science. The *vis medicatrix naturæ*, when not interfered with, is

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* See Chapter on Abscess.

an extraordinary power. Nature restores what man would ofttimes destroy; nature converts into a living structure, parts of the human body which man would reject as worthless.

Excision of articular surfaces and of bones in their continuity, form an important part of conservative surgery, and the results which are daily obtained by these operations continue to verify their importance. Like all other improvements in science a long period of time elapsed before resections came into general favor, and though here and there an operation was successfully performed, surgeons, until recently, did not consider conservative operations among the legitimate and systematized proceedings of the art.

It was proved by Boucher, in 1753, that wounds of considerable severity entering into a joint might be treated by simply removing the fragments of bone. In 1740, Thomas resected the head of the humerus in a child four years old, particulars of which may be found in Guthrie's work on Gunshot Wounds, page 215. White made an incision at the upper part of the humerus, dislocated and removed its upper part, which was carious; the patient lost only about two ounces of blood during the operation, and in five weeks the boy had so far recovered as to be able to lift a heavy weight. At two months quite a piece of the remaining bone separated and was removed, after which the wound healed, the patient being perfectly cured in four months. The arm was shortened only about one inch. It is worthy of remark that neither splints, bandages, or the like were used. Gooch reports that he sawed off the heads of the tibia, the fibula, and the radius, and also the second bone of the thumb. A somewhat similar operation is reported to have been performed on a girl at the hip-joint. Syme made a flap in the shape of a V, and then brought out the head of the humerus and removed it. Walther was the first to demonstrate upon the dead subject the practicability of removing the scapula; and in a case where a tumor had become attached to this bone, it was excised with success by Haymann. Park wishing to know if he could remove the knee without cutting into the popliteal vessels made various experiments on the cadaver. An incision was made from about two inches above the patella to the same distance below, another across this, just above the patella, extending nearly half around the limb. The two lower angles were now dissected up and the knee-cap removed, after which the upper angles were raised, so as to lay bare the condyles of the femur and to allow a small catling to be passed back of the bone, just in their rear. The condyles were then sawn off. The head of the tibia was then removed, as was also a considerable part of the capsular ligament. On examination it was found that the vessels had incurred little danger during the operation. Excision was next performed at the elbow. An incision was made from about two inches above, to the same distance below, the olecranon. It was at first attempted to divide the lateral ligaments, but as it proved very difficult, the olecranon was removed; the joint was now dislocated with ease, and the lower end of the humerus sawn off, together with the heads of the ulna and radius. This, however, is more difficult to perform when the parts are diseased. Park first performed this operation on a living subject in 1781. It gave him great trouble in the after-treatment, abscesses and sinuses forming, obliging the patient to keep his bed nine or ten weeks, the cure being completed some months after. The patient, in time, went to sea, and was able to do his duty quite well. The same surgeon soon after performed this operation again, but the patient did not live four months after it.

Moreau, Jr., thought that two flaps are needed in excision of the elbow, and that it is unnecessary to remove the olecranon unless it be diseased.

In our own country a great impetus has been given to resection, by the successful removal of almost every bone in the body. The clavicle and scapula, the maxillary bones, the hip, knee, wrist, and ankle joints, all have been excised by American surgeons, the importance and success of the operations being unsurpassed by any in the world. The names of the distinguished men who have achieved triumphs in this field, are too numerous to mention, but they have won laurels which will never fade, and their names everywhere are honored and respected.

Dr. Deadrick, of Tennessee, in 1810, removed half of the inferior maxillary, and Charles McCreary, of Kentucky, 1813, exsected the entire clavicle. Dr. Mott, in 1828, performed the same difficult operation, and Dr. Franklin, in 1862, removed the sternal two-thirds of the bone. McClellan, Stevens, Carnochan, Wood, and Rogers, also performed resections of the upper and lower jaws. Butt, of Virginia, resected the radius in 1825; while Pancoast, Gross, Mütter, Blackman, Ackley, Stone, Hamilton, Buck, and others, are all equally entitled to elevated positions in this field of surgery.

The *conditions* which call for resection of bones and joints generally are caries and necrosis, extensive injuries and malignant disease, and the operations are only to be resorted to when all other means have failed. Then the question arises between amputation and resection. In every case where there is a probability of saving the patient a limb, though it be stiff, resection should have the preference.

The instruments for excision of bones are varied, and consist, first, of the ordinary knives for making flesh-wounds. Metallic retractors to hold the soft parts away from the osseous, and strong bone forceps, used either to hold and lift away bone, or to divide the osseous structures.

FIG. 289.

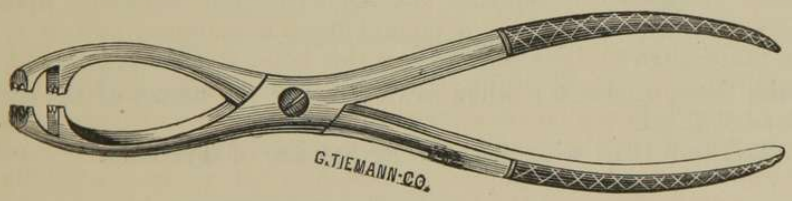


Fig. 289, shows a modification of Fergusson's Lion-jawed Forceps.

FIG. 290.

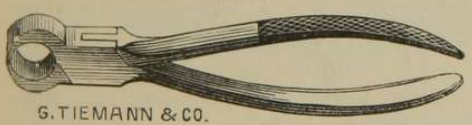


FIG. 291.

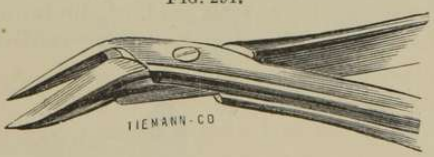
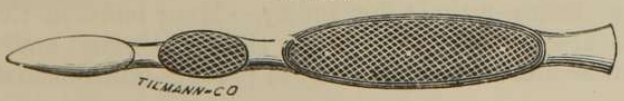


FIG. 292.

Bone-cutters are of different shapes. Fig. 290, shows Satterlee's Bone Forceps. Fig. 291, Liston's Bone Forceps, knee-curve. Fig. 292, Liston's Forceps, curved on the flat.

These forceps are of various sizes, some large, and with long handles, to give powerful leverage when great force is required.

FIG. 293.



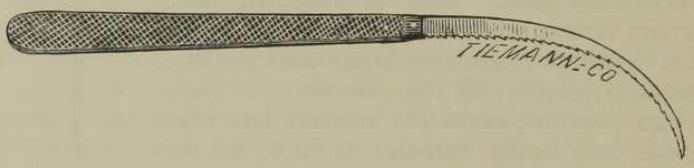
Blunt instruments are also used to denude the bone of muscles and periosteum. Fig. 293 represents Sand's interosseous knife, and Fig. 294 the instrument of Dr. Sayre for the removal of the periosteum.

FIG. 294.

Sayre's Periosteotome.

The saws used are of various shapes and sizes. Fig. 295 is curved and made expressly for the maxilla.

FIG. 295.



Maxilla Saw.

Fig. 296, a narrow, fine-toothed saw, introduced by Dr. Lente, and is very useful when working in a limited space.

FIG. 296.

Lente's Interosseous Saw.

Besides these, there are other saws bearing the names of the surgeons who devised them.

Fig. 297, chain-saw with the rotating handles of Tiemann.

FIG. 297.

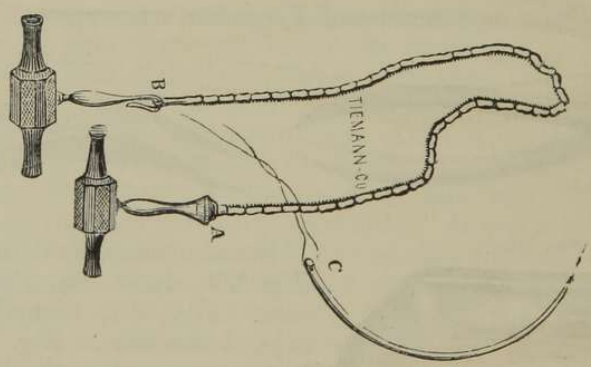


Fig. 298 shows an instrument devised for carrying the chain-saw.

Professor Hamilton has invented a bone-cutter with strong serrated jaws for dividing bone (Fig. 299), and also a pair of bone-forceps (Fig. 300), which are well adapted to the uses for which they are employed.

Resection of Bones in their Continuity.—Many bones of the body, from injury or from disease, can be resected in their continuity, and thus the surrounding parts be preserved sufficiently to prevent much deformity. When,

in such cases, the periosteum can be protected, which should always be the endeavor of the surgeon, the bone may be almost entirely reproduced. There are no operations which have shown more success than those introduced by modern conservative surgery, and none which ought to be more acceptable to the public. In olden times where the loss of an entire limb, or a terrible operation about the mouth, was considered absolutely necessary for the preservation of life, it is now certain that diseased portions of bone may be sawed out or cut away, and the ossific structures reproduced. Dr. Von Tagen mentions a case where in fifteen months the entire lower jaw was produced.* The operation was performed by Dr. William Hunt, of Philadelphia.

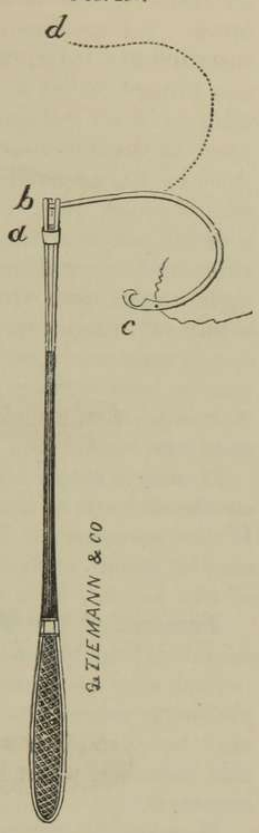
Dr. John C. Minor reports a similar case.†

In the same paper, Dr. Von Tagen relates a very interesting case of resection of the left superior maxilla in its continuity, which was progressing well when his paper went to press.

Sometimes bones, or portions of bone, may be removed by subcutaneous incisions, and when such can be accomplished it saves the unsightliness of a scar.

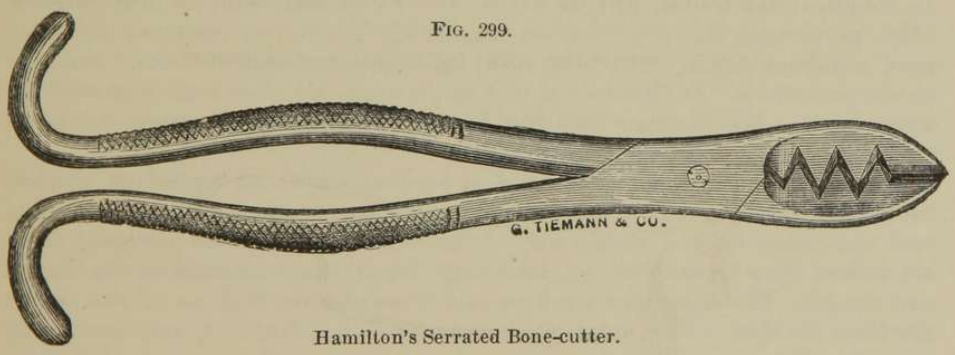
Excision of the Bones of the Hand.—*Case.*—A man presented himself at the clinic with the following history: Many years ago while using an axe he severely bruised the palm of his hand. Intense inflammation followed, with severe pain; suppuration ensued, and the pus was allowed to find exit

Fig. 298.



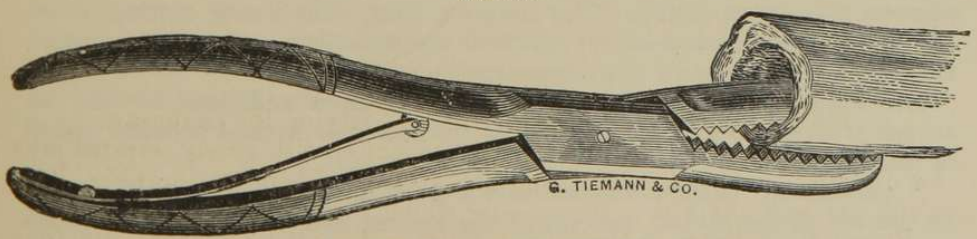
Instrument for carrying Chain-saw.

Fig. 299.



Hamilton's Serrated Bone-cutter.

Fig. 300.



Hamilton's Bone Forceps (half size).

* United States Medical and Surgical Journal, vol. i, p. 333.
† The Medical Union, vol. i, No. 1, p. 6.

for itself, which it did after a considerable time, on the dorsum of the hand. No professional advice was sought for many months. A probe revealed the roughened surfaces of the middle and ring metacarpals. He was placed under anæsthetic influence; the arm and hand pronated on the table, and an incision made on the dorsum of the hand, of V-shape; the apex at the wrist and the ends of each of the diverging cuts terminating at the knuckle of each of the diseased bones. This incision was merely carried through the integument and fascia, which were dissected up. The muscles and tendons were separated with a blunt periosteotome, and held aside with retractors. Each bone was then divided with the pliers held at right angles with the shaft. The cutting pliers were then relinquished for a pair of lion-jawed forceps, with which each extremity of the bones was raised separately and dissected away. The flap was brought down, there was no hæmorrhage; the lips of the wound were united with silver sutures. A compress wet with calendula and water was the only dressing, and the cure was complete.

If *only a single* metacarpal bone is to be exsected, *a longitudinal incision* on the dorsum of the hand over the course of the bone is all that is required. If the metacarpal bone of the thumb is to be removed, the thumb must also be taken with it, as has been mentioned in amputation of that portion of the hand. It is inexpedient to resort to resection of the phalanges.

Excision of the Wrist.—The diseases which most frequently call for removal of the radio-carpal articulation, the carpus and metacarpal joints (which also are comprised in excision of the wrist) are synovitis and caries, the latter especially, as well as gunshot and other injuries. The operation may be *partial*, in which but portions of the diseased bones are removed, and *complete*, when the entire joint and bones entering therein have to be removed.

Moreau, the younger, is said to have performed the operation of excision of the wrist, and other European surgeons have occasionally resorted to it. In England the revival of it is due to Mr. Fergusson, who, on August 16th, 1851, performed it. On October 9th, 1852, Mr. Simon operated on a lad aged nineteen years. On May 21st, 1853, the same surgeon had recourse to the procedure. In October of the same year, Mr. Erichsen removed the wrist joint. Mr. Butcher and Mr. Liston have also given great attention to the subject.

The operation may be performed in several ways; an excellent method being the following: Two longitudinal incisions are made, one on the radial and the other on the ulnar side of the wrist on its dorsal surface; these are united by a transverse cut, avoiding the extensor tendons of the fingers and thumb. The supinator tendons and the extensor tendons of the carpus are then divided. The joint must next be flexed forcibly, and cautiously opened. The operator carefully selects the uncut tendons, and having drawn them to one side, places them in charge of an assistant, who protects them from injury. The surgeon, then, with a saw, cutting pliers, or the chain-saw, successively divides the articular ends of the radius, the carpal, and bases of the metacarpal bones.

Mr. Fergusson believed a single *ulnar incision* sufficient for the removal of the bones, but it appears to me that this method is better suited to partial excision.

A curvilinear incision also answers a good purpose. The knife should be entered at the styloid process of the radius, and be carried downward across the back of the joint, and around up to the styloid process of the ulna. The extensor tendons of the thumb and fingers on the ulnar side

must be avoided, the supinator tendons and extensor carpi divided, and the joint entered as before.

Lister's method is excellent, and is as follows: The radial incision is made on the dorsal aspect of that bone to avoid the tendons of the extensor ossis metacarpi pollicis, and the extensor secundi internodii. The bones are removed as before. When the bones have been separated, the wound must be thoroughly cleansed with a stream of warm water, and then sprayed over with carbolic acid water, the first centesimal dilution, 1 to 100. The hand then should be laid upon a carved splint, similar to Bond's, with a protuberance at the end over which the fingers may be bent. The thumb should be moved daily, and soon pronation and supination be resorted to. Gentle passive motion of the fingers is made in a few days after the operation. The parts must be kept constantly moist with calendula solution.

Excision of the Bones of the Forearm.—Portions of the radius and the ulna have been removed by different surgeons, leaving, in some instances, little deformity. When the radius is to be exsected, the incision should be made on the posterior and outer aspect of the bone, the structures carefully separated, and the bone then divided in its middle. This greatly facilitates the operation. By seizing then one of the divided ends with the lion forceps, it can be raised and taken away, the knife always being kept close to the bone. The ulna is removed in like manner, excepting the incision is made on the inside of the arm. The brachial artery may be compressed, but neither the radial or the ulnar will be touched in the majority of cases if a moderate amount of care be used in the dissection.

In *removal of the olecranon*, a V-shaped incision is made, the flap dissected up and the saw applied.

Excision of the Elbow.—Excision of the elbow-joint is a standard operation of conservative surgery, and the success which has attended its performance, together with the usefulness of the limb which often remains after the operation, are sufficient inducements for the judicious surgeon to attempt the proceeding.

Before describing the operation, let us look a little into the anatomy of the parts concerned. Three bones enter into the formation of the elbow; and the joint is a compound one, a ginglymoid and a diarthrodial. On the anterior face of the humerus are two muscles, which connect the forearm with the arm. One of these, the biceps, is inserted into the tuberosity of the radius; the other, the brachialis anticus, is fixed to the lower portion of the coronoid process of the ulna. If we draw a line from the outer side of the axillary space between the folds of the axilla to a point or depression midway between the condyles of the humerus (which depression marks the boundary between the inner border of the coraco-brachialis and biceps), we have the direct course of the brachial artery, which is comparatively quite superficial in front of the joint, before its bifurcation. These structures, which we have mentioned, being in front, are in a measure out of harm's way. But there is yet a point in the surgical anatomy of this joint to which I desire to particularly call attention. It is the course of the ulnar nerve, which comes from the inner cord of the brachial plexus, and lies on the inner side of the artery. From this course it diverges, pierces the intermuscular septum, and winding around, passes into the groove between the internal condyle of the humerus and the olecranon process of the ulna. It is necessary to preserve this nerve from injury, during the operation.

There are a variety of methods recommended for resecting the elbow-joint; but the truth is, as in all surgical operations, the size of the flaps and their number, and the direction of the incisions, are to be influenced by the circumstances attendant upon each particular case. Perhaps the

single straight incision is, as Druitt says, the best theoretically. Moreau preferred the H incision, as does also Professor Hamilton, of New York; although the position of the patient (on his belly), as recommended by the former surgeon, I conceive to be inadmissible on account of the danger from the full and prolonged anæsthesia. Manne made two semilunar incisions, and Roux recommended the cut to be made in the shape of the letter T.

Resection by the *single long incision*, as recommended by many distinguished surgeons, appears to have been performed in London about the same time by Mr. Paget, Mr. Fergusson, and Mr. Erichsen; and it appears that considerable time and thought were expended on the merits of the operation before its introduction. The H incision was made first; then it was discovered that the long cut on the radial side of the arm could be omitted, thus the incision was converted into the T-shaped. It is said that Langenbeck showed that the cross cut could also be omitted, thus leaving the single linear incision. I have practiced the H incision, although an excellent method is the V-shaped cut, the apex of which should terminate above the olecranon. (Fig. 301.) The flap must then be dissected down, the triceps detached, and the parts having been held aside, the saw may be applied in such manner as to divide the olecranon at its base, and the radius at its neck (Fig. 302). The condyles of the humerus are then exposed, the ulnar nerve sought after and put aside from the condyle, and the soft parts being well protected, the diseased portions removed with the saw.

In the following operation the reverse of the preceding was practiced:

J. T., aged 42, suffered from caries and necrosis of the elbow-joint of many years' duration. The patient was placed on the table so that his arm

FIG. 301.

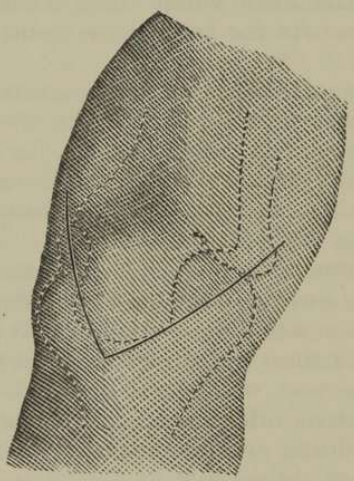
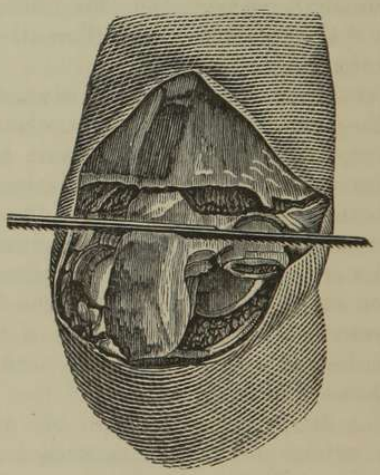


FIG. 302.



projected over the edge, his shoulders were elevated, and the anæsthetic administered. I began by making a straight incision, commencing four inches above the joint, and prolonging the same four inches below, carrying the scalpel directly through the tissues down to the bone, opening in its course the fistulous orifice. Keeping the edge of the knife to the bone, I separated the tissues, and introducing the index finger of my left hand into the lower extremity of the joint, found the head of the radius, loosened the same from its connection, and pushed it through the wound. The retractor

was then placed under the head of the bone, which was removed by means of the saw. Next I proceeded to remove the condyles of the humerus. It was found necessary to prolong the incision upward, on account of the disease extending far up the shaft of the arm-bone. The tissues were very much diseased and infiltrated with pus, and a transverse incision was made across the joint, about two inches in length, at right angles with the first. After the tissues had been separated, I inserted my finger into the angle of the wound, and distinctly felt the ulnar nerve lying in its groove; this I pushed over the process, and the lower extremity of the humerus being disengaged, was sawn off. The third step was the removal of the olecranon, which I took off with the chain saw; and after having drawn the wound together with interrupted suture, placed the arm on a pillow, dressed it with the calendula lotion, and fixed it in a splint bent at an obtuse angle.

After the joint has been resected, it should be flexed at an obtuse angle, and an anterior splint of rubber, tin, or felt applied, which may be strapped above and below the joint, thereby giving free access to the wound, and allowing the escape of effete discharges. The cut surfaces are to be treated on general principles.

It may, in some instances, be a matter of consideration, whether excision of the joint or amputation should be resorted to. It appears to me that if disease has affected the lower portion of the condyles of the humerus, leaving some healthy bone above for the attachment of the flexors and pronators, the extensors and supinators, exsection of the diseased mass should certainly be practiced.

If the whole of the olecranon be involved, together with the sigmoid notches, and even a part of the coronoid process, leaving, however, a healthy point for the insertion of the anterior brachial muscle, the limb may be saved. If, together with this, the head and neck of the radius be implicated, leaving the tubercle for the attachment of the biceps, exsection is the remedy. But if, on the contrary, both condyles of the humerus and the ridges leading to them, together with the shaft of the bone itself, the coronoid process of the ulna, and the tubercle of the radius and body of the bones be in a state of disorganization, nothing but amputation can be resorted to with a reasonable hope of success.

According to statistics of Erichsen, of the University College Hospital, the results, after exsections of the elbow, are far more favorable than those after amputation.

According to the Surgeon-General's Circular, No. 6, of 315 cases of excision of the elbow, practiced for gunshot injuries, in 16 amputation was necessary, and 62 cases terminated fatally, making an average mortality of 21.67 per cent., which is somewhat greater than that resulting from amputation.

Fig. 303, drawn from one of my cases three days after operation, shows the carious olecranon, B, with head of radius, C, united thereto by bony deposits. This was quite a troublesome case, on account of extensive infiltration of the soft parts.

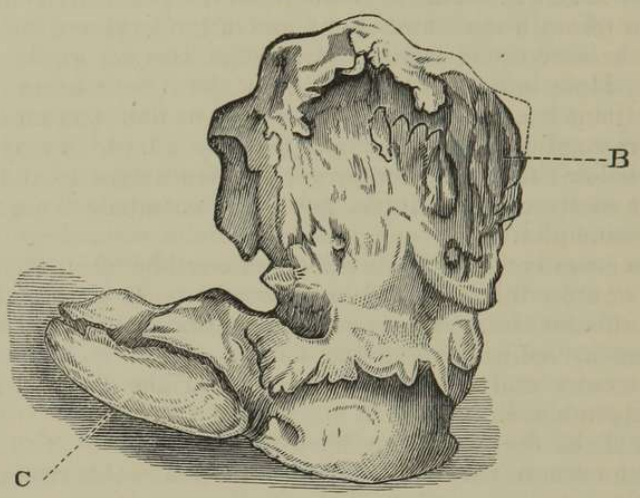
Dr. H. J. Bigelow,* to avoid cutting the fascia and muscles which unite the arm to the forearm, excises the elbow-joint by the longitudinal incision, first excising the head of the ulna, then the articulating surface of the humerus, leaving the condyles, if not diseased, by sawing immediately

* Monthly Abstract of Medical Science, June, 1876; Boston Medical and Surgical Journal, March 30th, 1876.

below them from each side upwards and inwards, and last of all removing the head of the radius.

Excision of the Humerus in its Continuity.—In some instances from caries or gunshot injury it may be necessary to remove a portion of the shaft of the humerus. Before performing the operation it is well to bear in mind that there is scarely any likelihood of bony union taking place, and that even if a small portion of the bone is removed new union will

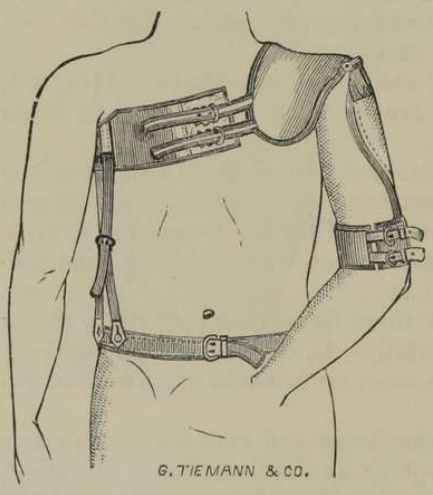
Fig. 303.



Carious Olecranon and Head of Radius, from Author's collection.

probably result, although there are cases upon record in which such fortunate results have taken place. A case has come under my own observation in which at least three inches of the shaft of the humerus was excised. There was no attempt made to bring the ends of the bone together. The arm was laid upon a pillow, and the wound allowed to heal. So soon as the parts had well united, by a shoulder brace, with two small steel rods passing to a band which was secured just above the elbow, as seen in Fig. 304, the patient had considerable motion of the arm and perfect use of the forearm and hand. There was scarcely a noticeable deformity. Therefore, when there is disease of the shaft of the bone to that degree that amputation would otherwise have to be resorted to, the removal of the shaft and the application of the proper instrument would be the preferable procedure, giving moderate motion at the shoulder and the use of the elbow and hand.

Fig. 304.



The incision, a straight one, as many inches in length as may be desired, should be made on the outside of the arm down to the bone, and the tissues removed by careful dissection with blunt instruments and occasional

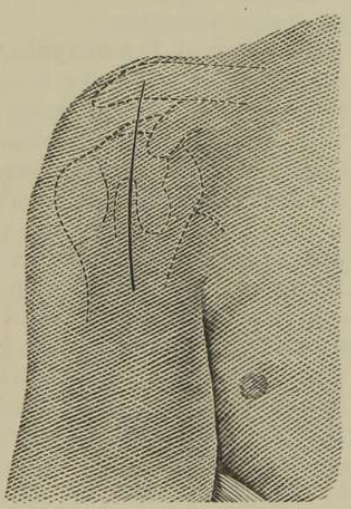
touches with the edge of the scalpel; beneath the bone a chain saw should be applied, or the instrument of Butcher, and the bone removed. The wound is then to be syringed with carbolic acid solution, and if but a small portion has been cut away, the ends of the bone brought together and secured by wire sutures. If several inches are to be removed, then the arm should be placed on a leather or gutta percha splint, and no attempt at union of bone made.

Excision of the Shoulder-Joint.—This excision is practiced for either disease or accident, and the results of the operation are encouraging. Caries and necrosis of the head of the humerus, generally commencing in a synovitis, or from a wound, and anchylosis of the joint, are the most frequent causes that require the operation. Of the 50 cases of excision of the joint collected by Hodges, 8 died, but in seven of the eight cases the articular surface of the glenoid cavity had been implicated. Of 30 cases published by Mr. Thomas Gant, the mortality amounted to 1 in 4. In 575 excisions of the shoulder-joint for gunshot injuries, practiced during the late civil war, in which there were 252 primary and 323 secondary excisions, 165 died, 343 recovered, and 67 cases remained with undetermined results. The percentage of mortality being 23.8 in the primary; 38.59 in the secondary, or a mean of 32.48. When these figures are compared with those of amputation of the shoulder-joint, the average mortality of which is 39.24; we find a percentage of 6.76 in favor of excision.

According to Esmarch, the resection of the right shoulder gives the best returns, although such statement has not been verified, according to a correspondent of the *Medical Record*.*

Thomas, an English surgeon, in 1740, performed this resection, although White, of Manchester, in 1768, is generally supposed to have priority in the operation. Vigaroux, of Montpellier, in 1767; and Redowald, in 1770, also performed excision of the head of the humerus.

Fig. 305.



In 1786 the elder Moreau excised completely the joint, including a part of the acromion and neck of the scapula. After this period the operation fell into disrepute, but was rescued from oblivion, and advocated in 1826 by Mr. Syme.

The following is the manner of operation, if only the head of the humerus is to be removed. A single straight incision from the point of the shoulder near the acromion, (see Fig. 305) four and a half inches in length, should be made and carried down to the bone. The tissues must then be dissected up and held aside with the metallic retractors, already noted. If it be possible during this dissection, the long head of the biceps must be saved, and drawn aside; in some instances, necessity may require its division.

The insertion of the rotator muscles must then be carefully divided. The capsule of the joint is next entered, and disarticulation effected by the entire separation of all the tissues. The arm must be pushed upward, and the elbow carried across the chest to expose the head of the bone, which is

* Medical Record, December 2d, 1872, p. 54, quotation from G. E. Ulrich, "De Ossium Resectione."

then removed, either with a chain-saw or the ordinary instrument found in the amputating cases.

In other cases the U incision is preferred, especially when portions of the clavicle or scapula are implicated. In such cases a strong scalpel must be entered near the posterior border of the acromion, penetrating to the bone, and carried downward across the insertion of the deltoid, and upward toward the inner border of the coracoid process of the scapula. The flap is then raised, the capsular ligament divided (provided it has escaped the ravages of disease), the humerus rotated and adducted, to carry the head of the bone from the glenoid cavity, and while assistants protect the soft parts with the retractor, the bone is sawn off. The pieces of carious bone should be gouged or scraped away, and the flaps approximated with silver sutures. I have found that sometimes, when the entire joint has been involved, the following incisions exposed the joint well: Commence about two inches from the point of the shoulder and carry an incision along the border of the clavicle outward to the joint. This cut is joined by another of the same length along the upper border of the acromion process. This makes a V incision, the apex of which is the point of the shoulder; at this point commence a longitudinal incision and carry the same down the arm to the insertion of the deltoid. This exposes the joint thoroughly and allows room for manipulation with pliers and saw. In a case lately operated upon, where most extensive disease existed, I practiced this method with excellent results.

Dr. W. D. Foster,* of Hannibal, Mo., successfully removed the head of the right humerus in 1865. The case gave rise to considerable discussion.

Dr. L. H. Willard,† of Allegheny City, also reports a successful excision of the humerus. Also one of the tibia, in a boy.

My colleague, Dr. Liebold, while surgeon in the army performed several successful resections.

Excision of the Scapula.—The shoulderblade has been removed quite a number of times for necrosis and for tumors of a malignant character, the former operation being generally the easiest and safest; the latter in most instances being protracted and bloody. I notice in *Holmes's System of Surgery*, vol. v, p. 670, that Mr. Syme is given the credit of having first successfully performed the operation for the removal of the scapula in 1856. If my memory serve me rightly, I believe that Walther, of Bonn, ten years previously performed the operation with a good result. In 1837, Dr. Mussey, of Cincinnati, removed the entire scapula and a great portion of the clavicle with wonderful result, the wound healing almost entirely by first intention, and the man enjoying good health when heard from thirty-four years after the operation. In 1838, Dr. George McClellan also removed the bone, and Gilbert and Gross also report successful cases. Dr. A. Hammer, of St. Louis, has also exsected the scapula and part of the clavicle with success; the patient was a female, and when I saw her had considerable motion of the arm.

M. Peán extirpated the scapula of a man aged nineteen, at the Hospital St. Louis, Paris, April 14th, 1877, the operation being followed by rapid recovery.‡

It is impossible to give very explicit directions for the removal of this

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* Western Homœopathic Observer, 1867, vol. iv, p. 13.

† Loc. cit., vol. vi, p. 92.

‡ Monthly Abstract of Medical Science, September, 1877; Lancet, July 28th, 1877.

bone, as the size of the tumor or the direction of the sinuses will often indicate the line and length of the incisions.

The patient having been etherized, the subclavian artery must be compressed by an assistant, in order to restrain the hæmorrhage from the subscapular and its branches. The integument must then be dissected entirely away from the tumor and turned back. The growth must now be pulled away from the body, and the muscles on the vertebral border of the bone severed rapidly from the inferior angle upward. As the arteries are divided they must be secured. The division of the clavicle should be deferred to the last, as the weight of the tumor and arm draw away the bone from important structures underneath. If the bone is to be removed for necrosis, the lines of incision must be made according to the sinuses, or the diseased portions of the bone.

Excision of the Clavicle.—The collar-bone has to be removed for caries, necrosis, tumors, and gunshot wounds. The operation is one of difficulty and delicacy, on account of the underlying important structures, and must be performed with great deliberation and care. There must be no hurry and no "flurry." According to Gross, Mr. Davie, of Bungay, "many years ago excised the inner extremity of the clavicle, in a case of dislocation backward from deformity of the spine; the luxated head causing such a degree of pressure upon the œsophagus as to endanger life from suffocation." In 1813, Dr. Charles McCreary; in 1828, Dr. Mott; in 1849, Dr. Gross; in 1852, Dr. Wedderburne; in 1856, Dr. Blackman and Dr. Curtis; and in 1862, Dr. Franklin removed either a great portion, or the entire clavicle. When the bone is to be removed for caries or necrosis, a single longitudinal incision is made over the entire part to be removed. The knife must be kept close to the bone, and the handle used as much as possible; the chain-saw must be applied cautiously, and the bone very carefully removed. When there exists a large tumor, the risk is still greater, and still more caution must be employed. The lines of incision must be left to the judgment of the surgeon. The handle of the knife must be more in requisition than its point or its edge. The arteries must be tied as they are divided. Time is no object in these trying and difficult operations. Dr. Mott was four hours in his excision of this bone, and applied over forty ligatures.

Excision of the Ribs.—As a general rule there is not much difficulty in the removal of portions of the rib. In the cases that have fallen under my own observation, both of which were from gunshot wounds received during the war, the chief trouble was the thickness of adipose tissue; I have learned from this, that in such cases the incision should be very long, and should extend considerably beyond the diseased bone. The parts are freed and the chain-saw, as in one of my cases, or Hey's saw, as in the other, applied. In the dissection the knife must be kept close to the bone. The saw applied from the top of the rib downward.

Excision of the Os Calcis.—The removal of the os calcis, either in part or entirely, was formerly regarded as an impossible operation, for two reasons: First, because it was a well-known fact that this bone sustains about half the weight of the entire body; and second, because it was formerly held that division of the tendo Achillis deprived the limb of a great amount of motion. Some surgeons (among whom was Moreau) even taught that if the tendo Achillis be destroyed, amputation is the only feasible resort. Paré regarded a fracture of this bone as a fatal injury. These opinions, however, have proved erroneous; and both the division of the tendon and the removal of the bone can be effected with slight resulting deformity.

In the Bellevue and Charity Hospital Reports for 1870, a very interesting paper appears, "On the entire Excision of the Os Calcis," by F. A. Burrall, M.D., of New York, in which he gives a tabulated statement of forty-eight cases. An analysis of this table is most interesting as regards the history of the cases requiring the operation. We find that young persons of the male sex were the subjects on whom it was most frequently performed, the ages being from ten to twenty years. There were five cases between the ages of forty and fifty-four. Of the forty-six cases in which the sex is recorded, thirty-eight were males and but eight females. The diseases which called for the operation were in forty-three cases caries and necrosis, the others being accidents,—pressure, friction, etc.

Only one death occurred, and that was but indirectly attributable to the operation. One was afterward lost from diphtheria, one from pyæmia, and two from phthisis; of the latter it may be said that the disease reappeared in one case in eighteen months, and in the other, four years after the operation. Seven secondary amputations were necessary.

The lessons we learn from these cases are: that complete excision of the os calcaneum can be practiced with success, leaving a good foot; that caries and necrosis furnish by far the greater part of the cases for the operation; that the young are more liable to the diseases requiring either resection or excision; and that the male sex is more prone to them than the female.

Besides the forty-eight cases to which we have alluded, there can be found in the *Medical Times* for October, 1870, an account of three cases of "Excision of the Os Calcis," by Dr. Hunter McGuire, of Richmond, Va. In his report, the ages were twenty-one, seventeen, and twenty-three years, all males; the disease in each was caries, and caused in every instance by injury. Thus in Case I, the patient was wounded by a nail driven into the heel. In Case II, the heel was severely bruised by a cricket-ball, and Case III, was that of a wound from a shell. In all these cases there was but a slight limp resulting from the operation.

At the termination of the papers, Professor McGuire gives two interesting records to show with what facility a patient can walk, after the destruction of the heel-tendon.

Complete excision of the bone must always give rise to a deformity, as the arch of the foot is taken away. In the majority of instances, caries does not invade the entire substance of the bone, its posterior surface being most generally affected. In such instances it is well to remove the posterior portion of the os calcaneum, and ascertain the depth to which the ulcerative process has extended, and then, if possible, remove with the gouge and chisel the diseased masses. Of this proceeding Dr. Heyfelder says:

"Partial resection is to be preferred to extirpation, when possible, both for the sake of leaving intact the joint and adjacent bones, as well as to preserve the muscular and ligamentous attachments. But partial resections of the calcaneum are not always successful [five failures in fifty-four cases], and amputations of the foot [twice] or extirpation of the bone [once] have been necessary. In sixty cases of partial excision, in which superficial or deeper wedge-shaped portions, or even larger parts of the bone were removed, none ended fatally. Relapses occurred in five out of fifty-four cases, rendering amputation necessary in three."*

According to these remarks of the German surgeon, the results of partial resection are very good, and it is so desirable to save the arch of the foot, if possible, that it appears to me that the partial resection should at least be first attempted. Then, if after the posterior portion of the heel has been

* Bellevue and Charity Hospital Reports, 1870, p. 202.

sawn off, the disease proves to have extended far into the plantar surface, the entire bone must be removed, unless the caries can be reached with the gouge, and can be removed with that instrument.

There are several methods of operating for removal of the os calcis. The chief point is to keep the incisions without the sole of the foot, as the cicatrices are liable to inflame from friction, and afterwards to suppurate and ulcerate.

Mr. T. Holmes's method is as follows: Enter the knife at the inner border of the tendo Achillis, carry it steadily around the back and outer side of the foot, along the upper margin of the os calcis, to a point midway between the heel and the projection of the fifth metatarsal bone, which point marks the calcaneo-cuboid articulation. From the anterior extremity of the incision, a second one is commenced, and carried downward and into the sole of the foot, terminating near the inner border of the os calcis, thus avoiding the posterior tibial artery and its branches. The joint between the cuboid bone and the astragalus is laid open, and the bone having been grasped with the lion forceps, is strongly everted, and the soft parts on its inner side detached, keeping the edge of the knife close to the bone.

This operation commends itself for its simplicity, and from the fact that the incisions avoid the posterior tibial artery; however, I do not think that the bone is so easily reached as in the dissection proposed by Erichsen, and recommended by Dr. Gross, which is practiced in the following manner:

So soon as perfect unconsciousness is obtained, an incision is commenced in the mesian line of the heel, an inch above the insertion of the tendo Achillis, and carried perpendicularly down to the sole; a second incision is then made around the margin of the os calcis, joining the lower end of the first cut as it passes around the sole of the foot, and extending farther on the outer than on the inner margin of the bone. The lateral flaps are then dissected up, the gouge applied, and the carious parts removed. If, however, the whole posterior surface is involved, the tendo Achillis must be cut through, the sole-flap dissected away from the bone, and with a metacarpal saw the posterior surface of the bone sliced off. The gouge and gouging-forceps are used freely, and all the diseased portions removed. The flaps are brought together, and tied by silver sutures. A dressing of prepared oakum completes the performance.

If the entire bone is to be taken away, the lateral incisions must be longer, and the joint opened from the inside, the bone seized with the lion forceps and dissected away.

Recently in two cases, one of removal of the posterior portion of the calcis, the other of the entire bone, I found that by careful dissection the posterior tibial vessels can be retained in the flaps, by the method of operation last named. In both cases, which were entirely successful, there was but little trouble from bleeding; the dissection, however, was very tedious.

Excision of the Astragalus.—This bone may be removed when in compound fracture, or dislocation, its unnatural position gives rise to untoward symptoms; in such cases the capsular ligament is torn, and the bone thrown either partially or entirely from its socket, and can generally be removed with comparative ease. In other cases the incision must be carried in front of the dorsum of the foot down to the bone, the foot having meanwhile been forcibly put upon the stretch. After the incision, the assistant flexes slightly the foot, and the muscles and tendons are turned off and held out of harm's way by retractors. The pliers may now be put into requisition, and the head of the bone cut off. Disarticulation is then readily effected.

The *cuboid, cuneiform, and scaphoid* bones may also be exsected, in rare instances, but in the majority of cases amputation, either by Syme's, Chopart's, or Pirogoff's method, is followed by better results than excision. In a case of my own, after a long and tedious dissection, I found the disease so extensive that amputation was necessary.

Excision of the Joint between the Os Calcis and Astragalus.—This operation is a new one, and has been practiced and thoroughly studied by Mr. Thomas Annandale. The object of the performance is to save the foot, and also to do away, in some instances, with the complete excision of the calcis or the astragalus. I will give the operation in Mr. Annandale's own words:

"The importance of recognizing and treating early disease originating in this articulation, especially after suppuration has taken place, must be acknowledged, for, owing to the situation and connections of this joint, there must always be a peculiar risk of the gradual implication of the surrounding bones and joints.

"Having carefully studied the anatomical relations of the joint under consideration, I found that its entire extent could be best exposed without injury to surrounding structures in the following way: The foot having been placed in the extended position, and resting on its inner aspect, an incision commencing about an inch above the tip of the external malleolus and carried along its posterior border in a curved direction to the calcaneo-cuboid joint, thoroughly exposes the posterior and external portion of the joint, when the peroneal tendons have been drawn outwards and some ligamentous bands divided. This incision will be found to run along the inner border of the tendon of the peroneus brevis muscle. The anterior and internal portion of the joint can then be exposed by placing the foot, still in the extended position, on its outer aspect, and making an incision from the tip of the internal malleolus along the course of the tendon of the tibialis posticus, as far as the prominence of the scaphoid bone, drawing forwards this tendon, and carefully drawing backwards the other tendons and the posterior tibial vessels and nerve. By making the first incision through the skin and cellular tissue only, and so ascertaining the exact position of the tendons likely to be injured, then cutting down through the periosteum to the bone, and with a periosteal scraper separating to a sufficient extent the periosteum, together with all the other superficial tissues, there is little risk of injuring any of the tendons or other important structures.

"Both aspects of the joint having in this way been exposed, it will be found that by means of the chisel and mallet the articular surfaces can be easily and accurately removed, the posterior portion being removed through the external incision, and the anterior portion through the internal one. Should there be any disease in the hollow or fossa between the two articular surfaces, it can be readily reached and removed with the chisel or gouge through either incision."

Excision of the Ankle-Joint.—The lower ends of the tibia may have to be removed after compound dislocations, and also portions of the fibula cut away. It appears from excellent authority that the operation is much better a secondary than a primary one. Mr. Hancock, in the *London Lancet*, for 1867, gives nineteen successful cases, and points out very forcibly the advantages of *total* over *partial* excision of this joint.

Mr. Hey, of Leeds, was the first surgeon who resected the lower ends of the tibia and fibula for disease, which operation was performed in 1766. Moreau, in 1792, performed the same operation for disease. Mr. Thomas Bryant gives to Mr. Hancock priority in resection of the entire joint.

The following is a description of the operation as practiced by Hancock, modified by Barwell, and published in Bryant's *Practice of Surgery*: "The foot is first laid on its inside, an incision is made over the lower three inches of the posterior edge of the fibula. When it has reached the lower end of the malleolus it forms an angle, and runs downward and forward to within about half an inch of the base of the outer metatarsal bone. The angular flap is reflected forwards, the fibula for about two inches above the malleolus is cleared sufficiently of soft parts to allow cutting forceps to be placed over it, and the bone is then nipped in two, and carefully dissected out, leaving the peronæus longus and brevis tendons uncut. The foot is now to be turned over. A similar incision is made on the inner side, the portion in the foot terminating over the projection of the inner cuneiform bone. The flap is to be turned back and the sheath of the flexor digitorum and the posterior tendons exposed, the knife being kept close to the bone, avoiding the artery and nerve. The internal lateral ligament is then carefully to be severed close to the bone, and now the foot is twisted outward and the astragalus and tibia will present at the inner wound. A narrow-bladed saw put in between the tendons, into the inner wound, projects through the outer. The lower end of the tibia, then the top of the astragalus, may be sawn off in a proper direction."

I may say here that in several cases I have succeeded in curing caries of the ankle-joint, which threatened a necessity for resection, by entire rest, and the prolonged and frequent use of the thirtieth trituration of silicea. I speak emphatically here of the thirtieth trituration as superior in its efficacy to the dilution, and of the almost specific influence of this medicine upon the bones of the *ankle-joint.*

Excision of the Toes.—In the majority of cases amputation is to be preferred to excision of the bones of the toes. If, however, the metatarsal bones are to be removed, an incision must be made on the dorsal surface of the bone and the tissues held aside, while with a strong pair of bone-pliers held perpendicularly the metatarsal bone is divided, which greatly facilitates the operation. The extremities of the bone are then raised by means of lion-jawed forceps, and, keeping the edge of the knife to the bone, each half is successively removed.

Excision of the Knee-Joint.—To Mr. Henry Park, of Liverpool, belongs the credit of having originated the operation of resection of the knee-joint. He, however, gives the credit of the first actual performance of the operation to Percival Pott, the date of which was July, 1781. Soon after the publication of the Park pamphlet, Mr. Filkin, of Norwich, declared that he had performed the operation as early as 1762. On the 5th day of November, 1789, Dr. Simmons performed a similar operation. M. Moreau, in 1792, excised the whole of a carious knee-joint; in 1809, Mülder removed it; in the year 1823, Sir Philip Crampton, and in 1829 and 1830, Mr. Syme resected the articulation. These latter operations were not successful, and the procedure gradually fell into disrepute until it was revived by Mr. Fergusson.

In the following table, altered a little from Butcher, the names of the surgeons, the dates of the operations, and the results are shown, embracing a period of eighty-seven years:

DATE	SURGEON.	SEX.	AGE.	RESULT.
1762	Filkin.	Male.		Recovered in three months.
1781	Pott.	Male.	33	Recovered in one year.
1789	Simmons.	Male.	30	Died in four months.
1792	Moreau, Sr.	Male.	20	Died in three months.
1802	Moreau, Sr.	Male.	18	Died in four months.
1809	Moulder.	Female.	34	Died in three and a half months.
1811	Moreau, Jr.			Recovered.
1816	Roux.	Male.	32	Died.
1823	Crampton.	Female.	23	Died.
1823	Crampton.	Female.	22	Recovered.
1829	Syme.	Male.	8	Recovered.
1829	Syme.	Female.	7	Died.
1830	Jaeger.	Male.	28	Recovered.
1832	Textor.	Female.	26	Died.
1832	Fricke.	Female.	8	Recovered.
1832	Fricke.			Died.
1835	Fricke.			Died.
1835	Demme.	Male.	36	Recovered.
1836	Fricke.	Male.	18	Recovered.
1839	Textor.	Female.	23	Died.
1840	Lang.	Male.	24	Died.
1842	Textor.	Female.	23	Recovered.
1842	Demme.			Died.
1842	Demme.			
1845	Textor.	Female.	44	Amputation; recovered.
1845	Textor.	Male.	29	Died.
1848	Heusser.	Male.	20	Recovered.
1849	Heusser.	Male.	32	Died.
1849	Heusser.	Male.	6	Recovered.
1849	Textor.	Female.	29	Died.
1849	Heyfelder.	Male.	21	Died.

We find in the *Edinburgh Monthly Journal* and *Medical Times and Gazette* for 1853, the record of thirteen cases performed by the continental surgeons since 1850. Thus: Three times by Mr. Fergusson, six times by Mr. Jones, once by Mr. Page, once by Dr. Stewart, and twice by Dr. Mackenzie. Of these cases two died from the operations, one from dysentery, and the remaining ten recovered, with limbs not very serviceable, but all of them in better condition than though amputation had been performed. Butcher gives a second table of fifty-one cases operated on from 1854 to 1856. Of these there were twenty-two cured, fifteen recovering when the table was made, one relieved, and one in a precarious state. The deaths only numbered ten.

Since that period the operation has been performed many times and with good success, both in this country and in Europe. In America we have the record of an operation performed by Gurdon Buck, at the New York Hospital, in the month of October, 1844. The operation was resorted to in order to straighten a limb, which was bent at right angles.* Dr. Bauer, formerly of Brooklyn, now of St. Louis, records an interesting case in which the operation was performed for genu valgus,† with traumatic diastasis of the lower epiphysis of the left femur.

The disease which properly directs to resection of the knee, is most generally a strumous inflammation of the joint. This may either commence in the synovial membrane of the knee, or in the spongy structure of the

* Velpeau's Operative Surgery, vol. i, p. 810.

† Bauer's Orthopedic Surgery, p. 193.

long bones, which become filled with strumous deposit, and very much degenerated, enlarged, and softened. The inflammatory action is generally of the subacute character; there is increase of temperature of the parts involved; the cancellated structure of the bone becomes filled with a reddish grumous deposit; the patients waste in flesh, have feverish exacerbations at night, and become sallow and cachectic in appearance. If this process is not arrested in due time, then the pain increases, and there takes place within the bone-cells a lardaceous or oily deposit, and the disease increasing, a chemical change is effected in the constituents of the bone. The calcareous matter lessens, or, even in severe cases, may be entirely deficient, and the compact structure is reduced to a mere shell. The periosteum also becomes very much thickened, and is less adherent to the bone than normal. Suppuration then may follow, and the debris is cast out with an ill-conditioned and a sanious pus. This disease, no doubt, has been often mistaken for caries of the ends of the bone; but there is a considerable difference between them, the one belonging more especially to the simple ulcerative process, the disintegration, molecule by molecule; the other being accompanied by, or essentially consisting in, an absolute degeneration of the spongy structure, and a deposit and infiltration of strumous matter in the cancellated structure of the bone itself. In such an affection, after suppuration has occurred, the joint should be excised.

Other affections which may lead to resection are, white swelling, degeneration of the cartilages, caries of the extremities of the bones, deformity of the legs, injuries of the joint, etc.

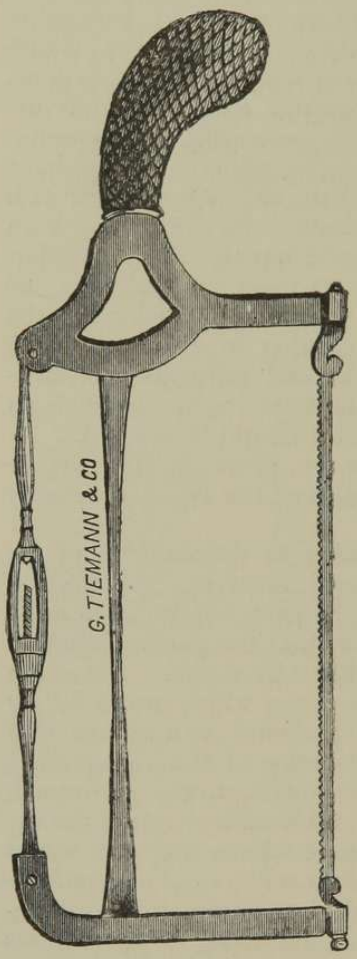
There is a question of some import in relation to the removal of the patella in this operation. If the bone is diseased, remove it; if it is not, refresh its under surface, that it may adhere to the parts below. I am quite certain that the rule adopted by some surgeons, that the patella, whether implicated or otherwise, should be removed, is not a good one. The excision requires considerable dissection; it leaves a cavity which has to fill by granulation; it increases the suppuration, and prevents the application of an anterior splint, if such be necessary. In resection of the knee-joint, I have divided the hamstring tendons before the operation was performed, with the idea of preventing muscular contractions from separating the extremities of the bones, but I found that the spasmodic action still would occur and occasion great pain. I should therefore rely on the internal administration of ignatia or cuprum, which should have a much more beneficial action. Again, surgeons have recommended that after the extremities of the bones have been sawn off, that an opening be made in the popliteal space, in order to allow drainage. I should think that this would be an excellent suggestion in some cases, but would much prefer to wait until the fact of very extensive suppuration was established, because, with calendula, carbolic acid, and strict antiseptic measures, I believe we have very great control over the suppurative process, especially with the internal use of silicea and hepar. The latter I generally use in the third decimal trituration, and the former from the 12th to the 30th potency. I have positive evidence, in my own mind, of the reliability of these two agents, but, with the exception of mercurius, cannot speak, that is, from my individual experience, of the efficacy of other medicines.

The best incisions, as a general rule, are those which will most freely expose the joint, and allow the removal of the bones with greater facility. The sweep of the knife may be semicircular, commencing at a point opposite the inner condyle, and extending below the tubercle of the tibia to a point opposite the external condyle.

Mr. Park preferred the crucial cut, as did also Mülder. Moreau operated

by two lateral incisions in front of the ham, which are united by a horizontal cut below the patella (Fig. 307). The H incision for many cases is the most desirable. The incisions should be about four inches in length on

Fig. 306.



Butcher's Saw.

Fig. 307.

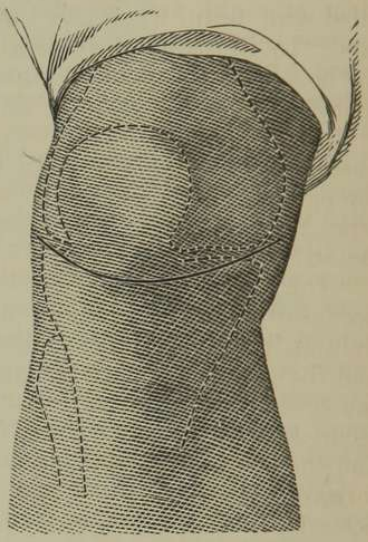
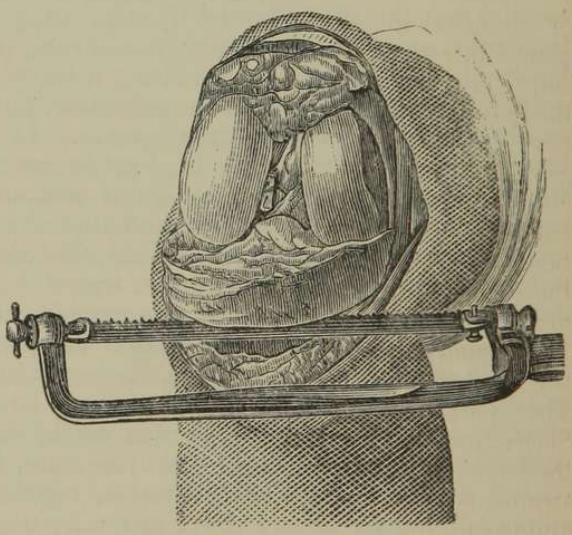


Fig. 308.



each side, beginning at the condyles, and extending downward; they should be crossed by a second cut, which will open the joint; the flaps are then turned aside, and the condyles rapidly freed with careful strokes of the knife; the leg is then forcibly flexed, and the crucial ligaments divided; retractors of metal should then be slid behind the head of the tibia, which must be removed first (Fig. 308). The condyles of the femur are treated in like manner. Butcher's saw (Fig. 306) can be used with advantage in the operation, as it cuts from behind, forward, and by the screw the blade can be made to assume any angle that may be necessary.

The after-treatment is very essential, and requires great care in its management. I have no hesitation in recommending the swinging splint of Dr. Hodgen; the modification of that, by Dr. E. A. Clark, or Smith's anterior splint. The method of application of each of these splints can be found in Chapter XXVI, p. 497. Sometimes, however, a fracture-box filled with bran, to absorb the discharge, is very useful in many particulars. To illustrate the operation, the accidents which may be expected, the beneficial effects of treatment, and good recovery with a straight limb, shortened but one-eighth of an inch, the student is referred to page 543.

Prof. Volkmann, of Halle, proposes a new operation for resection of the knee, by a cross section of the patella. A horizontal incision is made over the patella, which is sawn in half, the parts to be reunited by catgut sutures after the completion of the operation. The following will explain the method more fully.*

"The incision extends horizontally across the patella from the anterior border of the epicondyle on one side, to the anterior border of the epicondyle on the other side. The joint is opened on both sides of the patella and the index finger passed under the bone, which is then divided with the saw or knife. The lower half of the patella is now drawn downwards and secured out of the way, while the lateral and crucial ligaments are divided and the end of the femur resected. The head of the tibia is next pressed forward into the wound, and the semilunar cartilages are seized at their posterior borders and removed along with the remains of the crucial ligaments, and the greater part of the adipose tissue which covers the posterior surface of the ligamentum patellæ. The head of the tibia is then laid bare and resected, the capsule is dissected out, and any carious spots in the resected bones or in the patella are gouged out. Finally the resected surfaces of the femur and tibia are brought together by two strong catgut sutures placed internally, and the two halves of the patella are united also by two catgut sutures. The sutures are introduced into both the epiphyses and the patella by means of strong curved needles. The operation should always be preceded by an exploratory incision, which will enable the surgeon to examine the joint by both finger and eye; for this purpose the incision should at first only be carried from the epicondyle as far as the border of the patella. If this exploratory incision shows that the operation can possibly be avoided, a drainage-tube should be introduced and the wound dressed antiseptically. The patella will sometimes be found firmly attached to the femur, but it can be easily separated with the chisel."

Excision of the Bones of the Leg.—The fibula may be resected in its entire extent or in part, the weight of the body not falling upon that bone. The operation was first suggested by Dessault, and executed by Percy, Suetin and others. The incision must be a longitudinal and long one, and the bone denuded, if possible the periosteum saved, by using the blunt instruments shown in the first portion of the chapter. The bone should be divided by the pliers, and the ends lifted by means of the lion forceps and removed carefully. The peroneal artery is frequently divided, and there is often a good deal of hæmorrhage from other vessels.

Portions of the tibia may also be resected with a good result. A very interesting case has come under my care. It was a compound fracture which had never been reduced. The broken bones had united, presenting a hideous deformity. The foot was twisted entirely around, and three inches of the tibia, covered with a thick crop of dark red granulations, protruded from the leg. There was a suppurating and offensive ulcer on the

* Medical Record, Oct. 20th, 1877.

posterior portion of the right leg, occupying the whole belly of the gastrocnemius; another sore about the hip-joint, together with spasmodic rigid contraction of the toes and knee-joint. The patient was also very much emaciated, with a dry, brown, hard tongue, pulse one hundred and thirty beats to the minute, tympanites, and all the well-marked symptoms of typhus gravior. To all appearances, the extent and gravity of his injuries, the exhausting suppuration, the deprivation of proper nourishment, were certainly data on which to found a very unfavorable prognosis.

The first medicine prescribed was arsenicum 3, about two grains every three hours, while brandy and water three times a day, with occasional spoonfuls of beef essence, were carefully administered. The ulcer on the right leg was dressed with calendula lotion, which was also applied over the protruding extremities of the fractured bones. It was some days before much improvement was noticed; but gradually the symptoms began to abate in their severity, excepting most excessive pain in the region of the hip-joint; the most acute pain beginning at evening and lasting through the entire night. The screams of the poor boy were such that the other patients in the ward were unable to sleep. The application of compresses saturated with strong tincture of aconite gave relief in time to this distressing symptom. The tympanites was relieved by turpentine in three to five drop doses taken once in four hours, and the remaining symptoms combated as they presented with bryonia, rhus tox., and sulphur. About this time a diarrhœa became very troublesome, but was successfully treated with phosphorus and phosphoric acid. During this treatment stimulants were constantly given, and their good effect was very appreciable. At length the disease was overcome.

As the danger to life passed, the deformed and misshapen limb began to claim the attention it deserved, and which it should have received when the injury was first inflicted.

My first impression, and I believe that of those who saw him, was that amputation must be resorted to, but upon reflection, I thought that resection might be practiced, and upon consultation it was agreed to attempt it.

On the 2d of March, assisted by and in the presence of several medical gentlemen, having placed the boy upon the operating table, and brought him fully under the anæsthetic influence, I began the operation by dissecting from the protruding bones the mass of granulations; then beginning about five inches above the site of fracture, I made a longitudinal incision along the spine of the tibia, and continued it three or four inches below the protruding bones; this incision was crossed at the centre by a second transverse cut, and the four flaps dissected up. Keeping the edge of the knife close to the bone, the aponeurosis of the tibialis anticus was divided, and the anterior tibial artery protected from injury. The ends of the bones were then sawed off, about two inches being taken away, and the bony adhesions of the fibula, which had united firmly with the shin-bone, were, with considerable force, refractured. The foot was then twisted back again, placed in its position, and fixed securely in a splint, leaving a space between the divided extremities of the bones, from which two inches of the ends had been removed. During the operation the hæmorrhage was not important, but when I visited the patient in the evening, there had been so profuse a discharge of blood, that I feared the teeth of the saw had wounded the anterior tibial artery. All dressings were therefore removed, but I found the bleeding to arise from the medullary canal. Compresses wet with a solution of the *liquor ferri persulphatis* were applied, which after two days arrested the hæmorrhage.

On the 5th of March the limb was placed in a fracture-box, extension made to keep the leg the proper length, and bran packed closely around it. This bran dressing was of the most serviceable nature; the leg was never moved from its position; the wound could be cleansed readily and as often as was necessary, could be examined at any time, and could receive the benefits of the cold calendula lotion, which was constantly applied. Moreover, as suppuration took place the pus was absorbed by the bran, which it formed into hard masses that were easily removed, and the space refilled with fresh material. On the 25th, a sequestrum came away. On the 27th, the leg was taken out of the bran, the fracture-box cleansed, refilled and reapplied as before. On April 4th, the whole apparatus was dispensed with, a slight splint applied on the inside of the leg, and held *in situ* by adhesive strips. The boy was soon about the house; has *a leg of the same length* as the other, though not quite so strong.

Excision of the Hip-Joint.—There are several forms of hip-joint disease, some requiring excision of the head and neck of the femur, and others forbidding the same. The different locations of inflammatory process in the hip have been already alluded to; it may commence in the soft structure within the joint, or in the head of the femur, or in the interarticular cartilage, or in the acetabulum. When, however, there is undoubted caries of the head of the bone, or it has been dislocated and thrown outward and backward upon the acetabulum, the operation presents a great hope of success, especially if the pelvic bones are free from disease; if together with this the patient has been healthy, is young, and originally of good constitution, though prostrated by continued profuse discharge and hectic, the removal of the head and neck of the bone is perfectly justifiable. This is true conservatism, and when compared with the terrible alternative, amputation at the hip-joint, the comparative ease of the performance of excision, the slight shock, the less amount of hæmorrhage, the comparative quickness of healing, the size of the wound, and, above all, the *saving of a useful limb*, there can be no doubt of the preponderance of argument in favor of excision.

The operation may be performed either by a single long incision directly over the head of the bone, or by a T incision, made somewhat obliquely, or a V-shaped cut (Fig. 308). These incisions should be made directly down to the bone, and an assistant on either side, with broad metallic retractors, should separate the structures with the handle of a scalpel, or with an instrument slightly curved upon the flat, fixed in a stout handle with a blade about four inches in length, and a blunt cutting edge of a quarter or three-eighths of an inch in breadth, very similar to that recommended by Dr. Gross for separating the structures from the inner side of the condyle of the inferior maxillary, when that bone is to be removed at the articulation; the tissues may be separated from the bone. Then by a rotary motion, the head may be abducted, and a chain-saw passed beneath the head of the bone, and with a rapid, though gentle motion, the caput, and as much of the cervix as necessary may be taken away (Fig. 309). In some cases the long bone-forceps of Liston may be used, or having placed a retractor or a towel beneath the bone, to prevent the soft structures from being injured, the ordinary amputation-saw can be used. I much prefer, however, the saw of Mr. Butcher (Fig. 305), which is so arranged that it cuts from within outward, by the direction the saw is made to take. We have already mentioned that disease of the acetabulum and head of the thigh together does, as a general rule, counter-indicate the performance of the operation, though there are some surgeons who hold a contrary opinion. The celebrated Mr. Hancock thus expresses himself:

"In deciding upon this operation, we would be guided by the condition of the patient, and not by any arbitrary stages of the disease, and whilst I always have and still continue to deprecate unnecessary and ill-considered

FIG. 309.

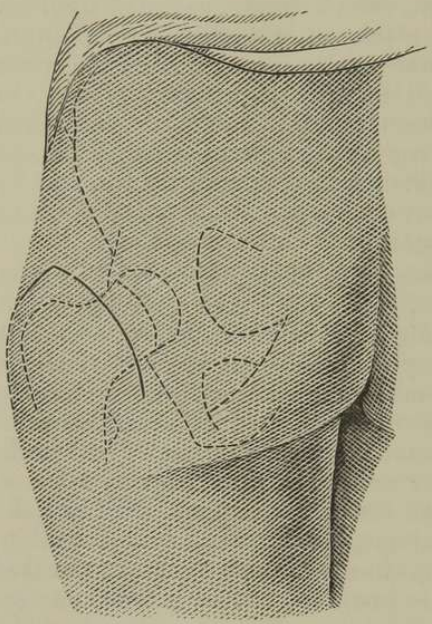
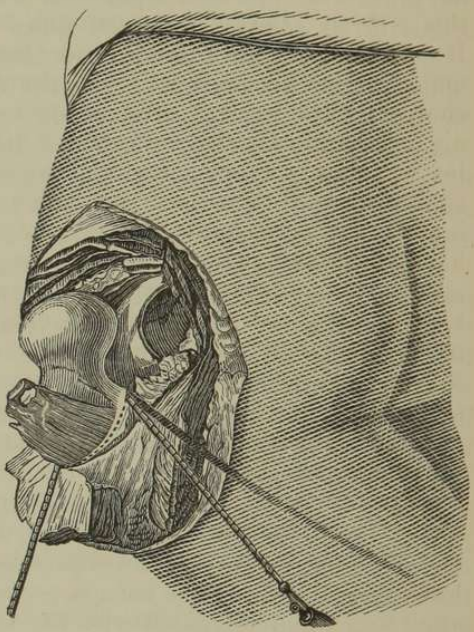


FIG. 310.



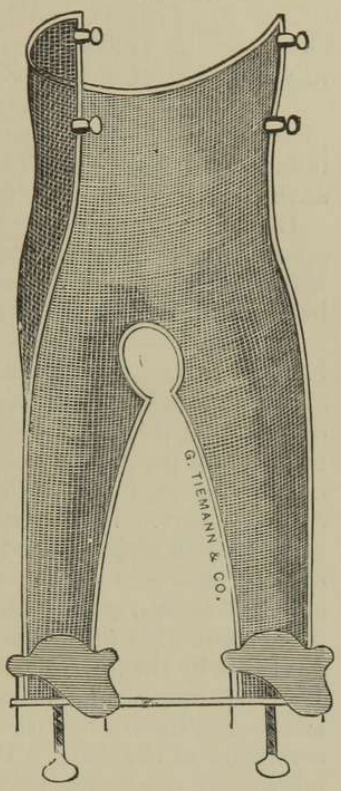
operations, I believe it to be our duty, when we have assured ourselves that the case is one of hip-disease, that the patient is dying, and there is no hope of saving him by the ordinary means, to perform, or at all events to propose the operation, without reference as to whether, pathologically speaking, the disease be in this or that stage, or whether the bone be dislocated, the acetabulum healthy or not."

There is a great deal of truth in the above remarks, and from late successful operations, in which not only the head and cervix of the femur, but also parts of the pelvic bones have been removed, it would seem that it would be the duty of the surgeon to attempt operative measures even in extreme cases. At all events, an exploratory incision may be made from the anterior inferior spinous process of the ilium to the trochanter major, and the feasibility of the operation ascertained.

The following are the directions of Dr. Lewis A. Sayre for the performance of the operation: "When the disease has gone on to another stage, when sinuses have occurred and discharged pus, when a probe leads down to dead bone, there is nothing to be done but to exsect it by making a small incision above the trochanter major, midway between it and the crest of the ilium, over the top of the acetabulum—a semilunar incision, the belly of the D covering the posterior part of the trochanter major, going straight down to the bone, *through* the periosteum. You then pull the soft tissues on one side, and, taking a small but strong curved bistoury, go as far around the bone on each side as you can reach, at right angles to your first incision, so as to divide the periosteum completely; you then take a strong firm periosteal elevator, with a large handle and the end slightly curved, and go

into this little triangle; you *peel* off the periosteum, and, as a matter of course, all the muscles with it; by opening the joint thoroughly and turning the head of the bone out, the periosteum is peeled off from the inner portion; you then saw off the bone above the trochanter minor. I believe that this is better than cutting through the neck. If you go through the neck, the trochanter major comes over the hole and prevents discharges; whereas, by cutting off the trochanter major along with the neck of the bone, you leave a perfectly free opening for the discharges from the diseased joint; and by peeling off the periosteum in the way which I have described, you carry with it all the muscles that move the joint; and if you then keep the leg pulled out to its proper length, by putting on a pair of wire breeches (Fig. 311), you can send the patient out into the air the very next day."*

Fig. 311.



In my operations I formerly always used the T incision, but have in more recent ones resorted to the cut of Sayre, already described, carrying the knife down to the bone, and turning back the flaps, removing the head of the bone with the chain-saw, then applying the gouge and chisel, if necessary, to remove all traces of diseased bone, and then placing the patient in a Smith's anterior splint, according to the directions given for this appliance in the Chapter on Fractures of the Femur. Bauer's wire breeches are also of great service. They keep the parts in good apposition.

Dr. J. H. McClellan, of Pittsburg, reports a successful case of excision of both condyles of the femur at the Pittsburg Homœopathic Hospital.

Dr. H. W. Kœhler, of Louisville, Ky., reported an excellent case of resection of the neck and trochanter major of the femur by himself. The report of the case is in the *Western Homœopathic Observer* for July and August, 1870, p. 226.

CHAPTER XXXI.

INJURIES AND DISEASES OF THE HEAD.

Wounds of the Scalp.—Mr. Pott has observed that though the scalp be called the common integument of the head, yet from its structure, connections, and uses, injuries inflicted upon it by external violence become of much more consequence than those of other parts of the body. It is a well-known fact that wounds, however slight, when inflicted on the head, are very liable to be followed by inflammation and suppuration either within

* Braithwaite's Retrospect, January, 1872, p. 114.

or without the cranium. In some instances the lips of the wound will unite readily, and little inconvenience result; in others, however, adhesion will take place only at certain points, while suppuration will occur at others; this is particularly noticed in contused wounds, in which the integument has immediately been destroyed by the violence of the injury, or in cases in which the scalp has suffered considerable laceration.

Small wounds, that is, such as are caused by instruments or bodies which pierce or puncture, rather than cut, are in general more liable to become inflamed, and are known to be productive of greater constitutional disturbance than those which are of a greater extent.

If the wound affect the cellular membrane only, and has not reached the aponeurosis or pericranium, the inflammation and tumefaction involve the whole head and face; the latter frequently assuming a jaundiced hue, and being covered with small bullæ containing a yellow serum.

Treatment.—If a blow on the head has caused extravasation of blood beneath the scalp (*cephalhæmatoma*), and if there be visible increase of the accumulation of fluid, the surgeon may suspect that an artery has been divided; in this case the course of the vessel, if possible, should be ascertained, and pressure made in order to arrest the hæmorrhage; after which, compresses saturated with a solution of arnica should be applied to the contused part. If the scalp be nearly or quite detached, it should be carefully washed and replaced as nearly *in situ* as possible, and the *aqua calendula* be used as a lotion; the parts should then be brought together with adhesive straps, and a bandage lightly placed around the cranium; sutures in the generality of instances should be dispensed with, as the punctures that are made by the needle are liable to become the seat of inflammatory action. If erysipelatous inflammation supervene, bell. or rhus radicans may be administered internally; the latter exerts a powerfully beneficial action over erysipelas of the scalp. If the fever be high, aconite and bell. may be administered, in accordance with symptoms that have already been mentioned in various places in this work.

Should symptoms of effusion within the cavity of the cranium be present, arn., bell., hell., cup., or zincum are the most appropriate medicines. If suppuration ensue beneath the scalp or occipito-frontalis muscle, the pus should be evacuated by early incision, and calend., hepar, merc., or silicea should be exhibited. If extravasated blood be noticed beneath the scalp, there is no need of incision, for by enjoining perfect rest, with the employment of arnica externally and internally, absorption of the clot will in all probability take place.

Gunshot Wounds of Scalp.—Of 3420 cases of this variety of wound which could be traced, occurring during the war of the Rebellion, the fatal cases amounted to 2.09 per cent., or about 1 in 48 cases. The British annals of the Crimean war give a mortality of 1.83. From these figures, it will be seen that gunshot fractures of the scalp are rarely fatal, and when they are, death is occasioned by some of the secondary complications. These are encephalitis, erysipelas, gangrene, ulceration, and sloughing. In this variety of wound, primary bleeding is not often found, while secondary hæmorrhage occurs quite often, especially during the separation of sloughs and sequestra. In some cases tetanus follows, and typhoid symptoms are not uncommon.

According to the Surgeon-General's report, 72.6 per cent., or nearly three-fourths of gunshot wounds of the scalp, are caused by small-arm missiles, and the remarkable fact is pointed out, that the scalp may be wounded by the largest projectiles, even from artillery, without injury to the skull, or concussion of the brain.

It is also important to bear in mind, in the majority of instances, when

there is sufficient contusion of the scalp to produce ecchymosis, even without any solution of continuity of the scalp itself, that brain symptoms may be expected.

Treatment.—The wound must be washed thoroughly, then compresses wet with a solution of arnica, one part to five, be applied, and a few drops of the same medicine administered internally. So soon as suppuration has begun, calendula must be substituted for the arnica and silicea, or sulphur must be taken.

FRACTURES OF THE SKULL.

This accident frequently occurs, and is occasioned by blows and falls upon the head. It may be either a simple *fissure*, or a separation of the entire bony structure. There are several varieties of the accident, thus: *simple, compound, comminuted*, or *depressed*. The external table may be the seat of injury; or, the internal table may be broken, or both may be implicated. Again, there is fracture with depression of the bone, and breakage without any such untoward circumstance. In simple fissure or fracture without any depression, there is nothing to do but keep the patient in a quiescent condition and apply to the part a compress saturated with a mixture of arnica and water, at the same time arnica to be given internally. When the fracture is accompanied *with* depression of the bone, the case is far different, as the depth of the depressed fragments may regulate the amount of compression upon the brain. *There may be considerable depression without symptoms of compression manifesting themselves.* Again, there may be a severe fracture, the tables being broken into many pieces, and spiculæ of bone so pressing upon the meninges as to render inflammation and suppuration inevitable. Under these circumstances, the correct course to pursue is to elevate the bone and remove the spiculæ with the forceps. If the injury shows but slight depression, it is conservative to wait and watch the case carefully.

A "*starred*" fracture is one in which the fissures radiate in all directions, often involving more than one bone, and extending to the base of the cranium. Such fractures may also be "guttered," or "saucer-shaped," according as the instrument is blunt, as when inflicted with a spade; or round, as when made with a hammer.

When there is much depression the symptoms are well marked. The patient is more or less comatose, the pupils are dilated, and the breathing stertorous. In such cases the diagnosis is apparent, and the trephine should immediately be used. I cannot understand when the symptoms call so urgently for relief, why there should be any delay in the application of the proper remedial means; there can certainly nothing be gained by delay, and every moment of hesitation gives the patient less chance of recovery. Very many fractures of the skull are compound, the scalp being more or less torn and implicated. Often the wounds are filled with dirt or other extraneous matter, particularly if the fracture be caused by a severe fall. In these cases, after having cleansed the wound thoroughly, the depressed bone must be elevated and all spiculæ be removed; this having been done the edges of the wound may be approximated with sutures. A blow upon the occiput may cause a longitudinal fracture at the base, or a fall upon the top of the head produce a serious fracture at the base of the skull. Where this takes place hæmorrhages occur from ears, nose, and mouth, caused by tearing of the sinuses of the dura mater. There are likewise immediate and well-marked symptoms of compression. After a day or two, or longer, a thin watery discharge takes place from the ear, supposed

to be the fluid from the sac of the arachnoid. An injury inflicted upon the frontal bone may fracture the anterior fossa of the base. In all fractures about the head, care must be taken to distinguish between those symptoms which belong to compression and those which signify concussion, and it must be borne in mind that symptoms of the former may be occasioned by the formation of clots within the ventricles. Fractures at the base of the skull always are to be considered most dangerous, as the patients generally succumb in a few days.

From what has been said it will be seen that three symptoms, when appearing together, point conclusively to fracture of the base of the skull: these are, 1st, hæmorrhage from the ear; 2d, the discharge of a watery fluid from the ear; 3d, facial paralysis. Each of these may exist alone without fracture, but when they present together the diagnosis will appear beyond a doubt.

In most of the cases, especially those which recover, in which the cerebro-spinal fluid exudes, the flow comes from the fractured labyrinth. If this should be cerebro-spinal, there must be a considerable tear in the dura mater—in itself an almost fatal injury—and the tear must gape considerably to allow the fluid to pass for a considerable time. In the former case, the fluid may exude without any inflammatory meningeal symptoms.

There is another fracture of the skull which is denominated a *punctured* fracture. This is caused by a nail, a spike, the sharp extremity of a pick-axe, or a rail, or bar of iron being driven into the skull. In this latter accident, there is always more or less injury done to the brain, and more or less depression of both tables. The symptoms of compression are not always imminent, but the accident must be considered serious, and calls for the immediate use of the trephine.

James McA., a slater by trade, while performing his avocation on the roof of a three-story brick house, lost his balance and was precipitated head foremost to the street below. He struck upon a pile of paving stones with the right side of his head, and lay for a time insensible. I was in the neighborhood at the time and was called to the accident. I found him bleeding most profusely from an extensive head-wound, which, beginning at the temporal ridge extended downward to the right eye, thence across the eyelid to the internal canthus. The upper part of the eyeball with the insertion of the trochlear muscle were distinctly visible. The flesh was rolled up and the wound filled with dirt. The bleeding was very profuse and therefore I was obliged to ligate the anterior and middle temporal arteries in the street where he was lying, and, having extemporized a stretcher, I sent him to the Good Samaritan Hospital.

Upon cleansing the wound and carefully inserting the finger, several pieces of loose bone (one an inch square) were detected and taken away, the larger one forming a part of the outer rim of the orbit, and a part of the base of the zygoma. The wound was brought together with silver sutures, and the other injuries examined. There was a Colles fracture of the left arm, which was dressed with a carved splint made for the purpose; not so perfect, by the way, as Bond's apparatus, but sufficiently good to make an excellent cure. A dislocation of the right elbow-joint (olecranon backwards) was then reduced, and a most severe contusion of the right knee carefully bandaged. Arnica 3 was given internally, and the patient, much exhausted from his sufferings, allowed to rest. Fever, delirium, coma, etc., set in, which were controlled by aconite during the first days, and opium thereafter. Slowly the young man recovered from his injuries, and a good constitution carried him through.

An orphan boy, about five years of age, was leaning from the third

story window of a schoolhouse, when he fell forward violently, striking his head upon the ground. He was perfectly insensible, and was brought a distance of five miles to the hospital. When I saw him, about six hours after the injury, I found him totally deprived of consciousness or sensation, his urine had passed involuntarily, the pulse was hard, full, and slow, the mouth drawn to one side, and other symptoms of an alarming character. Upon examining the wound I found a depression in the skull on the right side, caused by an irregular fracture of about an inch and a quarter in length. This was, with a little difficulty, raised with the elevator, and the external wound allowed to remain open. Six hours after, a slight return of consciousness was indicated by sensibility to pain. He was given arnica 6th every two hours, and arnica solution applied to the open surface. The next day the wound was brought together, and the patient rapidly recovered.

Ambrose Paré is said to have been the first who pointed out the fact, that the inner table of the skull, may be fractured, without the external being broken, or there may be a *depressed fracture* of the inner table without a breakage of the outer, though the latter may be divested of its periosteum. This curious condition is chiefly found in *gunshot fractures* of the cranium. The fracture of the internal table, until the year 1865, was supposed to be due to the greater brittleness of the vitreous bone, but Mr. Treevan has proved, that fracture always commences in the line of extension, not that of compression.

There can be no doubt at the present time, that if there is apparently a simple fracture of the skull, and there be doubt about its diagnosis, the proper method is to cut down upon it and ascertain its nature and extent. This is in direct opposition to the rules of all the older surgeons, who saw in scalp wounds, erysipelas, hæmorrhage, and death. Experience, however, proves this to be the best rule, and it may be followed in every case of the kind.

Concussion of the Brain may be divided into three stages. The first is that of insensibility and derangement of the bodily powers, which immediately succeed the accident. While in this condition the patient is apparently insensible to external impressions, but can generally be aroused, pulse intermitting, extremities cold, and breathing difficult, but in the generality of instances without stertor. The pupils may be dilated or contracted, or one may be dilated and the other contracted. This stage has but a short duration, and is succeeded by the second, in which the symptoms gradually disappearing, the pulse and respiration become more natural, and though not entirely normal, are sufficient to diffuse warmth throughout the extreme parts of the body, and to maintain life. As the effects of the concussion still diminish, the capability of exerting the mind becomes increased, the patient can reply to questions, and refers the chief cause of his sufferings to the head. *Vomiting* often occurs at this time, and is not an unfavorable symptom. As long as stupor remains, inflammatory action appears to be moderate, and as the former abates, the latter increases; and this constitutes the third and most important stage of concussion. Death, however, sometimes instantaneously supervenes, from cessation of the heart's action.

These are the symptoms that are laid down as belonging to concussion. The question, however, arises regarding the fatal cases of so-called concussion, as to how much *contusion* there is of the brain-substance in these cases. Dr. Bryant* makes the following remarkable statement: "*At*

* The Practice of Surgery, p. 63, American Edition.

Guy's Hospital, during the last fifteen years, no case is recorded of death from concussion without change of brain structures." He also says, page 63:

"Mr. Hewett states: 'In every case in which I have seen death occur shortly after, and in consequence of an injury to the head, I have invariably found ample evidence of the damage done to the cranial contents.'

"Mr. Le Gros Clark, of St. Thomas's Hospital, states: 'I have never made nor witnessed a post-mortem after speedy death from a blow on the head, where there was not palpable physical lesion of the brain;' and Dr. Neudorfer, of the Austrian army, declares that he has never seen concussion, properly so called, except in apparently trivial injuries.

"M. Fano, a recent French writer, has also come to the conclusion, 'that the symptoms generally attributed to concussion are due, not to the concussion itself, but to contusion of the brain, or to extravasation of blood.' In fact, all now agree when death follows a severe shaking of the brain, or concussion, that contusion or bruising of the brain is invariably found."

Treatment.—The medicine that is most essentially serviceable in the treatment of concussion, is arnica; and its early administration, if the injury be not extremely severe, will not only prevent many of the evil consequences that may result, but by its influence upon the vessels may limit extravasation of blood within the cavity of the cranium. If the injury be severe, and there is extreme restlessness and jactitation of the muscles, quick, small pulse, rigors, and delirium, bell. must be employed. If there be jerking of the tendons of the extremities or clenched hands, foam at the mouth, stram. will be of service. If the patient roll the head from side to side, and there is much oppression, stertorous breathing, hiccup, etc., hyos. is indicated. The medicines that are homœopathic to irritation, and which should be employed at the commencement of the third stage, are ignatia and cicuta virosa. It would perhaps be the better practice, when the cause of the affection is considered, to alternate arnica with other medicines which the symptoms may render most applicable. Aconite should not be forgotten, when after the injury the mental faculties of the patient appear considerably impaired, as inability to think, weakness of memory, vertigo on raising the head, blackness before the eyes, nausea, and sometimes vomiting; when the latter symptom is prominent, and the matter ejected is blackish or brownish, with prostration of the vital powers, ars. should be employed.

Compression of the Brain.—The brain may be compressed four ways. 1st, from effusion of inflammatory product; 2d, extravasated blood; 3d, from suppuration, and 4th by depressed bone. Assistance in the diagnosis from either of the above causes is derived from a knowledge of the time at which the symptoms of compression occur. Thus a blow with a hammer, fracturing both tables of the skull, produces immediate symptoms. An extravasation of blood takes place more slowly, and the symptoms follow gradually in severity, as more fluid is poured out. Effusion from inflammation takes a longer time for its appearance than the extravasation of blood, and suppuration, which is generally caused by the presence of a foreign substance, occupies a still longer period, while depression of bone, either of one or both tables, produces immediate symptoms.

The records of surgery furnish numerous examples of perfect recovery after the most extensive depressions, from which the patients sustained but little inconvenience, and for the relief of which no operations were performed. On the other hand, cases occasionally occur in which from depression of both tables of the skull, or from extensive fracture of the inner table, the most urgent symptoms have resulted, but have been speedily relieved upon elevating the bone to its natural level.

The symptoms of compression resemble those of apoplexy. If the cerebral functions cease totally or partially in consequence of the pressure of extravasated blood upon the brain, the symptoms of nervous apoplexy or paralysis are present, which in many respects closely resemble those produced by violent concussion. The patient is extremely pale, with pulse feeble and irregular, and the whole body appears totally paralyzed; vomiting sometimes occurs. In some instances, after such a condition has existed for a time, the pulse becomes fuller, the face assumes a more natural color, or becomes very red, and all other symptoms of hyperæmia make their appearance, precisely as after concussion.

In other cases the patient is deprived of consciousness or sensation, is totally or partially paralyzed, fæces and urine pass off involuntarily, or the latter may be retained: the breathing is stertorous, the pulse is hard, full, and slow, the eyelids droop as if paralyzed, the mouth is drawn to the side, and the eyes are staring and protruded, with insensible and often dilated pupils. In many cases the patient vomits, and the face looks livid and turgescent. Pus, or coagula formed by extravasated blood, may also produce compression. Suppuration, however, does not immediately follow an injury of the skull, and often proceeds from irritation occasioned by the shattered fragments of the internal table. Mr. Bryant lays down the following important diagnostic points:

"When a patient receives a direct blow upon one side of the head, and a fracture with depression of the bone ensues, associated with paralysis of the opposite side of the body as an immediate result of the injury, and a fixed and dilated pupil on the side of the injury, the conclusion is inevitable that the depressed bone is the cause of the paralysis, by producing pressure upon the brain; the depression must, however, be very great to give rise to such symptoms.

"When another patient sustains a similar injury, with or without depression of the bone, but followed after a distinct interval of time by paralysis of one side of the body, whether of the injured side or not, it is quite fair to infer that hæmorrhage has taken place inside the skull, and is the cause of the compression.

"In both of these cases a local injury is followed by local mischief, causing a local paralysis, and surgical treatment is of great promise. In these cases the mode of production of the injury and the history form the surgeon's best guide to its nature. These cases are, however, very rare."

The following is the differential diagnosis between concussion and compression:

CONCUSSION.	COMPRESSION.
Symptoms immediate.	Interval from a few minutes to a quarter of an hour.
Patient able to answer questions, with difficulty, and in monosyllables.	Power of speech lost.
Power retained by special senses.	Not retained.
Nausea and sometimes vomiting.	Stomach not active.
Relaxed bowels.	Torpid bowels.
Respiration, without much noise.	Stertorous.
Passage of urine involuntary; power retained.	Atony of bladder.
Contracted pupils, lids movable.	Dilated and unaffected by light.

Treatment.—The first act of the surgeon, when called to a patient suffering from compression of the brain, is to administer a dose of arnica. This medicine is now employed by many of the most distinguished surgeons in

the treatment of this particular variety of injury, but few of them (we refer to allopaths) acknowledge their indebtedness to Hahnemann for the introduction of this important remedial agent. If symptoms are present that in a measure call for the exhibition of other medicines, they may be administered in alternation with arnica.

Veratrum should be employed when there is coldness of the whole person, with distorted and protruded eyes, disfigured countenance, flabby muscles, trismus, and imperceptible breathing. **Coffea** by the mouth and anus has frequently succeeded in relieving such symptoms.

Aconite is an important medicine in the treatment of compression, and **belladonna** has frequently produced the most desirable results.

Coffea is an excellent palliative, but must always be succeeded by other more appropriate medicines. **Opium** also restores the reactive power of the organism, and is indicated when there is stupor, with coma, stertorous breathing, red, bloated face, constant motion of the lips, full, slow pulse, and frequent profuse sweat.

Lauroc., hyos., stram., merc., plumb., and iodine, are useful medicines; the latter, especially when there are violent pulsations of the whole body, with anguish and dyspnœa. Other remedial agents may also be called for, but want of space will not permit their insertion in this place. Full details may be learned from the various works upon the Materia Medica. When this treatment does not relieve the patient, and there is reason to believe that the brain is still oppressed by a coagulum, the trephine must be resorted to, and the foreign substance removed.

If after injury inflicted upon the skull, a depression is observed, and there are but slight symptoms of compression, the surgeon must remember that fragments of bone, though at first producing little irritation, may after a time provoke the inflammatory process, which may terminate in suppuration, and thus the most disastrous consequences may ensue. The question of operation in this, as in all other cases, requires serious consideration.

The Application of the Trephine.—The use of the trephine was known from remote ages. Bones have been exhumed from the tombs of the Incas in Peru which present undoubted signs of having been perforated with this instrument. From this we learn that the trephine must have been known prior to the times of Cortez.

At the present time there is perhaps no subject within the domain of surgery upon which surgeons are so divided in opinion, as that of the application of the trephine in injuries of the head. Mr. Gamgee has well stated that "the lesson very impressively taught by a careful study of the subject, is this, that whereas the trephine was almost indiscriminately employed before surgery attained to the position of a science, its use has steadily decreased as enlightened experience has accumulated."* From rather a careful study of the literature of this subject, I am disposed to believe that the presence of brain symptoms, or in other words, the appearance of those symptoms which indicate that the brain itself is being much interfered with, and *that the lesion is on the increase*, is the indication that the trephine should be employed. Liston,† thus wrote years ago: "When fracture of the skull is complicated with wound of the scalp, the surgeon will not in general mend matters much by trephining, as has been advised, merely because there is a wound; if the depression is pretty extensive, and unless he has a better reason to give for the proceeding than the mere circumstance of the fracture being compound, as it is called, he will often thus

* On the Treatment of Compound Depressed Fractures of the Skull, by Sampson Gamgee, Esq, F.R.S.; Braithwaite's Am. Ed., January, 1877, p. 116.

† Practical Surgery, p. 45.

add as much to the injury and to the risk which the patient is subjected to by it, as he would by dividing the scalp in simple fractures."

And to-day, after a most careful review and comparison of the practice of various surgeons, Mr. Gamgee thus finishes his most scholarly lecture:

"Many surgeons, from being advocates of the trephine, have gradually abandoned it; but, so far as my researches have extended, I cannot find an instance of conversion to the practice of trephining by a surgeon whose reason indisposed him to adopt it, or whose experience had once led him to relinquish it. That there may be cases of compound depressed fracture of the skull justifying operative interference, I do not deny, and I myself had occasion to operate successfully on such cases in this theatre. For the present, I shall limit myself to again impressing upon you my conviction that, in compound depressed fractures of the skull, without brain symptoms, the proper course of practice is not to trephine."

In the *American Journal of Medical Sciences* for April, 1877 (page 542), is a report of 106 cases of fracture of the cranium, by M. C. Sedillot, taken from the *Gaz. Médicale de Paris*, No. 39, 1876, in which the author holds, "that in fracture of the internal table of the cranial vault, with displacement of fragments, trephining is the only means of preventing complications which are almost inevitably fatal."

Of the 106 cases of fracture collated, 77 were trephined; in the remaining 26 cases, no operation whatever was performed. Of the latter, but a single one recovered.

Of the 77 patients who were trephined, 30 recovered and 47 died; 9 were operated upon before the appearance of any untoward symptoms; of these 6 recovered and 3 died.

Of the 21 cases in which the operation was performed before the sixth day, 8 ended in recovery, and 13 in death. Of the remaining 47 patients who were trephined *after* the sixth day, 15 recovered, and 32 died; showing that the mortality is in direct proportion to the time of operating. Two-thirds of the number of cases were cured by preventive trephining; more than one-half by early trephining (before the sixth day), and less than one-third by late trephining (on or after the sixth day).

In injuries of the head there is at present a great deal of discussion among surgeons as to whether, disregarding depressing fractures, the application of the trephine should be determined by internal symptoms, or, if the operation has been determined upon, to localize the spot where the instrument should be applied by the presenting subjective symptoms. Especially in recent cases of traumatism is this method of determining the point of operation said to be the most serviceable. According as one or another set of muscles are implicated, the surgeon may be able to determine the particular motor centre that has been injured. It should be, however, borne in mind that by reflex nerve irritation remote parts may be affected, and symptoms, therefore, being only secondary, trephining at the wrong point might be indicated. In the present state of our knowledge of the convolutions of the brain, trephining cannot, I think, be guided by the "*localizations of the cerebrum.*"

This much, however, we know, that if there exists a convulsion, and above all, paralysis of a group of muscles, there also exists some lesion of a motor centre, and since physiology teaches us where these centres are, it should be an easy matter to refer them to their corresponding points in the cranium. M. Lucas Championnière tells us, that what are termed the cortical centres occupy a space limited to the vault of the cranium, and that all the centres and all the convolutions which form them, are grouped around the fissure of Rolando, and immediately below the anterior half of

the parietal bone. The method of finding it is thus described. It is known that in man the fissure of Rolando commences fifty-three millimeters behind the bregma; fifty-five millimeters are to be measured behind it and marked on the skull. Next we must measure behind the external orbitar process a horizontal line, seven centimeters long, and erect a line at right angles to its extreme edge, three centimeters long, and the point thus found will correspond with the inferior extremity of the fissure of Rolando. If, between these two points thus formed, we mark off on the integument a straight line, we obtain the "*line of Rolando*," and if the trephine be applied exactly over this line, the fissure of Rolando is met with invariably. These measurements are rather less in females.

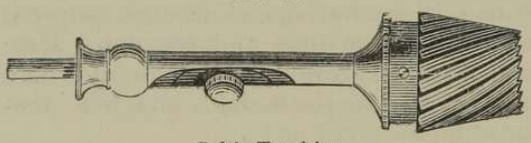
It must be remembered that, although this method of measurement is true for certain regions, individual convolutions vary somewhat in their positions, and are not always constant towards the vertex, and that the size of the crown of the trephine must be taken into consideration according to the presumable exactness of the diagnosis.—*Abstract of Medical Science*, vol. iv, No. viii.

The instruments to be employed are found in the trephining cases, or are placed in the ordinary amputating, resecting, or general operating cases of the day. They consist of a couple of scalpels, a lenticular-shaped knife, a trephine or two, which are set in one handle (Fig. 312 represents the shape of the ordinary instrument; Fig. 313 shows Galt's trephine, and Fig. 314 the handle), the ordinary artery forceps and tenaculum, a brush to clean the trephine, a sharp-pointed piece of wood, or a wire or toothpick to clean the groove made by working the instrument.

FIG. 312.

Plain Crown Trephine.

FIG. 313.



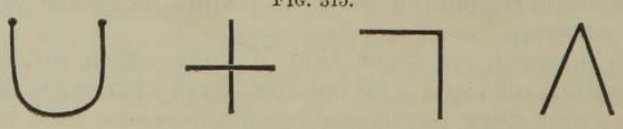
Galt's Trephine.

FIG. 314

Trephine Handle.

The patient generally being in a comatose condition, or in a state of partial insensibility, an anæsthetic agent is unnecessary. If the fracture is compound, it may be requisite to enlarge the incision. If the fracture is a simple one, with depressions, then incisions may vary according to the judgment of the operator. They may be made either of the following shapes (Fig. 315). After

FIG. 315.



having raised the flap sufficiently, the crown of the trephine is placed over the part to be removed, and fixed in its place by pressing down the pin in the centre, which must be, by a little rotation and pressure, fixed in the skull; the instrument is then rotated—*without pressure*—backward and

forward, being removed from time to time to clean away the dust with a brush, and to cleanse the groove with the quill; as the lower table of the skull is reached more care is required, and when the "button" is sawn out it may be lifted away with the forceps, elevator, or a gimlet made for the purpose. If it is possible, in using the trephine, the sinuses of the dura mater and the large vessels should be avoided. It may also be borne in mind that there is often space enough left between the fractured bones to introduce an instrument and elevate the depressed portion without applying the trephine. Again, it is not always necessary when endeavoring to

FIG. 316.

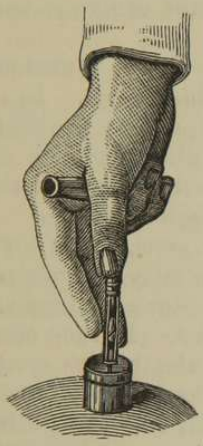
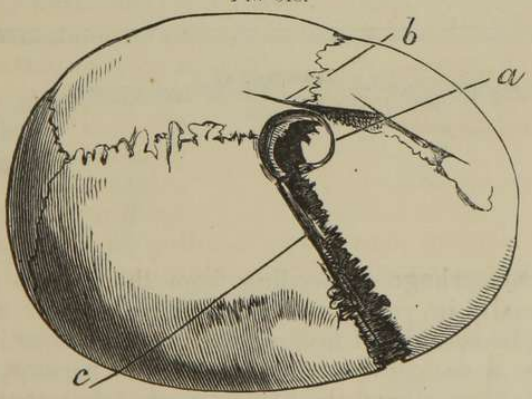


FIG. 317.

elevate a portion of bone to remove the entire circle with the trephine, all that is required is sufficient space for raising the bone; this may be often done by fixing the pin on the edge of the sound bone, and removing with the saw only the segment of a circle. Figs. 316 and 317 show the methods of operating, and Fig. 318, from Holmes, shows the *method of placing* the crown of the trephine partly in sound bone.

FIG. 318.



An extensive depressed fracture of the vertex of the skull which has been elevated by trephining. The mark of the trephine is seen at the corner of the sound bone, *a*, and it has also just touched the end of the depressed bone, *b*, and the traces of Hey's saw, which has been used to take off the overhanging edges of the sound bone, are very distinctly marked, *c*. The depressed bone has all been very fairly elevated, and the operation did temporarily relieve the symptoms of compression, as the patient became a little more sensible, and was able to speak, but he only lived a few hours. Death was caused mainly, as it seems, by hæmorrhage between the bone and dura mater, the source of which was not precisely ascertained. The fracture passed across one of the main grooves for the middle meningeal artery, but the vessel itself appeared uninjured. The dura mater was not torn, but the lower part of the middle lobe of the brain was contused on each side. The depression seen at the back of this preparation appears to be due to some old injury, but nothing is known about it.—St. George's Hospital Museum, Ser. i, No. 16.—HOLMES.

CHAPTER XXXII.

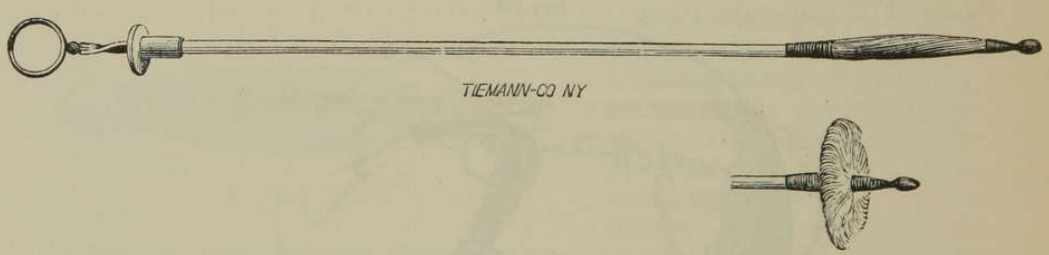
INJURIES AND DISEASES OF THE NOSE.

Malformations.—The nose is occasionally subject to malformation, the chief of which is a deviation of the septum from the centre to one side, or, in some instances, downward.

In two cases that came under my own supervision, I was enabled to remedy the deformity by excising the superabundant parts. In one case I was obliged to cut through the central cartilage, and in the other to slice off a portion of it, and restore it to position by plugging with tinfoil the nostril encroached upon. In both instances I was astonished at the amount of blood lost, although no vessels were large enough to ligate.

Foreign Bodies.—Foreign bodies, such as beads, peas, bits of wood, cotton, pieces of pencil, etc., are thrust into the nose, especially by children. They often occasion not only a good deal of inconvenience and fright, but lead to very serious ulceration, if not speedily removed. If they can be seen, a small pair of curved and delicate forceps, with the blades spread widely apart, should be introduced carefully along the floor of the nares and the foreign body grasped and removed. If this is not sufficient, a bristle probang closed (Fig. 319) should be passed into the nostril and the handle withdrawn. This bends the bristles, fills the nares, and the body is removed. In other cases longer instruments are required. On all occasions the greatest gentleness and patience should be employed, and in the majority of instances an anæsthetic should be used. Strong snuff may sometimes produce sufficiently violent sneezing to dislodge the foreign body.

Fig. 319.



Epistaxis—Hæmorrhage.—Bleeding from the nose is a very frequent occurrence, especially in young subjects. It may occur as a critical discharge and then be considered favorable, or it may occur in enfeebled constitutions and be a dangerous symptom. Some persons are much more prone to epistaxis than others, the bleeding occurring upon slight provocation, or in many instances without any assignable cause. Puberty and old age are the periods at which hæmorrhage from the nose is most likely to occur. In some cases it is so profuse as to cause very great prostration; indeed, instances are recorded which terminated fatally.

Treatment.—The homœopathic Materia Medica furnishes a number of medicines which are very efficacious in the treatment of nosebleed, even of a violent character. Among these are:

Aconite, especially when the bleeding arises from congestion and is accompanied with a full bounding pulse.

Carbo veg., in old persons of a debilitated constitution and when the hæmorrhage is profuse and long lasting. I have been very much gratified with the marvellous effects of this medicine in cases of severe nosebleed.

China, also, in anæmic and weak persons, with tendency to faintness and vomiting, cold sweat on the forehead, paleness, singing in the ears, is an excellent medicine.

Crocus is a specific for hæmorrhage from the nose of dark blood, and not only arrests the flow for a time, but given regularly for a month has, in several cases coming under my observation, eradicated the disposition to a recurrence of the discharge.

Erigeron is also a valuable agent for epistaxis, when there is congestion of the head, with dark-colored blood, though not of so deep a color as that calling for crocus.

Hamamelis is said to be excellent in this affection, but has generally disappointed me.

Nux vomica will arrest bleeding in plethoric people, with tendency to congestion of the liver and hæmorrhoids, constipation, and dyspepsia.

Veratrum; in cases where there is great weakness, cold sweat, blueness of surface, vomiting, and great prostration

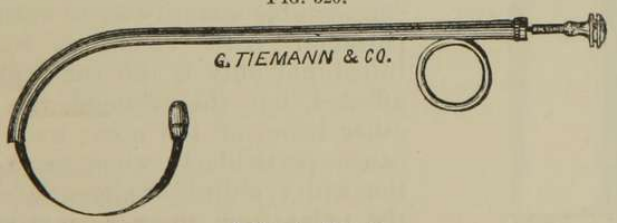
Secale; when the symptoms resemble those described under veratrum, without the vomiting.

When there is passive hæmorrhage in old people, carbo veg. is excellent. Trillium also may be employed.

Thlaspi bursa pastoris, arsenicum, pulsatilla, rhus tox., mercurius, and agaricus, are also medicines of importance.

If the medicines fail in producing an arrest, and the patient is sinking, or shows symptoms of prostration, I have frequently stopped the hæmorrhage by cutting strips of cotton cloth, half an inch wide and six inches in length, twisting them upon themselves, and then having dipped them in a solution of alum, or tannin, passed them into the nostrils with a female catheter. In other instances, it may become necessary to plug the posterior nares. This is effected as follows: Prepare two dossils of lint, each somewhat larger than the openings of the posterior nares (Rohrer's styptic cotton would answer admirably for this purpose), and having secured them by tying around their middle a strong cord, pass into the nostrils a Bellocq's canula (Fig. 320) with the piston drawn out; having carried the instru-

Fig. 320.



Bellocq's Canula.

ment carefully along the floor of the nares, its curve will project down behind the velum palati; then push forward the piston, which brings the spring with the eyelet at its extremity, into the cavity of the mouth. Into the eyelet pass the end of the cord attached to one of the dossils of lint, and draw out the piston; this brings forward the thread, and the dossil is forced into one of the openings of the nares. A similar proceeding is adopted with the other nostril. The plugs should be allowed to remain a day or two, before they are carefully removed.

Professor Weber discovered that when a person breathes entirely through the mouth, the posterior nares are closed by the soft palate; therefore the

nasal douche should be employed. The water should be hot, and contain a small quantity of *liquor ferri persulphatis.*

Dr. Beverley Robinson* records a most severe case, in which styptics had failed, but pressure on the facial (made with pads of lint) on the superior maxillary bones, just before the vessels reach the alæ, was successful.

Lipoma Nasi—Hypertrophy.—This affection consists of a hypertrophic condition of the integumentary substance of the nose, which may arise from various causes; often from acne rosacea of long standing, and from depositions of a fatty substance around the alæ nasi. The growths, as we most commonly see them, are globular or lobed, and vary in number and size. Cases are upon record in which they attained such magnitude, that they hung down on the chin, interfering with respiration and speech. In other cases, these growths may be *flattened*, and again in others, they may be *pedunculated.* They are gristly and hard when cut into, and though they may attain a remarkable size—growing externally—they never invade either the mucous membrane or cartilaginous substance of the nose.

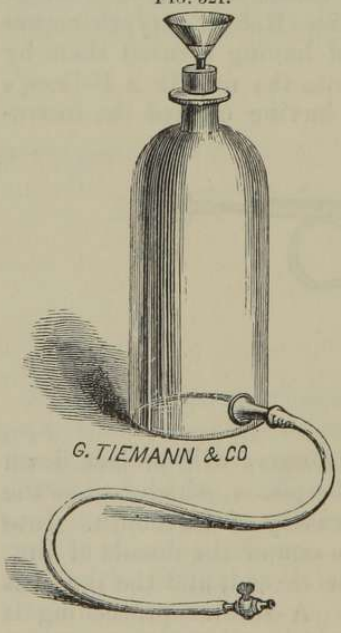
The color of lipomata is dusky red, or purplish; and they rarely appear in persons under fifty years of age.

Treatment.—Nothing but the knife will be of any avail. The growths must be cut away, or better, a flap of integument dissected from them, and then enucleation effected. There is often a good deal of nicety required in the dissection to prevent the cartilages from being cut through. To obviate this, the surgeon should keep his finger constantly in the nostril.

Ulceration—Ozæna.—This affection consists in a troublesome ulceration of the lining membrane of the nostrils, attended with fetid purulent discharge. Occasionally it is followed by destruction of the nasal cartilages, and by caries of the nasal bones. In some instances the senses of smell and taste are entirely destroyed.

Though the origin of the disease is somewhat obscure, yet there is reason to believe that, in most instances, it is connected with the primary or secondary forms of syphilis; and in others with the purely scrofulous diathesis. The most disagreeable feature of the affection is the accumulation of inspissated mucus or incrustations within the nasal cavities, which sometimes form in such considerable quantity as to entirely close the passages. After ulceration is fairly established, not only is the cartilaginous septum affected, but the ethmoid, the spongy, and other bones of the nose; and, in the worst cases—particularly when there is complication with syphilitic or mercurial disease—even the palate and superior maxillary bones exfoliate, and in consequence of such ravages the contour of the nose is destroyed, and an otherwise frightful deformity of the face results.

Fig. 321.



Treatment.—The medicine which has been productive of most beneficial results in my hands is the *bichromate of potash.* It has cured for me the most inveterate cases. The secret of success, is its prolonged use, sometimes it being steadily taken for months.

* Medical Record, March, 1876.

I use the third trituration, and give one powder per day. In addition to this every morning the nasal douche (Fig. 321) is employed, the water being at a temperature of 68° or 70°, and containing salt sufficient to render it brackish to the taste. Patients, in the majority of cases, express themselves as experiencing the greatest relief after its use. In some cases, however, it cannot be borne, it giving rise to pain and sometimes even hæmorrhage. In such, of course, cleanliness must be obtained by the use of a small syringe. With reference to the insufflation of alum or tannin, or the local application of various substances by means of steam atomizers, I cannot speak in very high terms, nor can I of the injections of carbolic acid, permanganate of potash, sulphate of copper, and other drugs. The properly selected medicine and cleanliness are much more successful than local measures, according to my personal experience.

Other remedies which have chiefly been employed in this affection are: alumina, teucrium, puls., sulph., calc., or magnes. mur., bryonia, bell., lycopod., nat. mur., and causticum, in the first stage; when the secretion has been transformed into pus, and the nasal bones are affected, with fetid odor from the nose and loss of smell, mercurius and aurum are to be administered. These may be followed, if required, in *ozæna scrofulosa*, by sulph., sil., acid nit., phosph., conium, or kali bich. In syphilitic ozæna, mercurius constitutes the principal remedy; if, however, the patient has previously been subjected to an injurious course of treatment with this medicine, aurum is preferred, and succeeded, if it be found requisite, by acid nit., hepar, asafœtida, conium, or thuja.

The following are the more particular indications for the administration of the medicines:

Alumina.—Constant discharge from the nose of a thick, yellow, fetid matter, especially in the morning; at the same time anorexia, with obstinate obstruction of the nose.

Aurum.—A thick, yellow, half-watery, half-dry discharge is blown from the nose; fetid odor from the nose; loss of smell, especially in ozæna syphilitica, with discharge of bloody pus; yellow ichorous crust over the alæ nasi; the nose, forehead, and upper part of the face red and swollen.

Magnes. mur.– Ozæna benigna; soreness in the upper part of the nose; yellow crust on the nose; discharge of a yellow ichorous matter; redness and soreness of the upper lip, and swelling of the lower part of the nose.

Mercurius is indicated, especially in syphilitic ozæna; swelling of the whole nose, the nasal bones themselves being enlarged; dryness of nose, with yellow discharge and fetid smell. This medicine is also suited to ozæna scrofulosa.

Pulsatilla must be employed when there is discharge of yellowish-green ichorous matter, with fetid odor; the nose swollen. This medicine is also serviceable when the disease attacks females with retarded menstrual discharge or leucorrhœa.

Baptisia, hydrastis, phytolacca, and sanguinaria, are recommended in *The New Remedies*, by Drs. Hale, Powers, and others, for this troublesome affection.

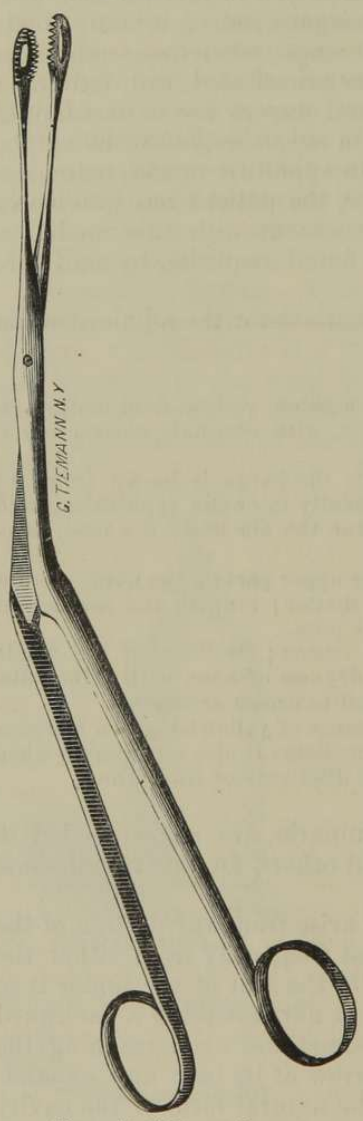
Polypus Nasi.—A polypus of the nose may arise from any portion of the schneiderian membrane, but it originates most frequently from either the superior or inferior spongy bones. Occasionally the seat of the tumor is so high, that instead of falling toward the anterior nares, it takes a backward direction, hanging behind the palate, and sometimes even reaching the pharynx. It is most commonly pyriform, narrow at its base and expanding below, though this depends much upon the natural form of the cavity in which it is situated; sometimes the base of the tumor is exceedingly large. Either one or both nostrils may be affected, and when the latter is the case, the patient breathes with much difficulty, and with a peculiar rattling noise; in damp weather the tumors often project beyond the

exterior of the nostrils, but assume their former position upon the reappearance of a dry atmosphere.

The consistence of nasal polypi are not less variable than their form. In some instances they are soft, and in reality consist of enlarged mucous substances; to these the term *mucous polypi* is given. These are the most amenable to treatment. The *fibrous polypus* is a dangerous and obstinate growth. It is not frequently met with, has none of the softness of the first variety, grows from the periosteum, is opaque, reddish in color while *in situ*, being traversed with large vessels. When it projects back into the pharynx, the term *naso-pharyngeal polypus* is given to it. It is often produced by pressure, caries of the ethmoid and spongy bones, inflammation of the brain, etc.

Treatment.—The medicines which have proved most efficacious in this disease, are calc. carb., teucrium, sulphur, and phos.;* puls., silicea, staph., carbo an., and sepia may also be called for in some cases.

Fig. 322.



Simcock's Polypus Forceps.

The best medicines are undoubtedly calc. carb., teucrium, phosphorus, and sulph. I once treated successfully a case of returned polypus, for which an operation had been performed in New Orleans, by teucrium, phosph., and filix mas., with occasionally a dose of calcarea carb and sulph.

Dr. John E. James speaks highly of freshly powdered sanguinaria canadensis root, blown through a quill or other cylindrical tube over the whole polypus; in many, if not most cases, three applications at intervals of from three to seven days being sufficient to effect a radical cure, and should the polypus be so large as to necessitate forcible removal, the application once or twice will give temporary relief before the operation.

Dr. Thos. Bryant, after an experience of three or four years, also speaks highly of the use of tannin in a similar manner.

Sometimes it is necessary, when medicines cannot effect a cure, to remove the polypus by mechanical means: this may be done in a variety of ways, but in most cases the use of the forceps is preferable. These should be stronger than the ordinary dressing forceps, well serrated and slightly curved. The patient is seated on a low chair, before a powerful light, with the head moderately thrown back and firmly supported; the surgeon then carefully introduces the instrument with its blades expanded, grasps the tumor firmly at its root, and then by twisting rather than pulling removes it.

* For several interesting cases of polypi nasi, cured by the three former of these medicines, see British Journal of Homœopathy, vol. viii, p. 283; and vol. x, p. 484

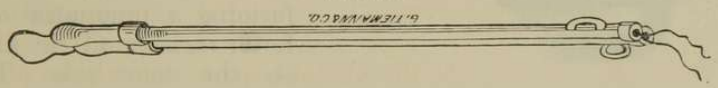
Although in many surgical works the extraction of a polypus is treated as an easy operation, yet my experience proves that a strong polypus, situated far back, with the greater part of its bulk posteriorly, is by no means readily detached. In the first place, the straight forceps usually found in pocket cases is not long enough, either in the handle or in the blades, and from its shape is not well adapted to the meati. The better variety of instrument should be eight inches in length, with a curve in the blades, with deep serrations at their extremities for the purpose of grasping firmly the polypus. Even these may sometimes have to be repeatedly introduced before a successful result is obtained.

A still better instrument is that of Simcock, Fig. 322. Its handle is well depressed and there are fenestræ in the extremities of the blades, which are long and narrow.

Ligature is employed often with success when the polypus cannot be extracted with the forceps. Many kinds have been used, as silk cord, silver or iron wire, catgut, etc.; probably the best is that composed of the latter and silver wire twisted together. A double canula should be introduced as far as possible into the nares, and the loop of ligature pushed far back to embrace, if possible, the foreign growth; this is aided by the introduction of the finger into the pharynx. The growth must then be constricted.

For this purpose the canula of Gooch answers better than the old-fashioned double cylinder, Fig. 323.

FIG. 323.



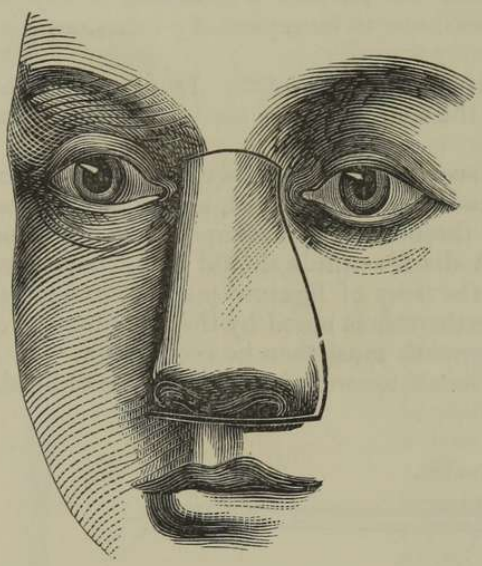
Gooch's Canula for Nasal Polypus.

Naso-pharyngeal Polypus.—In consequence of the difficulties experienced in obtaining access to the naso-pharyngeal polypus very many operations have been recommended as preliminary measures to the extirpation of the growth itself. Hence we have the division of the external nose, advocated by Hippocrates; the total resection of the superior maxilla, as performed by Syme in 1832, and by Flauvert in 1840; but this always left behind great disfigurement and functional disturbance, and for this reason was opposed by Langenbeck in 1861, who proposed to make the resection in such a manner that, after the second or fundamental operation is performed, the divided bone can be restored to its normal position.

Probably the most satisfactory operation for gaining access to the seat of this form of polypus is that advised by Prof. Bruns, of Tubingen, which he calls an "Osteoplastic Resection of the External Nose for the Removal of Naso-pharyngeal Polypi." It consists of a temporary resection of the bony skeleton of the external nose, allowing the bony and cartilaginous portions in connection with covering soft parts to be turned sideways. *Either one-half* or the *whole external nose*, according to circumstances, requires the opening of one or both nasal cavities. In the first instance the operation divides, temporarily, the processus nasalis of the superior maxilla, and the nasal bone of the same side, then, by violently forcing asunder the suture of both nasal bones, the hinge movement is obtained; while in the second case, a temporary resection is made of the processus nasalis, of the superior maxilla, of the septum nasi, and of both nasal bones; and here the movement proceeds at the junction of the nasal bones and of the processus nasalis of the superior maxillary of the opposite side. In order that the *modus operandi* may be fully understood, suppose a case where the

whole external nose is to be laid over on the right cheek. The first incision is made in the skin, beginning just below the inferior edge of the right ala nasi, and is carried in a horizontal direction through the upper lip toward the left as far as the first molar of that side. The section is made through the inferior bony edge of the apertura pyriformis, and there the point of the knife is directed obliquely upward in order that the parts where the mucous membrane passes over into the gums may be uninjured.

Fig. 324.



The second incision runs horizontally over the root of the nose corresponding to the naso-frontal suture, the point of beginning and ending being one continuation inward and upward from the internal angle of the eye.

The third incision connects the extreme left points of the two horizontal incisions, extending from the inner angle of the left eye, somewhat obliquely outwards and downwards along the left lateral wall of the nose and forming a junction with the inferior incision at the first molar on the same side. These incisions are seen in Fig. 324.

All these incisions must be carried through the periosteum down to the bone. With the saw, the spina-nasalis is divided at its base, and with the bone-scissors the section is carried still farther in the bony septum of the nose. A pointed saw is now inserted in the left inferior angle of the pyriform opening, and following closely the incision in the skin, cuts its way at first horizontally outward through the superior maxilla and then obliquely upward and inward along the course of the *third* incision to the naso-frontal suture. During this act, the point of the saw is constantly in the nasal cavity, and the internal wall of the maxillary cavity is not opened unless it has already been perforated by the tumor, but the exterior end of the inferior concha of the nose is cut through. The basis of both nasal bones is divided with a saw along the naso-frontal suture. There now only remains the vertical division of the septum narium, which is accomplished by the scalpel or bone-scissors, carried obliquely backwards, partly from the upper and partly from the lower half of the cross cut, thus forming in the septum an angle open in front. Now, by inserting a lever in the upper end of the vertical sawed cleft, the connection of the nasal bone and of the processus nasalis of the superior maxilla will be forced asunder and the entire external nose laid over on the right cheek (see Fig. 325). Thus the whole nasal cavity on both sides becomes directly exposed, and the space thus gained may be further enlarged by removal of the concha by horizontal incision and lateral dislodgment, or total removal of the septum, according to circumstances, whenever the neoplasma does not itself push away these parts or render them atrophied. The posterior wall of the palate can now be easily reached and also the basis cranii, which usually forms the seat of the naso-palatinal polypus (Fig. 326).

In Fig. 325 the normal relations of the parts after operation are exhib-

ited, and the same are shown in Fig. 326 after the removal of the septum and the conchæ of the left side.

While such a procedure is demanded for the removal of very large polypi, the opening of one cavity only will be sufficient in lighter cases, as when one nasal cavity is filled by the neoplasma and is greatly dilated by dislocation of the septum towards the opposite side. The measures adopted

Fig. 325.

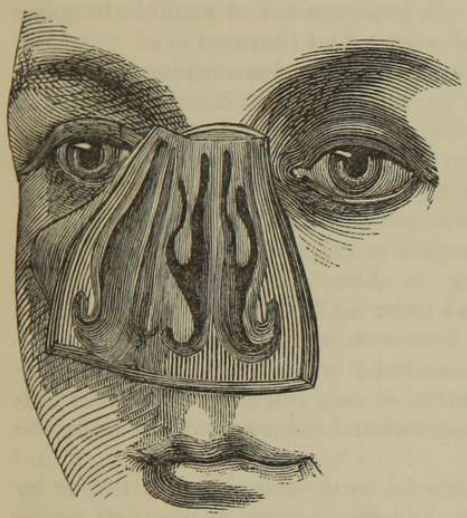
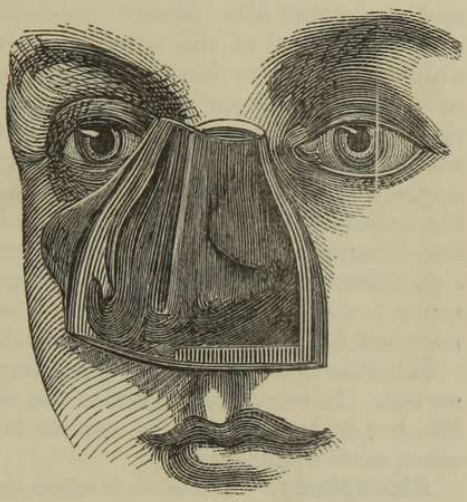


Fig. 326.



in such a temporary resection of one side of the external nose differs but slightly from the one already described. The incision through the integument is the same, only both horizontal sections begin somewhat nearer the median line. A modification might be also made in the lower horizontal incision by putting the knife into the external angle of the nostril, dividing the lower edge of the nostril, and then continuing the cut in a lateral direction.

The section is thus made somewhat smaller and does not touch the upper lip; but then the continuity of the aperture of the nostril remains intact. The sawing through of the bone with the pointed saw, begins at the lower external angle of the apertura pyriformis, at first horizontally, and then as before, upward and inward to the naso-frontal suture. From here the basis of the nasal bone, on the same side, is sawn across to the median line; then, by the use of the lever, the suture connecting both nasal bones is opened, and the one-half of the nose is by the hinge movement turned over to the opposite side.

The execution of the operation requires but a few moments, and presents no serious difficulties. The solution of continuity causes very slight functional disturbances, if any. None of the neighboring parts are in danger of being injured, except the lachrymal duct, which might be wounded by sawing too closely to the inner angle of the eye, but which can readily be avoided.

The hæmorrhage in this region is never great, and generally ceases spontaneously, as no large bloodvessel is cut through.

Having finished the temporary operation, the nose remains in its lateral position, till the fundamental operation, removal of the polypus, is completed. In the most favorable cases the preliminary and fundamental operations are executed at the same time; immediately followed by reposi-

tion and reunion of the nose. But in difficult cases the complete extirpation of the polypus is not advisable at the first operation, as when it has extensive attachments to the walls of the nose and palate, or when the operation has to be interrupted on account of fainting or great hæmorrhage. By the tampon, the hæmorrhage from the tumor is stopped, filling up the whole cavity with lint or cotton, and by this means the wound is kept open till in one or more consecutive sittings all the foreign growth is removed. In one case, reposition of the nose was performed only after twelve days, and in another after twenty-one days. It has been found possible to delay the replacement of the nose for several weeks, and this fact is of considerable importance to those surgeons who see in the supplementary application of caustics to the seat of the growth, a provision against a reappearance of the polypus. During this time nutrition is maintained by anastomosis with the sound side, so that no alteration in color or temperature of the skin appears on the divided parts. When reposition is adopted immediately, the application of a few sutures soon brings on speedy union, except when the division of the bony sutures is imperfect or jagged, then strips of adhesive plaster will aid in keeping the parts in direct apposition. Where reunion is delayed, the edges of the wound must be lightly freshened, and the necrosed bony edges removed with the bone-cutting forceps.

Reunion takes place in a few days, and the sequestration is never observed. In immediate reunion the cicatrix is only linear and scarcely visible, but in later cases the eschar is somewhat broader, and the disfigurement more apparent.*

Rhinoplasty.—The nose is often destroyed by disease, by accident, or by caustics. It may be that either the whole or a portion is removed, or indeed the entire nose, septum, turbinated bones, lips and roof of the mouth, making hideous deformity, thus rendering the patients not only revolting to themselves, but to all others. In such cases, the operation of rhinoplasty has accomplished changes of a most satisfactory character. Dr. Gurdon Buck and Dr. Hamilton, of New York, Drs. Pancoast and Gross, of Philadelphia, the Warrens, of Boston, together with many European surgeons, have made successful rhinoplastic operations.

Rhinoplasty may be performed by either *sliding* the flaps forward from each cheek, by *jumping* them by a twist, or by taking them from remote parts.

To remedy a partial destruction of the nose is an operation which may be often completely successful; but to restore the entire organ, is a much more difficult task.

If one or both alæ of the nose be destroyed, a flap "jumped" from the cheek and twisted by half a circle, may often prove satisfactory. The following case was successful:

Mrs. T., a middle-aged and respectable married lady, applied to me to ascertain if any means could be devised to remedy a deformity of the nose which was produced in the following manner:

She had some time since a painful tubercle on the right ala nasi, which had caused her much worriment of mind; and being fearful of malignant disease, she had consulted a cancer doctor, (?) who applied a paste which took away the tubercle, and with it, the whole ala of that side, causing a severe ulceration, which extended to the internal angle of the eye. This solution of continuity had healed, leaving an ugly cicatrix. I explained to her the nature of the operation which could be performed for the restora-

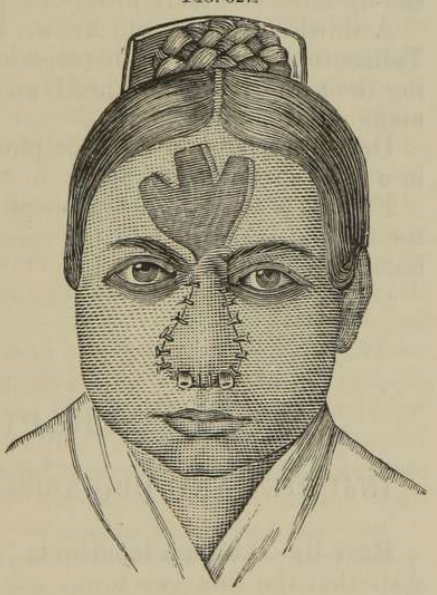
* For the description of this important operation, I am indebted to my friend Dr. Lilienthal, who translated it from the original German.

tion of the absent ala, to which she eagerly assented, and which was performed on the second day after our interview. The edge of the gap next to the face was very thin; indeed, was formed of a portion of the cicatrix already mentioned; while toward the tip of the nose the border was full, healthy, and prominent. The trouble, if there should be any, would evidently be at the thin margin during the process of cicatrization.

The operation was thus performed: Before she was brought under anæsthetic influence, a piece of wet parchment was laid over the nose, and cut the exact shape of the cavity to be filled, though, one-third larger all around. This was turned back upon the cheek and its outline marked with a pen and ink, by dotted lines. The patient was then rendered insensible, and the flap dissected up, leaving a pedicle. I did not, however, make an incision perpendicularly through the tissues to the cellular substance, but entered the scalpel in an *oblique* direction, thus making a bevelled edge around the entire flap, leaving the pedicle as near as possible to the ala nasi. In a similar manner the edges of the entire gap were refreshed, thus making two tolerably broad raw surfaces. The flap was then twisted to its place, and secured by pins of pure silver, around each of which a single turn of silk was passed. The ends of the pins were then cut with the nippers, and when fully recovered from the anæsthetic, the patient was allowed to return home. On the third day after, I visited her, and removed two of the pins, and applied a strap across the face and over the nose, extending from one cheek to the other. In two days I removed the remaining pins and a single suture which I had applied to draw the flap close down to the septum. The recovery was complete, and the astonishing manner in which the new ala has been rounded off by nature, and the almost imperceptible scar which remains from the wound in the cheek, render the operation one very satisfactory both to patient and surgeon.

If the whole nose is destroyed, the flap "*jumped*" from the forehead is generally preferred, as seen in Fig. 327.

Fig. 327.



Having moulded a piece of wax, the size and shape of the organ to be reproduced, over it a piece of wet parchment should be laid and accurately fitted; this should be turned back upon the forehead, and twisted over the mould two or three times, until an "accurate fit" is obtained. Many measurements and many adjustments are always necessary. Having fitted the pattern, it must be flattened out, laid on the forehead, and a line drawn an eighth to a quarter of an inch from its margin around it. The nostrils should then be filled with rolls of tenax, "prepared tow," and the flap raised. The edges of the chasm must then be carefully pared, in an oblique direction, and the flap brought downward, placed in position and secured by twisted silver wire.

After the parts have regained their vitality, the restoration of the columna may be attempted. Of this Mr. Liston writes:

"Restoration of the columna is an operation which, in this and other civilized countries, must be more frequently required than the restoration

of the whole nose. This latter operation came to be practiced in consequence of the frequency of mutilations as a punishment; but the punishment for some of our sins is left to Nature, and she generally relents before the whole of the organ disappears. The columna is very frequently destroyed by ulceration. The deformity produced by its loss, is not far short of that caused by destruction of the whole nose. Happily, after the ulceration has been checked, the part can be renewed neatly, safely, and without much suffering to the patient. The operation, which I have practiced successfully for some years, and in many instances, is thus performed: The inner surface of the apex is first pared. A sharp-pointed bistoury is then passed through the upper lip—previously stretched and raised by an assistant—close to the ruins of the former columna, and about an eighth of an inch on one side of the mesial line. This incision is continued down, in a straight direction, to the free margin of the lip; and a similar one, parallel to the former, is made on the opposite side of the mesial line, so as to insulate a flap about a quarter of an inch in breadth, and composed of skin, mucous membrane, and interposed substance. The frænulum is then divided, and the prolabium of the flap removed. In order to fix the new columna firmly and with accuracy in its proper place, a sewing-needle is passed from without through the apex of the nose, and obliquely through the extremity of the elevated flap; a few turns of thread over this suffice to approximate and retain the surface. It is to be observed that the flap is not twisted round, as in the operation already detailed, but simply elevated, so as to do away with the risk of failure. Twisting is here unnecessary, for the mucous lining of the lip, forming the outer surface of the columna, readily assumes the color and appearance of integument, after exposure for some time. The fixing of the columna having been accomplished, the edges of the lip must be neatly brought together."

A third method is that known as the Italian, and was first practiced by Taliacotius. It consists in removing the flap from the arm, and then bringing the arm over to the head, and fixing it by means of a cap and jacket made of strong drilling.

Dr. McFarland, of Philadelphia, has recently performed this operation in a most successful manner.

For the treatment of lupus, epithelioma, and fracture of the nasal bones, the student is referred to the consideration of those subjects in other portions of this work.

CHAPTER XXXIII.

INJURIES AND DISEASES OF THE MOUTH AND THROAT.

Hare-lip—Labium leporinum—Cheiloplasty.—It is scarcely necessary to state that the first two terms are used to designate a fissure, generally in the upper lip,* involving all the structures concerned in its formation; in most instances situate to one side of the mesian line, and extending to and often within the nostrils. Cheiloplasty is the operation for restoration of the parts.

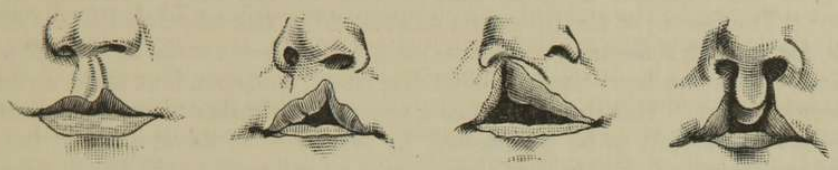
The arrest of development is more frequent in the male than in the fe-

* There are two exceptions to this rule mentioned by Christopher Seliger and Nicati.

male, in the proportion of 70 to 30, and it is said that a complicated hare-lip seldom occurs in a female child; although Butcher, of Dublin, has recorded several cases of this remarkable deformity.

The malformation may be single, consisting of one fissure, or double, consisting of two; simple, or complicated with other malformations, Fig. 328.

Fig. 328.



Different Varieties of Hare-lip.—Bryant.

The causes of hare-lip appear to have perplexed the minds of many medical and surgical writers. In some instances the fissure has been attributed to an impression excited on the mind of the mother during the period of utero-gestation. M. Moulin relates the case of a woman who, in the fifth month of her pregnancy, was much startled by the sight of a hare, which her husband had skinned in her presence. During the last months of her pregnancy her imagination presented to her the sight of a hare denuded of its skin, and she feared that her child would be subject to hare-lip. Her prediction was verified by the event. M. le Professor Roux has observed precisely a similar fact.*

There is undoubted evidence, however, that children are born with such malformation—if the affection may so be termed—when it can be referred to no such cause. Others are of opinion that the cleft in the lip arises from an arrest of development; that, in their earlier formation, the lips have three or even more points of growth, a middle or two or more lateral, and that the deformity is occasioned by an arrest in the development in one of these primitive notches or fissures, proof being found in the occurrence of the cleft in the majority of instances to one side of the mesian line. This idea, viz., the arrest of development in *the substance of the lip*, was advocated by Blumenbach, Meckel, and others. Dr. Gross† writes, "Of the causes of hare-lip we are entirely ignorant; that it is the *result of arrest of development is certain*, but how this result is produced is a circumstance in the history of fœtal life which has not been satisfactorily explained." Velpeau‡ differs from the above; he says: "Numerous researches on embryos and the fœtus at every period, induce me to believe that these ideas are the results of erroneous observations or gratuitous suppositions. Hare-lip is not always without loss of substance, and the lips are no more formed of two, three, or four portions, at three, four, six, or eight weeks, than at three or four months. . . . . Hare-lip, like most other monstrosities, has appeared to me to be much more frequently ascribable to some disease than to a defeat in its natural evolution." M. Cruveilhier is of like opinion.

Churchill§ on this point says: "I shall, in the remainder of the chapter, notice hare-lip and cleft palate, *which are arrests of development*, and imperforate anus, which is a malformation."

Bouchut|| thus writes: "The force of growth which presides as the disposition of parts at their juxtaposition, at their reunion, *interrupted in its efforts, ceases to act*, and the lips formed from three points of increase, one

* *Vide* Bouchut, On Diseases of Children, p 389.
† Operative Surgery, vol. ii, p. 613. ‡ Operative Surgery, vol. iii, p. 329.
§ Diseases of Children, p. 405. || Diseases of Children, p. 390.

median and two lateral, which this force incites to fusion, remain separated so as to resemble the lip of the hare. When the reunion does not take place at all, the hare-lip is double, when it takes place between two of these points only, the median and a lateral, the hare-lip is single, and is only observed on one side of the mouth."

Todd and Bowman* believe that the hare-lip does not arise from an arrest of development as does cleft-palate, for, say they, speaking on this point: "The fissure of the lip seems to arise from the *alteration of the deeper parts*, for as such a fissure exists *at no period of embryonic life in the soft parts*, it cannot, like the bony fissure above described, be dependent upon an arrest of development." Rokitansky takes a somewhat similar view of the matter; he believes the cleft to be occasioned by an arrest of development, but not in the substance of the lip, but that it can be referred to the bony casement beneath; he says:† "The most common and important cases of arrest of development are: fissures of the upper lip, on either or both sides of the mesian line, corresponding to the union of the intermaxillary with the superior maxillary bones, which may or may not present the fissure also."

As is usual in these discussions, nothing definite has been reached.

The *treatment* is essentially surgical in its character, and although the operation for the relief of the simple variety of the deformity is not generally a difficult proceeding when carefully performed,‡ yet there are cases, particularly those of a complicated nature, which do require a steady hand and a good knowledge of the parts, not only during but after the operation, for, writes Dr. Mott,§ "There is no operation in surgery apparently so formidable, and which may so frequently be made so, in reality by want of delicate and adroit manipulation in the operator, as this of hare-lip in infants, in all its forms." Yet there are some points of interest which have arrested the attention of the greatest surgeons in the world, to which due importance should be given, and among these we notice, the *period of time* which should be allowed to elapse after birth before the operation is resorted to.

Much discrepancy prevails on this point.

Dr. Mason Warren‖ recommends the performance of the operation at as early an age as possible, he having frequently resorted to it twenty-four hours after birth, and with better success than in older children. He states that at this period less resistance is offered by the child, and the healing process being great at that age, it is enabled to suckle almost as soon as if nothing abnormal had been present.

Dr. Dawson, of Dungannon, operated seven hours after birth; the pins were removed in forty-eight hours, and in two days more the union was so perfect that the adhesive straps were removed. Dr. Dawson is confirmed in his determination to operate in similar cases soon after birth.¶

Anselm also states that long experience has convinced him of the expediency of early operation. Bonfils, of Nancy, also coincides in these views.

M. Guersant observes that there are three periods at which this operation may be performed with different chances of success. The best is offered within the first fifteen days from birth. At a later period a favorable termination is less frequent, and when the child has reached an age of from twelve to fifteen years, the successful result is more certain.

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* Physiological Anatomy, p. 877. † Pathological Anatomy, vol. iii, p. 17.
‡ Operative Surgery (Velpeau), vol. i, p. 28.
§ American Journal of the Medical Sciences, No. xxx, pp. 327–28.
‖ Union Médicale, No. lxxvi.
¶ *Vide* Ranking's Half-Yearly Abstract, June, 1847, p. 218.

M. Paul Dubois has also expressed himself in favor of early operations.*

Gross† writes, that "The most eligible period is from the third to the sixth month, or a short time before the appearance of the milk-teeth; the operation is then generally borne well, there is no danger of convulsions, and the adhesive process generally proceeds most kindly."

Mr. Bransby Cooper says: "For my own part, I agree entirely with Sir Astley Cooper, in regarding it as unsafe to operate upon infants before weaning." This opinion is also advocated by Roux, and also by Velpeau.‡

With all due deference to the opinions of these eminent authorities, and speaking purely from my own experience in many cases of hare-lip, on which I have operated, and the numerous cases in which I have assisted and seen in the wards of hospitals, etc., I agree with Dr. Gross—making, however, the period even a little later than he does, say from the sixth to the eighth month. I never have had opportunity to operate after the age of reason for hare-lip; although, in a case of deformity of the lip and cheeks, in a young girl of fifteen, a similar operation was performed with complete success.

Bouchut remarks: "Consequently it is my opinion that we should not hesitate, whether simple or double, complicated or not, hare-lip should be operated on in the twenty-four hours which follow birth." When we consider the shock that often follows the operation for double hare-lip—a performance that requires the nicest surgical manipulation, and a considerable amount of time—it would seem rather rash advice to recommend surgical interference so soon after birth; but when the hare-lip is complicated with cleft palate, and perhaps other deformity, it would appear that the danger of killing a very young infant is certainly imminent. Remember for a moment the condition of a child twenty-four or thirty-six hours old; its utter prostration, scarcely accustomed to light and air, half dormant with sleep, and without the power even of concentrating its vision, and remember, also, how many children grow with the malformation in question and thrive tolerably well, and I think that no judicious surgeon would attempt the operation, either for double or complicated hare-lip, until a later period of life.

If the operation has been determined upon at a very early age, chloroform is not necessary, the child being easily held, particularly if enveloped in a large strong towel. If, however, the infant has reached the age of six or eight months, or a later age, a few inhalations of the anæsthetic will be found of service, and during the operation it is well to literally put the child in a strongly made pillow-case and draw the strings around the neck.

Some operators prefer scissors to the knife in this operation, but the majority are in favor of the latter. A small sized, sharply-pointed, keen scalpel, with a firmly set handle, is the best instrument that can be used; for, no matter how sharp may be the edge of the scissors, there is necessarily some bruising of structure, which is unfavorable to the adhesive process by the first intention, and is liable to leave a much larger cicatrix. Together with the scalpel, the surgeon should provide himself with the proper variety of suture—either the ordinary hare-lip pins, silver wire, curved needles, the silver button of Mr. Wood, a pair of wire nippers, sponges, adhesive straps, collodion, etc. It is a rare case when the coronary arteries require ligature, the hæmorrhage being readily controlled by pressure, and by the apposition of the parts. There is, however, one point in this connection which must be remembered, and that is, that blood may escape into the

* Ranking's Half-Yearly, 1849, p. 257. † Operative Surgery, vol. ii, p. 613.
‡ Operative Surgery, vol. iii, p. 341.

mouth, and by passing into the larynx cause the death of the patient; there is a case of this kind, mentioned by M. Roux,* in which but little blood was lost during the operation, but what there was remained in the mouth; a large clot of blood being swallowed by the infant, a portion of it passed into the larynx during deglutition, and occasioned such extreme asphyxia that the surgeon believed the child to be dead. By the introduction of a catheter into the larynx the coagulum was withdrawn and life preserved. There are some other cases upon record in which the hæmorrhage has been very profuse, and these may certainly be considered as the exceptions, and should not deter the surgeon from attempting the operation. It is too frequently the case that the dangers of an operation are often made so prominent by surgical writers that those who would attempt surgical interference in many cases are deterred by reading the dangers, difficulties, and accidents which, under unfavorable circumstances, have occurred. It is proper and right that these should all be made clear to the mind; but, at the same time, the favorable results and successful terminations should as plainly be laid before the student, in order that he may exercise his judgment in the formation of his determinations.

The old, and no doubt an excellent method, is to insert a piece of thin wood or stiff pasteboard under the lip (Fig. 329), and then to refresh or pare the margins of the cleft with a sharp straight bistoury. There need not be much dread of taking away too great a part of the flesh, and it is better to make a free incision than not to cut out enough of the labial substance. The knife is then laid aside, and a hare-lip pin, composed of steel or silver, is passed into the lip, nearest the prolabium, on the right side from below upward, and on the left side from above downward, beginning about a quarter of an inch or more from the cut surface, and bringing out the point in the centre of the thickness of the lip; the point is then entered at a corresponding part of the refreshed edge of the opposite side of the cleft, and brought out at the healthy skin at the same distance from the cut as it was entered on the other side. Another pin is introduced in a similar manner, above the first, and, if necessary, a third just below the

Fig. 329.

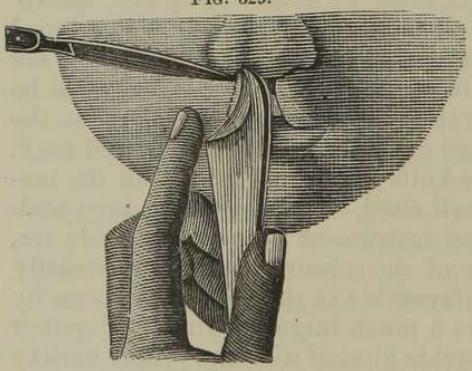
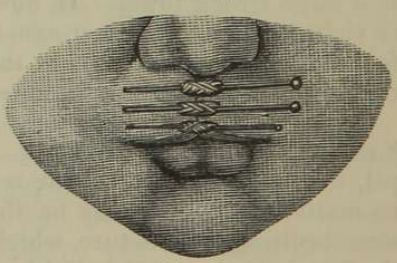


Fig. 330



nose. Beginning, then, at the upper pin, a figure-of-eight suture is wound around it. Use a separate piece of silk for each pin. I have found that one ligature extending from one pin to the other materially interferes with the circulation. After the wound is thus thoroughly closed the *points of the pins must be cut off* with the wire nippers (Fig. 330), and the blunt ends covered with pieces of white wax, and the whole lip, pins,

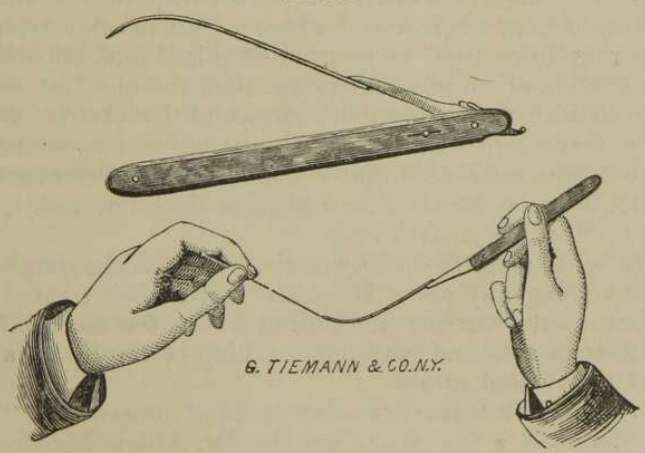
* Ranking's Half Yearly Abstract of the Medical Sciences, 1846, p. 138.

ligatures, etc., covered with a thick coating of collodion. So soon as this application is thoroughly dry, two adhesive straps, of sufficient length to extend from ear to ear, are to be applied upon the cheeks, crossing each other on the upper lip, at the site of the wound. I would lay especial stress upon the latter steps of the operation, viz., the severing of the *points* of the pins, the headings of wax, the coating of collodion, and the application of the adhesive straps. Many an operation for labium leporinum has been a failure, simply from neglecting these simple precautions. If the points of the pins remain uncovered they may catch in the pillow, or in the clothes of the mother, and, by a single motion of the child's head, the work of the surgeon is destroyed; or a severe catarrh may set in on the second or third day after the operation, and an acrid discharge from the nostrils may irritate the wound, prevent adhesion, and thus spoil the whole performance. Such an unfortunate result is prevented by the collodion, while the strips of plaster prevent too great traction being made upon the pins, and assist very materially in closing the wound.

The application of the straps, which are always at hand, is merely a modification of the spring truss invented by Dr. Dewar, of Aberdeen, which is known by the name of Dewar's Compressor, and which, if the surgeon can procure, should always be used in preference to the plaster.

Dr. Buck has contrived a needle for the more exact coaptation of the wound: "The instrument consists of a needle, of the slightness of an ordinary knitting-needle, fixed on a handle, and slightly curved (Fig. 331). It

FIG. 331.



grows a little larger round for half an inch near its point. Its extremity is bevelled off to a sharp point on its concave side, and perforated lengthwise on its bevelled face like the stem of a hypodermic syringe, such as is in common use. The mode of using it is as follows: The edges of the wound intended to be brought into coaptation, having been traversed by the conductor guided by one hand, a pin held between the thumb and fingers of the other hand is engaged by its point in the perforated hole at the end of the conductor, and held steadily in place, while the conductor is withdrawn and the pin made to follow it, which it does with unerring certainty. A soft iron or silver wire may be inserted in the same manner as the pin, if it is intended to employ a wire suture."

Mr. Wood, of Gloucester Hospital, some time since introduced what is termed the button hare-lip suture. This apparatus is composed of two per-

forated silver disks, having wires soldered to their backs, over which a double ligature is tied, after having been passed through the lip. Mr. Wood believes that by thus avoiding the pinching and rigidity of the needles he obtains a more efficient and unobjectionable mode of union, and recommends the same suture in cases of divided perinæum.

Dr. J. Marion Sims places the most reliance on the silver suture. According to his direction the wires should not be further apart than the three-sixteenths of an inch, or even less, thus affording good support and perfect coaptation. He says further, "As it is important to prevent any mark from their unequal pressure, a thin plate of some transparent material may be placed like a delicate splint on the coapted edges, over which the wire may be tied, thus preventing the tender cuticle of the child's lip from their cutting pressure. . . . A clarified goosequill, split into sections, and softened in boiling water, and then flattened out by heavy pressure, fulfils every indication in this hare-lip suture."

Another method of curing hare-lip is by what is termed the *living suture*, which mode is very warmly recommended by surgeons of the present day. The same inverted V incisions are made, taking care, however, not to carry the knife entirely down to the lip; the flap is then turned down, and the sides of the lozenge-shaped opening, which is thus made, are placed in contact by one or more sutures; now, even if these should yield to the pressure, the *living suture still holds*, and by degrees the hole that is left becomes obliterated. The advantages claimed for this form of suture are these: that the edges of the wound soon swell and become covered with healthy granulations, and a *natural suture* is thus produced and remains, even if by mismanagement or accident, the other sutures are displaced, at that very point where structure is most needed, and where a cleft so often remains. Of all the methods that have been recommended this is undoubtedly preferable, and I can conceive of no nicer operation than the one just recommended, if it be coupled with the india-rubber suture of Dr. Atlee. Since I have known of the *living suture* in hare-lip I have not had opportunity to put it in practice, but I am convinced that it must be both efficient and extremely safe; because, if union by the first intention does not result, a secondary process will produce the desired end.

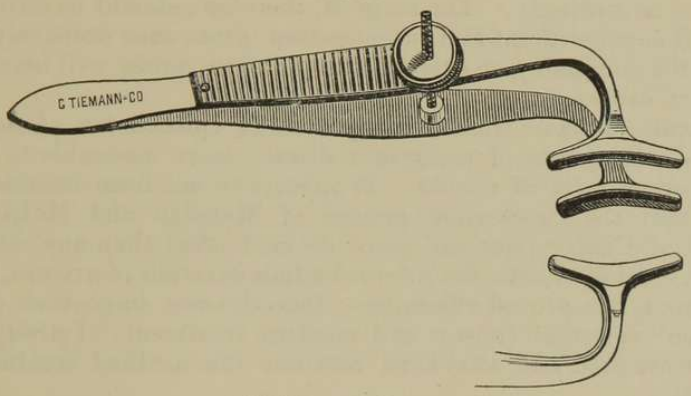
Erichsen, after having tried many methods, prefers the simple interrupted suture without using any pins; he states that he has treated many cases of the malformation occurring in children from a few days to four years of age, with perfect success, and with less marking of the lip than when union is effected by the twisted suture.

Dr. Smith recommends the following mode of procedure: "Take two of the forceps invented a few years ago by Dr. Alden Marsh, of Albany; provide them with catches like artery forceps, and have transverse lines marked upon them at distances of a quarter of an inch, so that a means may be furnished of exactly and rapidly determining the situation of the sutures. I modify the *method* of operating by applying these two exactly similar forceps, one to each side of the cleft, fastening them there by the catch, introducing the sutures about half an inch from the margin of the forceps, exactly opposite the transverse lines, and finally cutting away the margins of the cleft inclosed in the forceps. Nothing now remains to be done but to close the cleft, which, on account of the mechanically exact introduction of the sutures, is effected instantaneously. Metallic sutures being used, their prior introduction does not expose them to the danger of being cut. According to Lisfranc's method I would not, at the labial margin, entirely sever the portion pared from the margin of the cleft, but would suffer it to remain on each side, until the cleft being accurately adjusted,

these *parings* may be shortened to suit, a suture being passed through them, forming a decided V-shaped projection downwards. I deem this precaution necessary, in addition to curving the lines of incision after the manner of Celsus, because I never yet saw any one, years after the operation, in whom an unseemly notch did not exist."

Fig. 332 represents a pair of forceps devised by Hutchinson to facilitate the operation and render the parts perfectly adapted to each other.

Fig. 332.



Hutchinson's Forceps.

Malgaigne's operation consists in paring the edges of the fissure so as to leave two angular flaps at the vermilion border, which when brought together would prevent the prolabial notch.

This notch of the prolabium is the great bugbear of the operation, and consists in an imperfect closure of the wound, which by cicatrizing and contracting leaves an indentation in the upper lip.

Double Hare-lip.—In cases of double hare-lip much has to be left to the judgment of the surgeon, particularly with reference to the disposal of the intermaxillary bones; if this be on the same plane with the other sides of the fissures, the operation for simple hare-lip must be but repeated. Frequently, however, the intermediate portion is composed of a rounded portion of bone and skin, which is connected to the septum narium. It may be horizontal or oblique, contain the germs of the incisor teeth, and very frequently exists with cleft palate.

In such cases, especially when the projecting intermaxillary bone is very prominent, it is necessary to cut it away with the forceps before adjusting the fissure. There is always a good deal of hæmorrhage following the operation, which torsion or pressure controls. The integument must be left pendent in view of forming a columna afterward. If the hare-lip is complicated with cleft palate, the latter must be first attended to, if it be desirous to attempt its closure. For directions for performing this operation, see "Staphylorraphy."

Epithelioma of the Lip.—Cancer rarely attacks the upper lip, while the lower is subject to epithelioma. In the commencement, there is observed beneath the integument, covering the vermilion portion of the lip, a small round tumor, resembling a shot, which, when pressed upon, rolls under the finger. The tumor in this state gives no pain, but if frequently handled by the patient, or otherwise irritated, it grows rapidly and soon adheres to the surrounding parts. In other cases, a firm and immovable lump of considerable size, is, from the first, deeply imbedded in the substance of the lip.

This gradually approaches the surface, finally ulcerates and throws out a prolific fungus of a dark-red color, so large, as in some instances to envelope the whole mouth. A third variety of the disease is found in the form of a chocolate-colored, warty excrescence; this never attains a large size, but is constantly casting off scabs, the places of which are speedily supplied by others. These tumors are all capable of contaminating by extension the adjoining portions of the neck, especially the lymphatic glands, and when this occurs, there is very little hopes of the patient's recovery. Venereal ulceration of the lip and lupus have been mistaken for cancer, and treated accordingly. The surgeon, therefore, should be strictly on his guard, and never without full investigation, pronounce decisively as to the nature of the complaint, or propose an operation, unless well assured of the existence of cancer.

Treatment.—I have treated many cases of epithelioma of the lip, and have found this variety of malignant disease more amenable to treatment than any other form of cancer. It appears to me, from considerable experience, that the enucleation process of Marsden and McLimont (see Treatment of Cancer), has had more decided effect than any other. This treatment, combined with the internal administration of arsenic, hydrastis, or phytolacca, has proved efficacious; indeed, cures have been performed by this combination of caustic and medical treatment. I always employ the escharotic first, and afterward continue the medical treatment for at least a year.

The chief medicine in cancer of the face is arsenic, pure arsenic. This medicine is the basis of all the "far-famed" remedies for this disease; and writes Dr. Wurmb, of Vienna, "There is no affection, except ague, in which it has been, and still is, so often administered. Even among the ancients it was considered a specific against cancer, and at the present day it has the same reputation; it was also known then, as well as now, to be capable of producing cancerous ulcers. The whole difference, therefore, between ancient and modern practice, lies in fact, that now it is known, or might be known, or ought to be known, that the therapeutic employment of arsenic in cancer, rests on the law of similarity; but that it is no absolute specific against that disease, because there exists no such thing as an absolute specific; further, that we possess certain indications for its exhibition, and understand the method of giving it in suitable doses.

"As regards the choice of arsenic in cancer of the lips, it is an easy task for the physician, well acquainted with the positive effects of medicines, to distinguish the cases in which arsenic suits, from those in which other remedies are indicated. Thus, arsenic is to be preferred before belladonna, baryta carbonica or conium, in very malignant ulcers, which increase on all sides, bleed easily, and have not been caused by any external injury, such as blows or bruises, but from the first, show plainly that they are the outward sign of a deeply seated inward disease, and are, therefore, often met with in cachectic individuals. Carbo veg., indeed, approaches very near to arsenic in this respect; yet, the latter is to be preferred unconditionally when the tendency to destroy the surrounding parts is distinctly marked in the ulcer."*

The pathogenetic effects of arsenic which point to cancer are:† burning swelling in the nose, with no pain on contact; tumor in the nose; ulceration of the nostrils, high up, with discharge of fetid ichor; ulcers in the whole

* British Journal of Homœopathy, vol. iv, p. 250.

† See Hartmann's Chronic Diseases, vol. ii.

face; wart-shaped ulcer on the cheek; dry, cracked lips, brown streak in the lips, as if burnt; bleeding of the lower lip; ulcerated eruption around the lips; cancer-like eruption on the lower lip, with thick crust, hard, pad-shaped edges, with burning pain, particularly when the parts become cold, and with a lardaceous bottom; spreading ulcer on the lip, painful in the evening, when in bed, with tearing and smarting in daytime during motion, which is worse when touching the ulcer and in the open air; disturbing the night's rest; corrosion of the edge of the tongue, in front, with smarting: the tongue is blackish and cracked.

Arsenic may sometimes require to be administered in alternation with some other medicine, but it is, undoubtedly, the most valuable when the cancerous dyscrasia has contaminated the organism; it is a sovereign medicine for cancer of the nose, tongue, and alveolæ

Clematis is asserted to be useful in carcinoma of the lips, arising from syphilitico-mercurial ulcers; when the pains are drawing or jerking, and experienced chiefly in the circumference of the ulcer, particularly when touching the part.

Aurum met. is also serviceable for cancer complicated with syphilitic or mercurial symptoms; or this medicine may be adapted to scirrhus, appearing in individuals of a scrofulous diathesis. The muriate of gold is also recommended for this disease, and may, in aggravated cases, be alternated with arsenic, when the tongue feels heavy, is elongated, and its motion much impeded. There may be also great dryness of the mouth and fauces; painful blister on the tongue, accompanied with burning pain; deep ulcer within the buccal cavity, with inverted edges and blackish base.

Mercurius may be of service if the bones have already become affected; or nit. acid may be useful if the sore be irritable, bleed profusely, with stinging and burning.

Asafœtida is indicated when the edges of the ulcer are hard, bluish, and sensitive to contact.

Conium has been employed with success in carcinomatous affections arising from contusions; it is particularly indicated by a scrofulous diathesis, and when the ulcers on the face and lips spread rapidly, present a blackish appearance, and discharge a bloody and fetid ichor.

Symptoms which may lead to the use of *silic.* in cancerous affections are: erysipelatous blotches, lymphatic and suppurating glandular swellings; scirrhous indurations; putrid and rapidly spreading ulcers, particularly when they arise from the abuse of mercury, and are attended with boring and stitching pains, also for scurfs and ulcers in the nose, cracked skin and scirrhous indurations of the face and on the upper lip; painful, spongy, and carcinomatous ulcers on the lower lip.

Sulphur is considered by some as an excellent medicine in cancer of the face. It is generally useful as an intermediate agent, and revives the activity of the organism when it appears unable to receive the impression of the proper specific.

In cancer of the lip, when the patient complains of violent burning pain in the ulcers, which may be covered with large scurfs that spread rapidly and become very thick, *sepia* is often the most appropriate medicine; it is also of importance when there exudes from beneath the scab, a corrosive ichor, which by irritating the surrounding parts, essentially favors the extension of the disease. The disposition of the patient should also be remembered when this medicine is to be prescribed.

Antim. crud. and **ranunc. bulb.** have been prescribed with success in cancer of the lip. Nit. acid likewise has been employed in carcinomatous ulcers, arising from syphilitico-mercurial disease.

Dr. Attomyr* relates the following cure of cancer of the lip: "Aloysia Lyde, six years old, lost the left half of the upper lip, and the soft parts extending upwards to the zygoma, and sideways a considerable portion round the angle of the mouth, by a cancerous ulcer. Arsenic (6th dilution), repeated every eight days, brought about the healing of the ulcer in six weeks. As a detergent application, the decoction of marshmallows was used outwardly."

When it is necessary to remove the lip, which is easily effected, provided the caustic treatment has not already been employed, a V-shaped incision embracing the whole mass should be made, and the parts brought together with hare-lip pins and the figure-of-eight suture. It is astonishing how much of the lip may be removed, and yet how little deformity may remain afterward. Ligatures are not required, as the nice approximation of the wound is generally sufficient to arrest all hæmorrhage.

Enlargement of the Mucous Glands of the Lip.—This affection, which amounts to hypertrophy, and is by some authorities classed as such, consists of a protrusion of the lip, the mucous membrane being everted. A cause of this may be from a vicious habit of biting the lip, or I have seen it accompanied with immobility of the jaws, and destruction of the cheek.

Treatment.—With a pair of good strong scissors, an elliptical portion of the mucous membrane and a portion of the subjacent structures must be removed, the edges are then brought together and held in position with wire sutures.

Cysts of the Lip.—Tumors of a cystic character are generally found in the lower lip beneath the mucous membrane. By cutting off the tops of the cysts (not merely incising them), they are generally cured.

CLEFT PALATE AND STAPHYLORRAPHY.

Cleft palate is an arrest of development in the osseous structures of the roof of the mouth, accompanied with a deficiency in the corresponding soft parts. It is, therefore, a fissure in the hard and soft structures of the roof of the mouth. It may exist either with or without hare-lip, but the two generally are found together.

It may also coexist with deformities of the posterior nares.

The palate, in common *parlance*, means the whole of the roof of the mouth, from the superior alveolar arch to the pharynx, and includes the velum palati. The surgeon divides it into two parts, the hard and soft palates. The hard palate extends from the internal surface of the upper teeth to the velum. It is formed by the horizontal plates of the palate and superior maxilla, a fibrous structure, and the mucous membrane. It is supplied with arteries, veins, and nerves. The bony portion forms the roof of the mouth by its inferior surface, and its superior surface is the floor of the nares.

The horizontal plates of the superior maxillæ form the anterior three-fourths of this osseous lamella, the remaining fourth belonging to the horizontal plates of the palate-bones. The inferior surface of the palate processes of the maxillary bones are joined together by a harmonia suture, giving rise to the palate ridge, which terminates anteriorly in the nasal spine, and posteriorly is continuous with a similar, though less defined, *raphé* in the palate-bones.

The soft palate or velum pendulum palati is the movable fold of mucous membrane, inclosing muscular fibres, aponeuroses, vessels, nerves, and mu-

* British Journal of Homœopathy, vol. iv, p. 257.

cous glands; it is suspended from the posterior border of the hard palate, like a curtain, and forms an incomplete septum between the mouth and pharynx.

The arched structure of the mouth, with the curtain that divides the oral cavity from the pharynx behind, exerts the most powerful influence on articulation, moulding the sounds which are created in the larynx, and giving them scope and reverberation. In its normal state it is that which gives smoothness and sweetness to the varied tones of which human language is composed. But in the cleft state, which we propose to consider, every agreeable quality of tone is lost, and the nasal, guttural, and half-suffocative sounds that are produced by those who suffer from the deformity, hinder even the ordinary intercourse of man with man, and frequently cause the sufferer to avoid society, and, from the seclusion which naturally follows, to become unhappy and misanthropic. Many of the simplest elementary sounds of our language are unutterable by those who are afflicted with cleft palate. The hard sound of "g," for instance, is made by pressing the roots of the tongue against the uvula in order to close the throat, as in beginning to articulate the word "go" without the "o."

Now, it is almost an impossible thing for a person afflicted with the deformity we are considering to make any such sound, and the greater the effort, the wider will the fissure become by the action of the elevators and tensors of the palate. I have questioned persons afflicted with cleft palate, and have seen them endeavor to utter the consonant in question, but never have known them to succeed.

Again, the sound of "l," which is a vocal lingual-dental sound, and is made by pressing the tongue against the upper gums, hard palate, or roof of the mouth, is rendered very imperfect, and plainly indicates the deformity of the parts. So also with "w, u, v," and many other letters. If, therefore, these elementary sounds are wholly wanting, or even imperfect, it may well be imagined how defective the utterance will be.

In order to a full and complete understanding of the question before us, I shall have to call attention for a few moments more minutely to the anatomical structure of the parts. Those who are familiar with the anatomy of the base of the skull, must bear in mind the relative position of the pterygoid processes of the sphenoid with the horizontal plates of the palate-bones, for it is to these that the muscular portions of the velum are attached.

These muscles are nine in number; four on each side, and a central strip of muscular fibres—the azygos uvulæ. They may be divided into elevators and depressors. The elevators are the levator palati and the tensor palati or circumflexus palati. The depressors are the palato-glossus and palato-pharyngeus. The levator palati has its origin from the inferior surface of the apex of the petrous portion of the temporal bone and from the under and internal portion of the cartilage of the Eustachian tube. The fibres descend and enter into the pharynx above the superior constrictor muscle, and then expand to assist in the construction of the soft palate; thus, with its fellow of the opposite side, it forms a stratum of muscular fibres, which is also in conjunction with the two planes of the palato-pharyngeus muscle.

The circumflexus palati, or tensor palati, as it is often called, is a small and narrow band of muscular fibres, partly tendinous, between the pterygoid muscle and the internal pterygoid plate of the sphenoid bone. It is attached to the scaphoid fossa, at the base of the pterygoid process, and also to the Eustachian tube. Besides these, there are some smaller fasciculi

which have their points of origin from the vaginal process of the temporal bone, and extend to the spinous process of the sphenoid. The fibres at the lower part of the muscle end in a tendon which winds around the trochlea or hamular process of the internal pterygoid plate of the sphenoid bone, and is inserted into the posterior border of the palate.

Of the depressors of the palate, the palato-pharyngeus is the largest, and assists in the formation of the posterior pillar of the fauces. The muscle arises from the posterior border of the thyroid cartilage, and, ascending behind the tonsil, enters the side of the palate, where it separates into two fasciculi; the anterior, which is deeper and much the stronger of the two, enters the substance of the palate between the levator and tensor, and joins also at the middle line a corresponding portion of the opposite muscle. In the palate, the muscle incloses the levator palati and azygos uvulæ between its fibres.

The palato-glossus assists in the formation of the anterior pillar of the fauces, and extends to the sides of the posterior surfaces of the tongue; or it may be said to arise from this point, and then, passing a little upward and backward, in front of the tonsil, it completes the triangular space for the lodgment of the tonsil, and is inserted into its fellow of the opposite side.

The azygos uvulæ muscle arises from the posterior nasal spine, situated at the posterior junction of the processes of the palate-bone. This muscle forms the substance of the uvula, and has no insertion, the tip of the muscle hanging free in the fauces. A small band of the palato-pharyngeus separates the posterior surface of this muscle from the mucous membrane, by which it is enveloped.

These muscles are covered with mucous membrane, and, it will be seen, are more or less blended or interlaced at their points of insertion, and act upon the soft palate as follows:

The levatores palati elevate the velum. The tensores palati muscles, their contraction and the arrangement of the tendons around the hamular processes of the pterygoid plates, draw each side of the palate outward. The palato-pharyngeus acts downward and backward. The palato-glossus downward and forward. It is very important to consider the normal action of these muscular fibres for the proper understanding of the surgical anatomy of cleft palate.

It is necessary here to bring to notice another muscle, or at least a portion of muscular fibres known as the superior constrictor of the pharynx. As usually studied, the points of origin of this muscle are situated anteriorly, but where one of these parts is in a state of division, its origin should be considered as the median raphé on the posterior wall of the pharynx, together with the aponeurosis of the same. The fibres then pass around on either side of the pharynx and are inserted into the inner surface of the internal pterygoid plate, particularly along the lower third, and the hamular process, to the posterior part of the mylo-hyoid ridge of the lower jaw, together with the mucous membrane of the mouth, and of the sides of the tongue. Particular attention, however, should be given to the upper border, which consists of arched fibres, with which the levator and tensor palati muscles are connected.

Having now well in mind the elevators and depressors of the velum, let us give Mr. Fergusson's idea on the subject. He tells us that the extreme mobility of two portions of the cleft palate has long been noticed, but that not much attention has been given to the moving powers. If a person with cleft palate be desired to swallow a little water slowly and with

the mouth partially open, the back parts of the fissure may be seen to approach each other, and it is this approximation which was formerly supposed to render the case favorable for a remedial operation. The cause of this movement had escaped the notice of the physiologist for two hundred years, and even so close an observer as Malgaigne had allowed it to pass his observation. "The semicircle," says Mr. Fergusson, "which these muscles form on the back and sides of the pharynx is, during deglutition, drawn almost into a straight line; the fibres come forward, inward, and downward, so that the soft structures immediately in front—being the two portions of the split palate—are pushed in similar directions, and thus the posterior part of the fissure is made to close." It was from a careful study of these words that I thought it preferable, when speaking of the origin and insertion of the superior constrictor, to reverse the usual manner of describing the muscle, because it is easier to understand how, by the superior arched border of the muscle in question, the margins of the cleft are pushed together. In other essays on the same subject, he speaks of three conditions in which the flaps of a cleft palate are noticed to be operated upon by the action of the muscles in question.

First. When the parts are not irritated, and are in a perfectly quiescent condition, the lateral flaps are quite distinct, the posterior nares and the upper part of the pharynx being observed above and behind.

Second. If the flaps are touched or irritated, they are pressed upward by a motion that appears to commence at the middle of each.

Third. If the parts be still further irritated by pressing the finger against them in the fissure, each flap is forcibly drawn upward and outward, and can scarcely be distinguished from the rest of the parts which enter into the formation of the sides of the nostrils and throat. These peculiar actions will be all readily understood after a careful study of the preceding anatomical details.

The next point to be remembered is the position of the Eustachian tubes, which open on each side of the upper part of the pharynx, at the back part of the interior meatus; just below and in front of these openings, we have parts of the muscles which it is necessary to divide for the successful termination of staphylorraphy. The arteries here are the posterior and inferior palatine, one being given off from the internal maxillary and the other from the facial. These vessels may be divided in forming the flaps, and it may be well to recollect, in connection with this, what has been said about performing a part only of the operation at once.

By the term staphylorraphy is understood the operation for the closure of the cleft in the palate. Synonymous with this word are the terms cionorrhaphy, uraniscorrhaphy, kionorrhaphy, and velosynthesis.

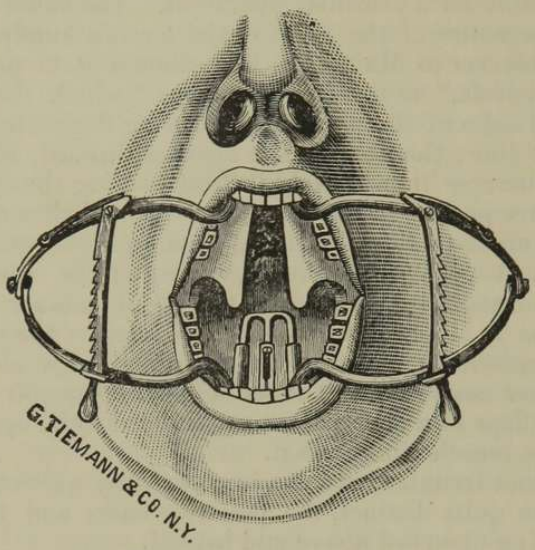
For the most part, surgeons nowadays agree that the division of the palatine muscles is a very essential step in the operation. It is not easy to imagine a more tedious proceeding than a carefully conducted operation for cleft palate, and the following are the most important considerations in the matter:

First. Preparation of the patient: For some time before the operation is to be performed, the patient should accustom the parts to the presence of foreign bodies, by introducing substances into the mouth, and while touching the sides of the cleft, endeavor to control the muscles, and thus avoid their being pressed aside or spasmodically contracted. The operation should never be attempted until the child has arrived at an age to appreciate the difficulties of the operation, and to be willing to bear a little pain for the benefits to be derived from surgical interference.

Second. A favorable condition of the weather is a great desideratum,

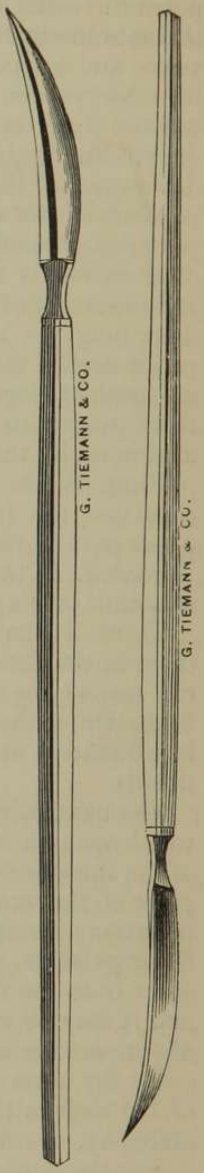
and the operation should not be performed unless the day be bright and

Fig. 333.



Whitehead's Gag in position.

Fig. 334.



clear. A room facing the sun should, if possible, be chosen, and the curtain blinds removed from the windows to allow a full supply of light.

Third. The patient should sit in an arm-chair, facing the window, with his feet upon a stool fixed firmly to the floor, with his head supported on the hands of an assistant. The jaws should be separated with a piece of wood set firmly between the molar teeth, or Whitehead's gag, Fig. 333.

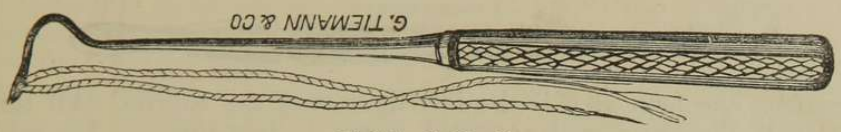
Fourth. If anæsthesia is used, chloroform is said to be preferable, as it is the least likely to produce salivation. There is some diversity of opinion among surgeons on the employment of anæsthesia in these operations. In my own opinion, if the patient is of good courage, the operation should be performed without it, and for these reasons: In the first place, during the whole period of an operation, the patient, if not under the influence of an anæsthetic, assists the operator very materially by depressing or holding forward the tongue, and keeping the teeth firmly set upon the foreign substances introduced within the mouth. Secondly, the whole operation may be entirely lost by the vomiting or retching of the patient at the very moment that a suture is being introduced, or a needle is being passed through a flap, or when it is about to be seized by an assistant.

Fifth. There should be at least three assistants, one to support the head, a second to assist the operator, and a third to throw light into the mouth by means of a good-sized mirror. This last precaution is of very great importance, though not generally mentioned by writers on the subject.

Sixth. The instruments are: a long forceps with bent handles, and the jaws armed with fine teeth, whereby the flaps can be held; a pair of long curved scissors in case the operator prefers them to the knife. Several knives with long handles and shanks (Fig. 334), but with a short cutting edge; also two knives at least, each with a double edge, and the blade at

right angles with the handle, to separate the flaps from the hard palate; a periosteotome; several small curved needles not more than an inch in length, with a double edge, and a needle to carry a silver wire; a needle-holder, or Whitehead's needle, Fig. 335; a dressing forceps, slightly curved at the jaws, to seize the needles after they have been passed into

Fig. 335.



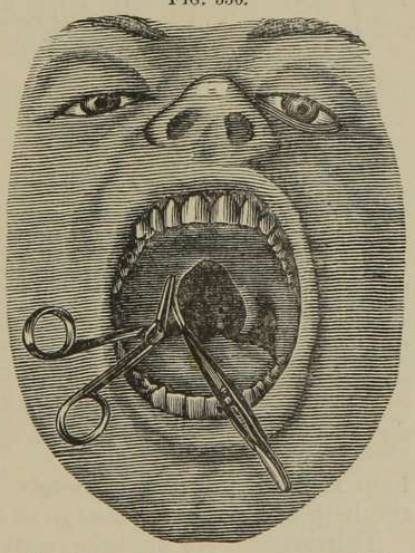
Whitehead's Needle.

the flaps; a pair of long curved scissors; two lead or silver plates with perforations to correspond with the proposed sutures. Several perforated buckshot; an instrument to forcibly compress the shot; also one shaped somewhat like an ordinary fork, which may be affixed to the end of forceps, or set in a handle, for passing the shot up to the cleft before it is closed; several sponge probangs, to cleanse the blood from the throat, and also to remove the mucus which often accumulates about the parts; iced water to arrest the hæmorrhage and rinse the throat; and wine and drinking-water, wherewith from time to time to refresh the patient through the tedious proceeding.

Seventh. The surgeon should sit in front of the patient with a steady assistant on his left, with forceps or hook. The lower portion of the margin of the left side of the fissure is seized and put gradually on the stretch. The surgeon is then ready to commence.

Eighth. If the fissure is large, it is better not to attempt to close it all at one operation, on account of the danger which may arise if both palatine arteries be divided in one operation, when the thin flaps would be imperfectly nourished, and thereby sloughing might ensue. By allowing some weeks to pass between the first and second operation, the collateral circulation becomes established, and this danger is avoided.

Fig. 336.



Ninth. The assistant having put the flaps on the stretch by the forceps, the edges may be pared from below upward, if it be designed to close the soft parts first. If, on the contrary, it is deemed requisite to unite the parts of the hard palate, the knife, or scissors, is entered at the anterior margin of the cleft, and the edges refreshed to as great an extent as it is deemed advisable. (Fig. 336.) In paring the edges, care must be taken, on the one hand, not to take off too much, and thus widen the gap; but, on the other hand, a sufficient amount of tissue must be removed to allow a fair chance for the healing process.

Tenth. If the hard palate is to be closed, the soft structures must be loosened with one of the double-edged knives with the cutting surface bent at right angles with the shank. The pointed edge of the knife is introduced close to the bone, and by a lateral motion the flap is, as gently as possible, separated. Great care must be taken not to bruise the flaps.

Eleventh. The next step in the operation is the division of the palatine

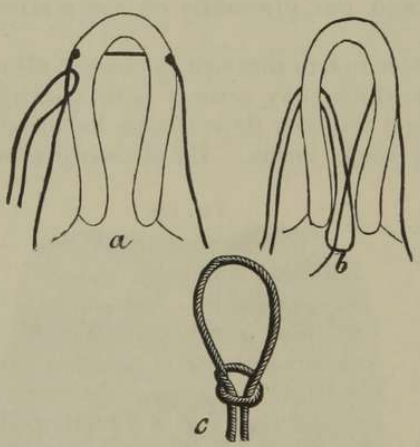
muscles, which should be done with care, and by means of a sharp-pointed, double-edged and long-handled knife, after the flaps have been put upon the stretch.

Dr. Whitehead has invented a forceps (Fig. 337), which grasps the muscle and much facilitates its division.

Fig. 337.

Twelfth. The next step is the introduction of the sutures. All things considered, silver wire, well annealed, forms the best suture. The needles should not be more than three-quarters of an inch in length. They are to be armed with wire, and inserted into the needle-holder at any angle which may be most convenient. Beginning at the lower margin of the fissure which it is desirable to close, a needle should be passed through the flap. So soon as the point is seen in the cleft, the needle-holder is opened, and the needle drawn out into the cavity of the mouth by means of an ordinary forceps held by an assistant. The needle is then again inserted into the holder, and introduced at a point directly opposite, on the other margin of the cleft, and again drawn out into the mouth. It is well, as the wires are drawn without the buccal cavity, to mark them, in order that when the sutures are to be tightened, the operator may not become confused, or lose time in disentangling them. A very good plan is to tie a single knot on the end of the first wire, two knots in the second, three knots in the third, and four knots for the fourth. Three, four, or even more sutures may be required.

Fig. 338.



Method of passing and tying the sutures in fissured palate: *b* shows the single suture passed through the left half of the palate, the double suture through the right, and the end of the single suture passed into the loop of the double one, which is drawn out of the mouth for that purpose. *a* shows the loop drawn back again, carrying the single thread with it, which now lies across the cleft. *c* shows the running knot made by casting a knot on one string and passing the other end through it before it is tightened.

Another excellent method, especially for surgeons who are not ambidextrous, is that of Mr. Mason.* A curved needle, fixed in a handle with an eye in its point, is armed with a thread and passed through the palate at about a quarter of an inch from the free edge. When the point appears in the cleft, the thread may be grasped by a tenaculum or forceps and the needle withdrawn. This leaves a loop of thread in the mouth, which may be drawn forward. The needle is now re-threaded and passed through the opposite side in the same manner and the needle withdrawn. One loop is then passed through the other, and by making traction on the free end of one of the loops the other loop is readily drawn through. It now only remains to draw one end of the loop out, and the passage of the thread is complete. (Fig. 338.)

Thirteenth. We are now ready to close the fissure. This is easily effected thus: Take one set of wires which are outside of the mouth, untie the knots which have been made for marking them, and pass the ends through a thin plate of lead or silver which has been perforated at points to correspond to the sutures. Do this with all the wires on both sides, then slide the plates

* Hare-lip and Cleft Palate, by Francis Wm. Mason, F.R.C.S. London, 1877, p. 83.

up to their places on each side of the fissure. Then slip a perforated buck-shot on the end of each wire, and taking hold of it with the jaws of the compressor, slide it gently to its place, and press it firmly up to the hole in the plate. The wires are cut off quite near to the shot, and their ends bent over, to prevent injury to the tongue, and to hold the parts together.

Fourteenth. After-treatment. The patient should sit up in bed for several nights, or at all events lie with his shoulders well elevated, in order to prevent any discharge from irritating or tickling the fauces, and thus avoid the risk of coughing, sneezing, or hawking.

He must not be allowed to talk; let him make his wants known, or answer any necessary questions by writing. All hawking or actions with the throat must be avoided. No solid food is to be allowed; the diet being soups, gruel, milk, or other liquid substances.

The sutures may be taken away between the fifth and the ninth day, according to the circumstances of the case; but it is far preferable not to be in a hurry for their removal if the parts are doing well. To remove them it is necessary to hold the shot with forceps and with the curved scissors clip the wire between the plate and the shot.

Sir William Fergusson detaches a piece of bone on each side of the cleft, and then forces the bone, periosteum, and mucous membrane towards the middle line, and fixes them there. After division of the levatores palati and palato-pharyngei muscles by means of a rectangular knife, he pares the mucous membrane from the edges of the cleft, and then, close to the edge on each side of the fissure, he makes two apertures with an awl. Fine silk sutures are then passed through the holes into the nasal cavity, and after traversing the floor of the nares, they are again made to enter the mouth through the corresponding holes on the other side. "An incision from before backwards is then made through the mucous membrane and periosteum, just outside the sutures." In the site of these incisions, he cuts through the hard palate by means of a small chisel, forces the two pieces of bone into coaptation in the median line, and fixes them by means of the sutures. "When the hard and soft palates are operated upon at the same time, he puts two sutures into the hard palate, and three into the soft, and ties them in the following order;" first, from before backwards, the second suture in the hard palate, then the three in the soft, and last, the foremost suture in the hard palate. Lint is then packed into the apertures in the hard palate, and allowed to remain from two to four days. The hard palate soon becomes so consolidated that, in a few months, it seems bony throughout. Mr. Mason is of opinion that by this method the bone is likely to exfoliate, to prevent which, he says:* "I have since applied a very simple method which I brought before the notice of the profession in 1874. It consists in boring holes with an ordinary brad-awl on each side straight through the hard palate, exactly in the line in which the chisel is to be applied." He then employs a small "screwdriver with a sharp edge" for cutting between the holes drilled in the bone, of which he says the least pressure will "at once divide the bone without splintering."

Dr. Parsons, of St. Louis, has reported an excellent success by this method.

Before closing this subject, attention should be given to the use of nitric acid, as suggested by Mr. Mason in the treatment of cleft palate. He thinks that this method of effecting union is especially applicable to cases in which the cleft is of average extent, and even where the hard palate is partially implicated. In more severe instances the ordinary operation may be required. Mr. Mason finds that the application of the acid is attended with no pain or inconvenience whatever to the patient, and although

* Monthly Abstract of Medical Science, Jan. 1876; Lancet, Nov. 6, 1875.

the cure is more slowly accomplished, it has the advantage of being sure, and of completely closing the fissure in the most perfect manner, without the risk of the parts giving way, either wholly or partially, as too often happens after the usual operation of staphylorraphy. A further gain seems to be that the cases may be dealt with as out-patients, as in all the examples now under notice. Mr. Mason, after many trials, prefers the strong nitric acid to any other form of caustic. He says: "I first produce a raw surface by carefully applying with a stick (not a glass rod), the acid nitric of specific gravity, 1.500, and in a few days afterward, I use in the same way, the acid nitric, specific gravity, 1.420 (Ph. Brit.), about twice a week to the part, especially the fork of the cleft."* He then states that others besides himself have succeeded with this method.

Gingivitis.—The gums often become inflamed; the inflammation may confine itself to the alveolar dental membrane, or the membrane that lines the socket of the tooth, constituting *periodontitis*. The disease is known by an uneasy feeling in the alveoli when the teeth are pressed together; the teeth are sometimes evidently forced outwards, in consequence of which, they cannot be precisely placed in contact. The pain is of a throbbing character. The inflammation may extend and be manifested on the outside of the gums, and in such a case the teeth may loosen, and pus which has been formed may be discharged between them and the gums. In some cases the alveoli become carious, and a *fistulous ulcer of the gum* ensues; the tooth or teeth then become permanently loose, occasioning, especially in chewing, much annoyance and pain. The causes of this disease are cold and hot fluids taken into the mouth, and exposure to cold and moisture.

The dental membrane itself also becomes inflamed, constituting *endodontitis* or inflammation of the lining membrane of the teeth; it cannot in the majority of cases be diagnosed from neuralgia of the teeth.

Acute local inflammation of the gums proceeding rapidly to suppuration often occurs, the symptoms of which are swelling, redness, heat, throbbing, and pain; this inflammation may terminate in suppuration or *gumboil, parulis, apostema parulis*. The gums also sometimes shrink away, to which condition the term *ulatrophia* is given; this causes looseness of the teeth, and they sometimes fall out without being decayed. The causes of this are often mercurials and the accumulation of tartar around the necks of the teeth.

Treatment.—For sore gums, which become detached from the teeth, bleed readily when touched, and are very red, with looseness of the teeth, and bad odor from the mouth, and if occasioned by *mercury*, also if the gums are painful during mastication, or look pale and bleed readily, with frequent pains in the sound teeth, *carbo vegetabilis* is indicated.

Sulphur for swelling of the gums, with shooting pain, also when abscesses form in the gums. *Staphisagria* is the specific for excrescences on the gums, likewise when such morbid growths arise on the inner cheek; also for white, pale, painful, and swollen gums.

I will not enter into the details of symptoms, nor the specific remedies for affections of the gums. Physicians are not often called upon to treat these ailments separately, as they generally fall into the hands of dental surgeons. These morbid conditions being so readily recognized, no difficulty will be experienced in ascertaining the appropriate remedies. It is not my intention to enter upon the various symptoms of odontalgia (toothache), to find the exact remedy for which will often require some patience and time. The best remedies, and those most frequently indicated, will be found among the *polycrests*, viz., *belladonna, chamomilla, mercurius, nux vomica, pulsatilla, and sulphur*, one or other of which will answer for most

* Hare-lip and Cleft Palate, by Francis Mason, F.R.C.S., London, 1877, p. 77.

cases. In selecting the remedy with a hope of its precisely suiting the cases, the following circumstances must be considered: the *kind* of pain; if one or more teeth are affected, or the teeth of one or both sides; the extension of the pains to the bones of the face; enlargement of the submaxillary glands, and whether odontalgia be congestive, rheumatic or arthritic; whether it be nervous; if caused by the abuse of coffee, tobacco, mercury, by cold or damp air, or water which has been drunk, or by a chill; whether sensitive and nervous persons are affected, females, young girls, or children; if it occurs at the period of the catamenia, during pregnancy, lactation, or in hysteric females.

Diseases of the Tongue.—Wounds of the tongue bleed profusely, but from the cases I have seen heal with marvellous rapidity. Sutures are necessary, if the wound is of any magnitude. I have known the tongue nearly severed by the teeth, the patient being kicked on the chin by a horse. In this case the sutures were removed in three days, when the wound was perfectly healed. I always advise the mouth to be washed with a solution of calendula.

Tumors of the tongue having all the appearance of scirrhous formation, frequently arise from disorder of the digestive organs, or from irritation produced by carious and ragged teeth. Sometimes, also, the whole tongue becomes enormously enlarged, fills up the mouth, and hangs below the chin. Many cases of this kind are recorded by writers, and in particular two very remarkable ones by Percy. The tongue is likewise studded over, in some instances, with small excrescences, having broad tops and narrow pedicles, resembling mushrooms. At other times, deep fissures or irregular cracks occupy the whole surface of the organ. But these are all different from genuine scirrhus, or cancerous ulceration, which is recognized by the hard, rough, broad-bottomed, wart-like tumor, usually situated about the middle of the tongue towards the tip; or to a ragged, ill-conditioned sore, covered with a fungous growth, and bleeding upon the slightest irritation, accompanied by a deepseated lancinating pain, extending to the throat and base of the skull, and terminating, eventually, if its progress be not interrupted, in the total annihilation of the organ. Epithelioma is the term applied to the latter tumors, because their cells resemble those of tessellated epithelium. There are two varieties, the *superficial* and *deep*; the *first* having mild symptoms of itching and burning, and raised papillæ; the *second* presenting severer manifestations, as related above. Children are occasionally subject to this disease, but it occurs most frequently in persons beyond the middle age.

Carcinomatous affections of the cheek and nose commence in the same manner, and pass through the same stages as have been already noticed in the other forms of cancer.

The proximate cause may be a blow or contusion, the injudicious treatment of ulcers, indurations, or excrescences on the face; syphilis; suppression of natural secretions, etc.

Treatment.—The medicines for cancer of the tongue are the same as those for cancer elsewhere. The student will find them at page 128, *et sequitur*. If one medicine appears to have more effect on the tongue than any other, it is the *galium aperinum*. The formula for its use can be found on page 133.

If an operation be deemed necessary, the ligature or the galvano-caustic wire, or the écraseur may be selected. These operations will be described further on in this chapter under "Amputation of the Tongue."

Hypertrophy of the Tongue.—Rokitansky,* in his *Pathological Anatomy*, says very little about hypertrophy of the tongue, and that almost indirectly, when speaking of hypertrophy in the system of voluntary muscles.

* *Vide* vol. iii, p. 233.

Jones and Sieveking* have the following paragraph: "The tongue is liable to be affected with an extraordinary hypertrophic enlargement, in consequence of which it protrudes from the mouth sometimes as much as two and a half inches; the structure is altered, becoming much more dense than natural; but it has not been determined exactly in what the alteration consists. In one case, recorded by Mr. Liston, the enlargement of the organ seemed to have been occasioned by the development of a nævus-like substance."

Cooper, in his *Surgical Dictionary*, mentions enlargements of the tongue consequent upon various diseases, and Dr. M. Reese, in his valuable appendix to the same work, records in a few lines the following facts, viz.: That Dr. Thomas Harris, of Philadelphia, twice performed amputation of the tongue for hypertrophy of that organ; and that Dr. Mütter also successfully resorted to the same operation. That in 1838, Dr. Mussey, of Cincinnati, and in 1836, Dr. Donnelan, of Louisiana, removed portions of the tongue, the latter gentleman by using ligature in preference to the knife. Mr. Muller has two paragraphs on the subject, including symptoms and treatment, the latter chiefly consisting in the administration of the iodide of potassium and the application of leeches, and these means failing, recommending operative procedure.

Neither Paget, in his *Surgical Pathology*, nor Cragie, in his *Pathological Anatomy*, makes allusion to the subject; but Gross is much more explicit. He tells us that all the structures which enter into the formation of the organ may be separately or conjointly affected, that the projecting substance is dense and rigid, "protruding considerably beyond the teeth, and causing serious obstruction to the functions of the mouth and a wasting discharge of saliva."

He states further, that the prolapsed part may be from a few lines to three, four, and even five inches in length, with enlargement of the papillæ and great thickening of the mucous investment of the organ. Females are more liable to be affected than males, and it generally comes on early in life, being now and then congenital. Further he says: "It is sometimes associated with unusual shortening of the branches of the lower jaw, with great separation of the incisor teeth. . . . . The countenance has an unseemly aspect, the inferior incisors are forced into a horizontal position, and the jaw itself is not unfrequently altered in its shape." In the *treatment* he recommends, as usual, purgation, punctures, incisions, low diet, the iodide of iron and of potassium, Lugol's solution, and pyroligneous acid. The latter solution, he states, has materially benefited a case of congenital hypertrophy of the tongue under his care.

I mention these authorities and for a description of the affection will narrate a case that came under my supervision:

The patient, a girl, aged eleven and a half years, was admitted to the hospital with a *congenital hypertrophy of the tongue* (Fig. 337); the organ at times became enormously enlarged, and protruded from her mouth from three to four inches. The little sufferer had been, during her whole life, subject to catarrhal fever upon the slightest exposure, at which times the enlargement increased considerably. She was somewhat emaciated, and the saliva dribbled from her mouth to such a degree, that she was obliged to wear thick cloths across her chest, which for cleanliness and comfort had to be frequently renewed. The jaws never having been brought together, it may well be imagined that the rami of the inferior maxillary did not form the usual angle with the body of the bone; and that the growing teeth, having constantly upon them the superincumbent weight

* A Manual of Pathological Anatomy, p. 453.

of the tongue, projected from the lower jaw more like the tusks of an animal, than the regularly developed masticating organs of a human being; they also, impinging upon the under surface of the hypertrophied mass, caused extensive fissures and ulcerations. On the superior surface of the tongue two longitudinal and rough depressions were seen.

Fig. 339, from a photograph, will give an idea of the deformity.

Treatment.—In such cases, compression is of no avail, and amputation of the tongue, or the superabundant part of it, is the only resource.

Amputation of the Tongue.—In the *American Journal of Medical Sciences*, for October, 1848, there is an interesting account of an operation successfully performed by W. G. Delaney, M.D., for congenital glossocele or hypertrophied tongue, in which the V-shaped incision was used.

FIG. 339.

The Author's Case of Hypertrophy of the Tongue; from a Photograph.

In this instance, the appearances were very similar to the case I have reported above.

The tongue protruded four inches, was seven inches in circumference, and was marked upon its dorsum by a deep linear fissure; the tongue could not be retained within the mouth except for a moment, and its intrusion filled the whole cavity of the fauces, and prevented respiration. The inferior maxillary bone was natural in form, except at the symphysis, where the incisor and canine teeth were separated half an inch, and inclined outward by the constant pressure and weight of the tongue. The lower teeth were covered with tartar, and rather loose in their sockets, and the lower lip was everted on the chin.

The similarity between this and my own case, just recorded, will readily be seen, with the exception, that under the most favorable circumstances my patient could not intrude the tongue entirely within her mouth, and at the time when the photograph, which is represented by the cut, was taken, she had not the power to draw backward the organ.

The position of the teeth, the shortening of the rami, etc., are all very similar. The operation of Dr. Delaney consisted in making a V-shaped incision.

Ranking's Abstract for 1853, p. 126, contains a portion of a communication on this subject, submitted to the Medico-Chirurgical Society of London. In that paper, Mr. Humphrey's case was very like the above, the parts being removed by the knife. That gentleman further says, after the operation: "The lips could not at first be brought together, and the thick stump could always be seen, though never protruding."

After a time the parts began to assume their natural appearance and position, and a cure was effected.

Mr. Cross's case was one in which pressure with bandages, soaked in a solution of alum water, after a long period produced the desired effect.

In the communication, the disease is said to be rare in England. A case was treated successfully by Sir Astley Cooper by ligature.

Mr. Syme removed the protruding portion in another case, by the knife, but the patient died of inflammation of the tongue and parts about the larynx.

Mr. Liston has recorded a case in which the hæmorrhage, after operative

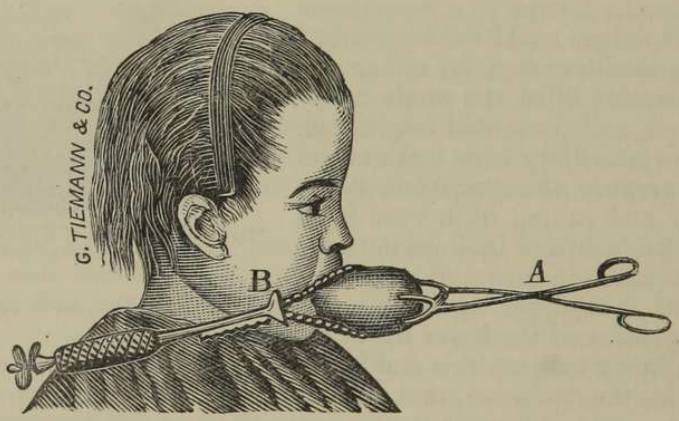
procedure, was so great that ligatures had to be applied to both lingual arteries; inflammation, suppuration, sloughing, and death followed in rapid succession.

Mr. Hodgson's case was operated upon by means of a ligature, after the parts had sloughed away; "the tongue was quite within the lips, but very thick in the horizontal direction; the altered shape of the lower jaw prevented its being brought into contact anteriorly with the upper."

At present the operations on the tongue are performed by the écraseur or the galvano-caustic wire. The following operation I performed with complete success for a rare case of congenital hypertrophy.

The patient was placed in a chair facing a window, her head being supported by an assistant; when the anæsthetic influence was complete, I passed the teeth of a hooked forceps into the substance of the tongue and drew it forward, handing the instrument to an assistant to retain it in that position; then standing on the left and a little to the rear of the patient, I passed the chain of the écraseur diagonally across the protruded portion of the organ, allowing the handle or cylinder to touch the right angle of the lip (Fig. 340). The screw was turned, the chain tightened, constricted, and

Fig. 340.



cut beautifully through the substance, which was as hard as gristle. After that portion had been removed, I changed my position to the right of the patient, allowed the handle of the écraseur to touch the left angle of the mouth, and worked it as before until the part was removed. It will be seen that by such method of procedure, I was enabled to point the tongue, and though the point at first was rather sharp, it has since been a source of gratification that I adopted such a method. The whole proceeding occupied about twenty minutes, and the amount of blood lost did not exceed half an ounce.

The patient was placed in bed with her shoulders elevated, and I had applied to the cut surfaces an iced solution of calendula.

For two weeks after the operation, as was anticipated, the tongue was swollen enormously again, but it gradually declined as the raw surfaces healed, until finally the tongue could with ease and satisfaction be retained within the mouth.

It is truly gratifying, however, to witness the manner in which nature has healed the wounded parts; instead of leaving them angular, as necessarily left by the chain of the écraseur, they are rounded almost as well as though the original margin of the organ remained.

The girl, never having brought her jaws in apposition, had a great tendency to allow the inferior maxillary to drop down, on account of the shortness of the branches of the bone, which has been before alluded to.

I therefore procured a piece of gutta-percha, bent it and made an oval gag or mouth-piece, cutting in the centre a small opening sufficient to admit air, but not large enough to allow her to protrude her tongue. To keep the bone in apposition and at the same time to endeavor to force back the symphysis, I used the splint and strap for fracture of the jaw-bone.

The cure was complete, and to this day the girl speaks and sings without impediment.

In the performance of either partial or complete amputation of the tongue it is necessary to remember the position of the genio-hyoid and genio-hyo-glossus muscles, and the relations of the lingual and the ranine arteries. The division of these muscles allows the tongue sometimes to fall backward, thus closing the epiglottis and producing symptoms of suffocation. It must be remembered, also, that operations upon the tongue often are followed by alarming hæmorrhage, due to the great vascularity of the structure.

In *partial amputation* the following method, which I lately have successfully employed, may be adopted. In place of the ordinary wire écraseur the galvano-caustic battery may be used.

The case was one of epithelioma, involving the right half of the tongue. A needle, armed with a double thread, was passed through the tip of the tongue, the needle cut off and the loose end tied, enabling the tongue to be well drawn out. Westmoreland's instrument was then applied at the corner of the mouth to hold the jaws apart. A stout pin was inserted through the tongue from above, to compel the chain of the écraseur to start properly in the sound tissue behind and inside the tumor. The écraseur chain was applied by means of a needle through the base of the tongue from below upward, that being united to the écraseur, it was worked, cutting anteriorly in the direction toward the tip, almost in the median line. The écraseur chain looped was next passed backward, the diseased portion of the tongue protruding through the loop, and marked out by three pins, which formed a fence, as it were, outside of which the chain worked at right angles with the tongue ; the screw was gradually turned, cutting laterally. The operation required thirty minutes, some delay, however, being occasioned by the slipping of the chain of the écraseur. No serious hæmorrhage resulted ; the ranine artery being avoided, but was visible through the little tissue left at its side. Calendula applications to the tongue, and ice-water gargles were ordered.

This is the third amputation that I have made of the tongue, and I have been careful to notice three facts : First, that the tissue of this organ is most rapidly reproduced, owing, I suppose, to the plentiful blood supply ; second, that removal of large portions of the tongue does not materially impair articulation or speech ; third, that the operation above described, with pins and the écraseur, or the galvano-caustic wire, is preferable to the more severe proceedings of Syme or Nunnely.

Removal of the entire Tongue is thus performed : It is a modification of that of Mr. Syme. The object, is to allow the application of the ordinary or the galvanic écraseur to the base of the tongue above the os hyoides. The incision is made in the median line of the chin, dividing the lower lip and extending to the hyoid bone : this will allow a sufficient dissection of the lip on either side, which should be raised about a quarter of an inch. A hole is then made on both sides of the symphysis of the jaw, which must be divided with a fine saw. The halves of the bone must then be drawn aside with hooks, and the genio-hyo-glossi muscles cut with scissors. The attachment of the genio-hyoid muscles must not be cut. With the aid of the fingers and scissors the tongue must be raised with the sublingual glands and mucous membrane, until it is free to the

hyoid bone. By means of a cord passed through the tip of the tongue that organ must then be drawn downwards, which will put the palato-glossi muscles on the stretch, which must be divided with blunt-pointed scissors. The chain, or the wire, must then be passed around the base of the tongue close to the bone, and the parts gradually severed, either by turning the handle of the screw or the action of the battery. As the parts are severed the operator must be prepared with a stout needle set in a handle, and threaded, to pass through the stump in case it should fall backward.

A piece of wire should then be passed through the holes previously made in the jaw, and twisted securely, to bring the bone into its natural position, and its ends then turned up between the bone and the lip. The lip is then brought together with hare-lip pins and figure-of-eight suture.*

Mr. Whitehead† has successfully performed ablation of the entire tongue with *the scissors*, without division of the symphysis or submental incision. A mouth-gag was inserted as usual, and the tongue secured by a ligature passed through its tip. This ligature was firmly taken hold of and traction made upon it; the frænum and muscular tissues divided successively. The tongue was then drawn out of the mouth and severed by cutting first on one side and then on the other. Two vessels were ligated, but secondary hæmorrhage coming on, recourse was had to the thermo-cautery.

Dr. George F. Shrady,‡ in a most excellent article on ligation of the lingual artery, prior to the extirpation of cancerous or other diseases of the tongue, arrives at the following conclusions:

"1. In cancer of the tongue, whenever it is possible, the disease should be removed through the mouth.

"2. Ligation of the lingual artery, is a very necessary preliminary to such a procedure.

"3. Ligation of the lingual artery, if performed at all, should be near the origin of the vessel, as by that means the whole of the blood-supply of one side of the tongue is completely cut off.

"4. The operation of ligation of the lingual artery, even in that situation, is less difficult than the securing of the vessel in the wound during the operation of extirpation of the tongue, and when there is free hæmorrhage deep in the mouth.

"5. The distance between the external carotid and the point of ligature is sufficient for the formation of a firm clot and the prevention of secondary hæmorrhage.

"6. The use of the scissors and the knife place the wound in a condition more favorable for rapid healing than when the écraseur or any variety of cautery is used.

"7. Ligation of the lingual may have a tendency to retard the return of the disease."

In the case which he records, the vessel was ligated just at the point where the artery passes under the posterior edge of the hyo-glossus muscle.

Malformation of the Frænum Linguæ.—It sometimes happens, though by no means so frequently as is imagined, that children are born with the frænum of the tongue so short that they are unable to raise the organ to the palate, and consequently sucking is materially impeded. This condition is made apparent by raising the point of the tongue with a spatula. If the surgeon should fail in this attempt and the tongue appear, upon ex-

* *Vide* A Course of Operative Surgery, by Christopher Heath, F.R.C.S. Philadelphia, 1878 P. 55

† Medical Times and Gazette, December 15th, 1877.

‡ Medical Record, September 14th, 1878.

amining it laterally, to be unnaturally confined, little doubt can remain of the frænum being defective.

Treatment.—This complaint is readily removed by means of an operation which, however trifling it may be considered, is one which should not be lightly performed, nor upon every ordinary occasion. Petit relates two instances in which death followed from the frænum being so much loosened as to permit the tongue to fall backwards into the pharynx, thereby occasioning suffocation; and other cases are recorded of fatal hæmorrhage following the operation from wounds of the ranine arteries and veins.

A pair of probe-pointed scissors are used for the operation. The tongue should be pressed upwards by means of the index and middle fingers of the left hand, and the frænum should then be divided in its transparent portion as far as may be deemed absolutely necessary; at the same time taking care to direct the point of the instrument downward, keeping as close to the lower jaw as possible that the arteries and veins may be avoided. If carefully performed, there is scarcely any hæmorrhage attending the operation; but, if hæmorrhage should result, it may be arrested by applying small pieces of sponge, a solution of alum, gun-cotton, or some other styptic.

Ranula.—By the term ranula was formerly understood an obstruction of one or more of the ducts of the sublingual glands, giving rise to the formation of a semi-pellucid tumor, supposed by the older anatomists to resemble the belly of a frog, hence the name.

More recent investigations have, however, demonstrated that the affection is produced by obstruction of the mucous glands situated beneath the tongue, such as the glands and ducts of Rivini.

From six cases observed by Professor Michel,* of Nancy, he concludes that, in the majority of cases, it originates in the areolæ of the connective tissue about the frænum of the tongue. In none of the cases "could a reaction resembling that produced by saliva be obtained," and the microscope only revealed tessellated and globular epithelium and crystals of cholesterin.

The swelling may attain a considerable size, interfere with deglutition, or even displace the teeth; the tumor is cystic, and is generally filled with a fluid resembling albumen, but not saliva. It arises from a natural imperfection or adhesion of the duct, or from the lodgment of a calculous concretion within its passage. This disease chiefly affects children.

Treatment.—The medicines which have been found most successful in relieving this affection are merc. sol., calc., and thuja. *Mercurius* should be employed when there is an excessive secretion of saliva, with soreness of the surrounding gums, and there is disposition to profuse sweat, the sufferings being aggravated at night.

Calcarea carb. is an excellent medicine, and is particularly adapted to children affected with scrofulosis; when there is violent burning in the buccal cavity, with difficulty of speech.

Thuja should be employed when the tumor is transparent, jelly-like, blue, red, or gray; and when the disease is accompanied with soreness of the whole palate, and with swelling of the salivary glands.

Other medicines are petrol., puls., silicea, stram., staph., and sulphur.

If medicinal means fail, an attempt must be made to open the ducts from within, which may often be very difficult. The better plan is to raise the upper part of the cyst with a pair of forceps or a tenaculum, and cut off the upper surface; then introduce cotton or lint soaked with a solution of iodine. If there should be great enlargement of the glands, an incision should be made on the outside through the integument, as cutting deeply

* Monthly Abstract of Medical Sciences, September, 1877; Gazette Hebdom., No. 16, 1877.

within the cavity of the mouth might result seriously. I have succeeded in several cases by passing a double silken ligature through the base of the tumor and tying the threads on either side, thus producing strangulation.

An excellent and very efficacious treatment of ranula is that introduced by Prof. Panas,* which consists of injecting from three to eight drops of a solution of $\frac{1}{10}$ in strength of chloride of zinc, without withdrawal of the fluid. He states that ranulæ, which had resisted treatment by excision, suture, and drainage, were promptly cured by this method.

Salivary Calculus.—Calculi are found also in the ducts of the salivary glands, but are chiefly confined to Wharton's duct, and are often present with ranula. The formation no doubt originates in a deposit from the secretion of the gland. These calculi are not generally larger than a pea, although I have seen one more than an inch in length removed by the late Dr. Hartshorne, of Philadelphia. A cautiously made incision directly over the calculus will allow its removal.

Salivary Fistula.—After operations upon the mouth and jaws, in which Steno's duct has been necessarily divided, or as a consequence of abscess, a salivary fistula is formed. The saliva flows from the wound over the cheek, and there is a corresponding dryness within the buccal cavity. Mr. Holmes gives the following operation for its cure:

"The disease is to be treated by restoring the passage for the saliva from the gland into the mouth. For this purpose the proximal part of the duct (*i. e.*, the part of the duct which is still in connection with the gland) should be found by examination of the wound; then the cheek should be everted, and along the natural opening of the duct, in the interior of the mouth (which is generally found without difficulty, opposite the second upper molar tooth), a probe or leaden string is to be passed across the wound and along the duct in the direction of the gland. The probe or string is fixed in its position by bending its extremity round the commissure of the lips on to the cheek, where it can be secured. When the saliva is thus guided into the mouth the fistula will probably heal, either of itself or on its edges being refreshed and brought together. In some cases the opening of the duct in the mouth cannot be found, and when this is the case, the distal opening of the duct as well as the proximal, must be sought in the wound; or if that part of the duct is obliterated, an artificial passage must be made and kept open; but such cases are far less promising. And indeed many cases of salivary fistula present very considerable difficulty, from the rottenness of the tissues surrounding the wounded duct, which renders them very unapt to unite when brought together, and favors the percolation of the saliva through the wound which it is intended to unite."

Tonsillitis—Quinsy.—(Squinsy or squinancy of old writers; the *cynanche* or *angina* of the medical books; *paristhmia*, from παρα and ισθμος, literally, *morbus faucium*, or throat affection; the signification of angina is strangulation: the patient complains of difficulty in swallowing.) No matter which part or parts be affected, there is swelling of the mucous membrane of the fauces, pain, redness, and glossy appearance; dryness in the first instance, but subsequently a secretion of ropy mucus, which increases the difficulty of deglutition. When the inflammation extends to the uvula, it swells and there is a constant desire to swallow (*empty deglutition*), and there is nausea and retching in consequence of the irritation produced in the throat by the elongated uvula and the secreted mucus. The smell, hearing, and breathing, also often become impaired in consequence of the disease spreading into the posterior nares, the Eustachian tube, and top of

* American Journal of the Medical Sciences, January, 1877, p. 255.

the larynx. The food is sometimes retained by the mouth, and solids are more easily swallowed than liquids; in consequence of some muscular fibres only being able to act, the particles of fluid having but little cohesion, slip from each other. There is a constant desire to hawk up the mucus, and the patient breathes with his mouth open. If the angina be excessive, the jugular veins swell, the face becomes purple and livid, there is headache, delirium, and other symptoms of febrile excitement. When the inflammation attacks the tonsils, constituting *cynanche tonsillaris* or *amygdalitis*, the following group of symptoms present themselves. At first slight chills, followed by very much fever, with uneasiness in the fauces, and more or less difficulty of deglutition, with a sensation of a foreign body in the throat during the effort; after a while a pain is experienced in the tonsils, the difficulty of swallowing increases, or swallowing is impracticable; one or both tonsils, on examination, are found very much enlarged, and the whole surface of the fauces red and somewhat swollen. The tongue is white and covered with a thick layer of transparent, viscid mucus, and is swollen; the pain shoots from the fauces into the ears, particularly when attempting to speak or swallow, and the mouth is opened with great pain and difficulty; a thick ropy mucus adheres to the inflamed surface and impedes respiration; the adjoining parts are red and swollen, but the principal pain and difficulty of breathing arise from the enlarged tonsils, which may very easily come in contact, confining the swollen uvula behind them, or pressing it forwards into the mouth. The outside of the throat opposite to the tonsils is always somewhat swollen, and tender to the touch. In some instances the mucous membrane is less vividly red, or is red in spots, and covered with a pappy, gray, white-yellow mucus, which extends to the tongue. One tonsil is generally inflamed first, the *left* sooner and more violently than the *right*. Sometimes slight ulcerations take place on the tonsils, which ulcers arise from small, yellowish pustules, which burst and pour out a lymphlike fluid, which hardens into a whitish, pseudo-membranous layer on the surface of the tonsil; this after awhile separates, leaving the part bright red, eroded, and discharging a purulent matter.

This disease may terminate in resolution, suppuration (*abscess of the tonsil*), gangrene, very rarely; or in permanent enlargement of the tonsils (*chronic hypertrophy*).

The causes are such as induce other inflammatory affections: wearing damp linen; cold applied to the neck; sitting in damp rooms; getting wet in the feet; violent exertion of the voice; blowing wind instruments; suppression of customary evacuations; acrid substances irritating the fauces.

The circumstances indicating resolution are, less fever, freer respiration, deglutition not so much impeded, the inflammation being of a *lighter red color*, with copious salivation. If it is about to terminate in suppuration, the dyspnœa and difficulty of swallowing increase, and it is altogether impossible to open the mouth. The pus may be discharged suddenly with immediate relief, by hawking or coughing, or the matter may be discharged without an aggravation of symptoms, and be swallowed by the patient.

The disease is supposed to affect particularly the young and sanguine, but this does not accord with general experience. It is often met with in adults and in very different temperaments. After having occurred several times, unless treated by specifics, it appears to establish a peculiar habit or diathesis; in such it can be readily excited and by slight causes.

Treatment.—The principal medicines for cynanche tonsillaris are acon., bell., merc. sol., merc. subl., hepar sulph., cham., ars., ignatia, nit. ac., nux vom., baryta, silicea, and sulphur, also gelsem., phytolac., sanguin., and podophyl.

In the first stages of the disease, when the patient is troubled with an

undue secretion of saliva, inducing constant and painful deglutition, and when the inflammation is accompanied by synochal fever, aconite should be prescribed. After the fever has been subdued, bell. is particularly efficacious, and frequently in alternation with aconite rapidly cures the affection. It is especially indicated by the following symptoms: Phlegmonous redness of the tonsil, with shooting pains during deglutition; sensation as if the fauces were spasmodically constricted, with slimy white mucus on the throat and tongue.

Mercurius sol., or *viv*, is required when there is much swelling of the glands, profuse secretion of saliva, deglutition much impeded; or should suppuration unfortunately have ensued, when there is throbbing and shooting in the gland, and small ulcers appear, which are isolated and round, with a tendency to become indolent in character.

Cham. may prove useful in mild cases of cynanche, when there are stinging pains in the part, with great restlessness at night.

Ignatia is called for when there is soreness during deglutition, with a sensation of a lump in the throat, shootings into the ears when not swallowing, and greater difficulty experienced in swallowing liquids than solids.

When the disease appears in persons who are affected with dyspepsia, *nux vom.* should be employed, particularly when there exists a feeling of excoriation in the throat, and there is a sensation of constriction during deglutition.

Erigeron is said to be especially useful in the early stages of the disease.

Gelseminum. If the pain shoots to the ear and appears to be external instead of internal.

Sanguinaria is claimed to be prophylactic for those repeated attacks of tonsillitis to which many are subject.

Hepar may be employed together with sulph. Silic. or sulph. promote granulation and cicatrization after the discharge of pus.

In chronic enlargement and induration of the amygdalæ, the medicines are chiefly bell., baryta c., merc., silic., sulph., or sep., puls., ars., nit. ac., etc. Chronic enlargement of the tonsils is a disease which for successful treatment requires the utmost patience and unwearying perseverance, not only of the practitioner, but also of the patient. The medicines must be well selected, administered in not too low a potency, and at considerable intervals; at the same time, it is of great importance that the patient should strictly observe the proper dietetic rules, and avoid exposure to a damp and cloudy atmosphere. It may confidently be asserted that from the negligence of patients, and the want of perseverance of practitioners, many cases quite curable are abandoned as hopeless.

It is suggested by Dr. Porter,* that the enlarged tonsils be injected with a watery solution of iodine (three drops to ten) into the enlarged glands. The instrument used is a hypodermic syringe, with a long needle. Half the above quantity is to be injected into each tonsil.

I have succeeded in removing tonsils without the aid of the knife, by the application of caustic paste.

Dr. Fournier, of Paris, reports fifty-two cases cured by the application of the Vienna Paste; the minimum time required was two weeks, the maximum one month. Dr. Morrell Mackenzie, of London, has introduced what he terms the London Paste, which I have used in many cases with complete success. Dr. Ruppaner† reports one hundred and twenty-three successful cases operated upon in this manner. The following is the method recommended by Dr. Ruppaner. I have used it with success.

The *London Paste* is prepared of equal parts of caustic soda and lime,

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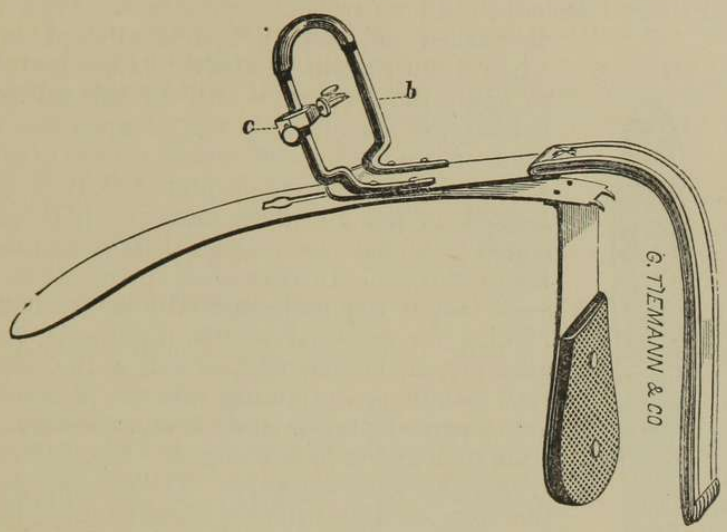
* U. S. Medical Investigator, December 15th, 1877.

† Medical and Surgical Reporter, Nov. 20th, 1869.

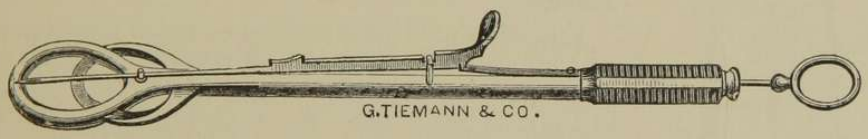
moistened with a little alcohol. It must be kept in a well-stoppered bottle, since caustic soda and lime have a powerful affinity for carbonic acid. If

FIG. 341.



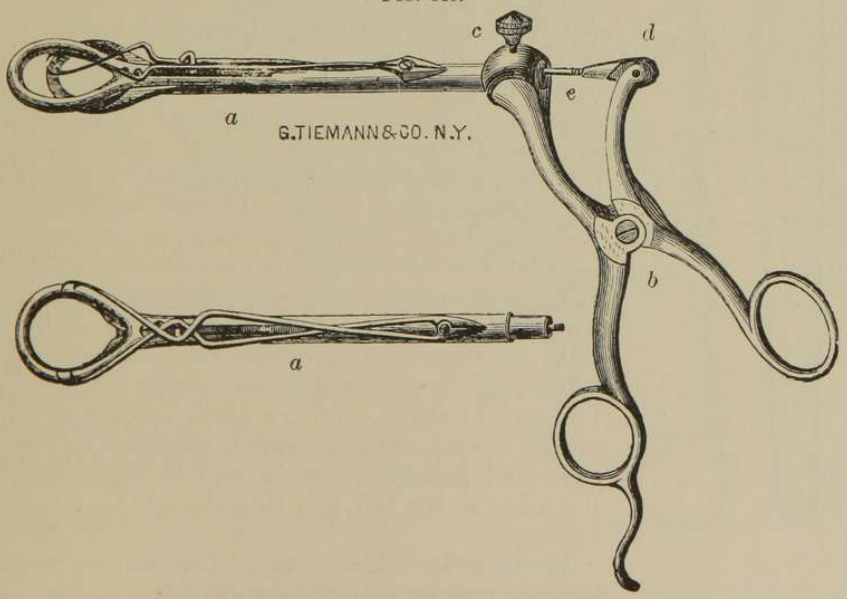
exposed, therefore, to the air, the causticity of the paste is lost. Various tests have also satisfied me, that it is necessary to employ absolute alcohol in preparing it.

FIG. 342.



In practice I proceed as follows: A quantity of equal parts of finely pulverized and well-mixed caustic soda and unslacked lime is kept on

FIG. 343.



hand. When an application is to be made to the tonsils, a little of the powder is put into a small porcelain cup, a few drops of absolute alcohol,

which is kept near at hand, are added, the two are carefully mixed with a glass rod, when the paste is ready for use. The patient must be placed in a good light, a tongue-depressor used, and the paste applied and allowed to remain for several seconds, until an eschar is produced. Then the paste is washed off, and the parts allowed to slough, when it must again be applied. Care must be taken to apply the escharotic only to affected parts. It is likely, if too much is placed upon the rod, that some of it will drop off, which causes great excoriation. When *excision* is preferred, it is to be performed in the following manner: The patient is seated in a chair, before a good light, and the mouth kept wide open. In examining the mouth and throat, some tact is required, especially in children, and in looking for enlarged tonsils, diphtheria, and other affections of the pharynx, as well as in operating for cleft palate, or examining into the pharynx, a suitable tongue-depressor is essential, especially if the examination has to be prolonged. Fig. 341 represents Elsberg's tongue-depressor. The surgeon then passes the ring of Fahnestock's tonsillotome (Fig. 342) around about half the tonsil (it is not necessary as a general rule to remove the whole gland), slides the pin through, and draws back the handle. The after treatment consists of gargling with calendula and water.

FIG. 344. FIG. 345.

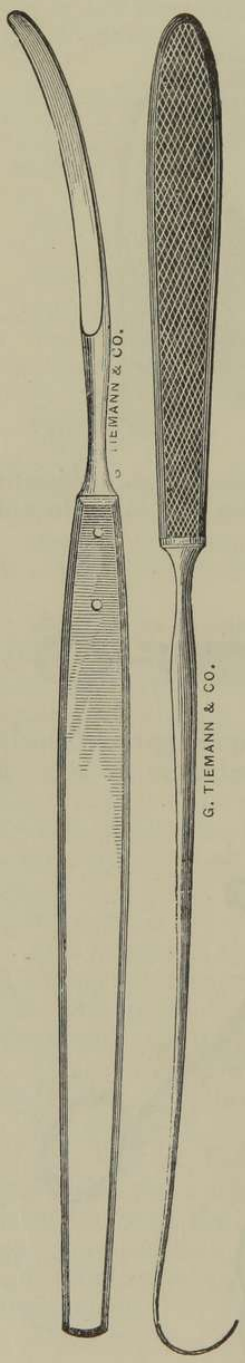


Fig. 343 shows Tiemann's one-bladed tonsillotome, which seizes the gland as it is removed. Some surgeons prefer a hook and a curved bistoury, as seen in Figs. 344 and 345. The hook is inserted into the tonsil, and drawn forward, and the tonsil, or a portion of it, removed by a stroke or two of the knife.

An ordinary curved probe-pointed bistoury, wrapped with a piece of cotton, or an instrument prepared expressly for the purpose, will answer in lieu of the tonsillotome.

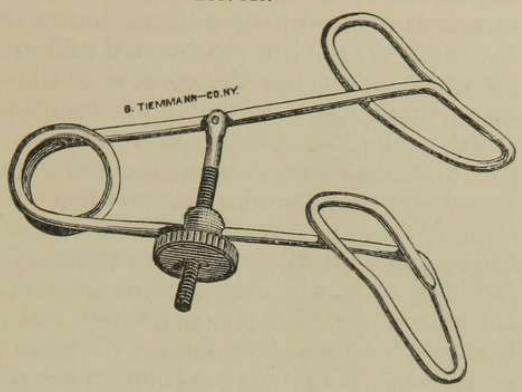
Rhinoscopy.—By the term rhinoscopy is understood an inspection of the nose and its cavities. It may be divided into anterior and posterior, the former being through the nostrils, the latter (called also choanoscopy), behind, through the fauces.

The ordinary bivalve speculum is often sufficient for anterior rhinoscopy, or the speculum of Folsom (Fig. 346) answers very well; indeed, oftentimes by throwing the head back, and allowing strong sunlight to shine into the nostrils, and pressing the thumb lightly on the tip of the nose, a good examination can be made. Metz's nasal speculum consists of two instruments or curved spatulæ, slightly concave and polished; one is held in the right hand, the other in the left, and thus the alæ of the nose are held apart.

In *posterior rhinoscopy*, either sun or artificial light is to be used; the mirror may be placed upon the head, as seen in the Chapter on Laryngoscopy, or the laryngoscope may be used. The patient

is so seated that the light may be caught upon the reflector and directed within the mouth. The operator then, taking a blunt flat hook, set in a long handle and curved somewhat to keep the hand out of the way of vision, introduces it behind the uvula, which is gently drawn forward. The mirror, also set in a long curved handle, as that used in laryngoscopy, being slightly warmed, is introduced, the glass looking upward and forward. The mirror may be moved backward and forward until the nares are well examined. It often takes several examinations before the parts are brought into view, some persons being much more easily managed than others. However, even an unsatisfactory view throws great light on diagnosis, and facilitates the performance of operation.

Fig. 346.



Pharyngitis.—The pharynx is liable to inflammation, constituting the disease called *angina pharyngea* or *pharyngitis.*

The same tissues are attacked as when other portions of the isthmus of the fauces are affected. If the inflammation be high up, it may be discerned by an examination of the mouth, when the parietes of the posterior wall of the isthmus will be perceived to be inflamed. Deglutition is very painful, and from the dryness of the parts very much impeded, the food frequently returning by the nose, and a violent and spasmodic cough is produced in the endeavor to swallow. *The voice is sometimes hoarse;* the inflammation spreads to the nasal fossæ and larynx, but *respiration is not often affected.* It frequently accompanies amygdalitis, and often follows angina faucium.

The inflammation in hydrophobia is somewhat similar to angina pharyngea, and it sometimes ends in suppuration.

The stylo-hyoidei, stylo-glossi, mylo-hyoidei, hyo-glossi, stylo-pharyngei, and the constrictor muscles of the pharynx are the muscles affected.

Gangrenous Pharyngitis.—The pharynx is also liable to *gangrenous inflammation; angina maligna, putrida, ulcerosa; ulcerated, putrid, or malignant sore throat.* This disease is an inflammation of a peculiar kind. Although it is true that ordinary pharyngitis may terminate in gangrene, still this is of very rare occurrence.

This variety is marked from the first with its peculiar symptoms, which are typhous in character. It is also perceived in scarlatina, but is not peculiar to it, as it sometimes appears without, at others with the scarlet rash; it may be sporadic or epidemic. The symptoms, from the first, are of the most alarming kind.

The disease seems to depend upon a humid or peculiar atmospheric condition, attacking chiefly children, and those of weak, lax fibre. When one member of a family is attacked, the others seldom escape, and hence its contagious character is inferred. It sometimes follows measles of a malignant kind.

Its first symptoms are, shivering, nausea, vomiting, and anxiety, followed by heat, thirst, dyspnœa, and restlessness; the face is flushed, the eyes bloodshot, the neck stiff, the respiration hurried, accompanied with hoarseness and sore throat; the internal fauces are of a dark-red color,

the tonsils slightly inflamed, *but not sufficiently so to obstruct respiration or deglutition;* in a short time, sloughs in color between a light-ash and a dark-brown can be seen on the tonsils, velum pendulum palati and uvula; the tongue is covered with a thick brown fur, the breath is highly offensive, the insides of the lips are covered with vesicles, which contain an acrid matter which excoriates the corners of the mouth and other parts. There is also a discharge of corrosive pus from the nostrils. Diarrhœa occurs, especially in infants, and the thin ichorous fæces excoriate the anus. From the first, the fever is high, the pulse small, frequent, and irregular; the fever remits in the morning and has evening exacerbations; there is also loss of strength. We find, likewise, low muttering delirium, or coma. On the second or third day, large patches of a dark-red color appear about the face and neck, which by degrees disperse themselves over the body, even to the extremities of the fingers, which feel swelled and stiff; these red patches continue for about four days, and leave without producing any change of symptoms. The inflammation sometimes spreads along the Eustachian tubes to the internal ear, where it produces ulceration, and indeed destroys the structure of that organ; in other cases, the parotid, maxillary, and other glands become painful and swollen; the entire neck often swells and assumes a dark-red color. As the sloughing spreads, the parts become darker-colored, the spaces between the sloughs assume a purple hue, new specks appear, and the whole internal fauces become covered with thick sloughs, which after their separation leave deep ulcerations.

If the case be very aggravated, the fauces become quite black, *the ulceration becomes deeper and deeper;* these disturbances spreading through the alimentary tube, often terminate in gangrene, with which increase of symptoms, a colliquative diarrhœa sets in.

An unfavorable prognosis will be found if there be a sudden abatement of violent symptoms, as of pain; the tonsils becoming dry, flaccid, and unequal, and of a pale-brown or livid color; the inflammation changing to a dull-red, interspersed with spots of a dark color (so long as the specks remain white, less apprehension may be experienced); the pulse becoming small, weak, and irregular, the face cadaverous. Also if clammy, cold sweat, and cold extremities, fetid breath, great anxiety, subsultus tendinum, foam in the mouth, coma, and delirium appear, and the tonsils become so large as to threaten suffocation, then the prognosis is bad.

The eruption which was stated to occur is not uniformly diffused, but is perceived in blotches or small points, scattered over the trunk and extremities, of a dark purple or livid hue, and which terminates in scanty desquamation.

Treatment.—The remedies for the treatment of these conditions will next be considered; to have pointed them out separately in connection with the inflammation of each part would have consumed much time, in consequence of the frequent repetition which that course would have rendered necessary. The symptoms of each remedy will, in most cases, explain for which kind of inflammation it is required, and as we proceed I will endeavor also to point out, with the view of making a stronger impression upon the memory, such specific adaptations as present themselves during the enumeration of the necessary medicines.

Aconite, if there be dry heat, violent fever, redness of the cheeks, tossing, impatience, and anger; deep redness of the parts, with difficult and painful deglutition; burning, choking, and *pricking*, with contraction of the throat, which is very painful when *speaking;* violent thirst, congestion of blood to the head; constant accumulation of saliva, which the patient endeavors to hawk up or swallow. Also,

if the fauces and velum pendulum palati are of a dark-red, accompanied with almost total inability to swallow; hoarseness and fever. This remedy may be required at the commencement of every variety of the disease; any attenuation from the 3d to the 6th or 12th may be used in repeated doses, every one, two, or three hours; the doses of other medicines about to be mentioned for these affections in an acute form, let it be here understood, are to be of similar strength, and repeated at similar intervals.

Belladonna is, of all the remedies, most frequently called for in these affections, and may be required in any case. When demanded, there is pain as if from *excoriation; scraping* sensation, with shooting, or a sensation of *enlargement* of the throat, with dryness and burning; *shooting* pains, especially when endeavoring to swallow and not succeeding; there is often also a rending pain extending to the *temples, lower jaw*, and *submaxillary* glands; also a constant desire to swallow, or inability to do so; violent thirst, which the patient fears to gratify, as there is entire inability to drink, in consequence of the fluid being forced upwards, and escaping through the nostrils; also a bright redness of the soft palate, velum pendulum palati, root of the tongue, uvula, and tonsils; or there may be a *bright and yellowish redness*, without swelling.

Belladonna, if it does not succeed in effecting a cure by resolution, seems to promote suppuration, causing the secretion of pus to be of the least possible quantity, and the opening of the abscess to be effected with so little pain as to be scarcely recognized by the patient. The efficacy of this specific in anginous affections would be sufficient to convince any competent and unprejudiced individual of the truth of homœopathy, and the power of infinitesimal doses, for very many cases of the most aggravated forms of angina, and in the acute stages, are relieved equally by the decillionth attenuations, as with those much higher, the 200th, 400th, 600th. It is also indicated when ulceration follows the suppuration.

Mercurius is the medicine next in importance to belladonna This remedial agent is strongly indicated in those anginas which appear on the slightest change of weather, and in individuals who have often suffered from and are consequently liable to angina; also to those anginose affections which occur after acute cutaneous affections, which depend generally upon a slight cold; they appear in spring and autumn in young, robust individuals. When catarrhs are frequent, such subjects are exempt from the catarrh, but are affected with angina. *Mercurius* is often used before *bell.*, and at the commencement of the disease, or in alternation with belladonna; the indications for its use are, the inner mouth, fauces, tonsils, uvula, velum pendulum palati, root of the tongue, and inner cheek, are swollen, with great inflammation, redness, etc., impeded deglutition, especially of fluids. If the salivary glands are implicated, there is salivation of a *tenacious saliva*, also violent shooting in the throat and tonsils, especially when swallowing, which extends to the ears and submaxillary glands; or a sensation of excoriation and burning in the throat, elongation of the uvula, constant desire to swallow, as if there were a lump in the throat; with unpleasant taste in the mouth. The parts are also very red, and not much swollen; pain in the parotid glands and lateral muscles of the neck; scraping behind the palate; frequent hawking up of pieces of mucus from the fauces and posterior nares; also, when deglutition and speech are impossible, unless with great effort, and saliva is constantly flowing from the mouth; also fetid smell from the mouth, resembling mercurial fetor; also, if the inflammation is much disposed to attack the tonsils, when the fauces are not of so bright a red, but are covered with large quantities of mucus, or when the tonsils are much enlarged, not very painful, but covered with patches of white mucus.

This medicine is suited to acute angina, catarrhal, phlegmonous, and rheumatic angina, for that caused by a chill, and for amygdalitis; also when there is ulceration or suppuration.

Arsenicum is the medicine *par excellence* when there is a rapid failing of strength with intense burning thirst, drinking often and but little at a time, dry and black patches on the mouth, fetid breath, a hard, dry, and black tongue, profuse watery diarrhœa, rapid emaciation, and profuse sweating. In fact, in gangrenous pharyngitis, in alternation with lachesis, this medicine is generally indicated.

When *belladonna* and *mercurius* fail to subdue the disease, although appearing to be strongly indicated, *lachesis* may be given when the pain in the throat is aggravated by the slightest external pressure; also if there be in the throat a sense of excoriation, burning, and dryness occupying small, circumscribed places, or extending to the ears, larynx, and tongue, with difficulty of breathing and danger of suffocation, redness of the tonsils, velum pendulum palati, and a feeling as if there were a tumor, plug, or lump, like a button, which it was necessary to swallow;

obstructed deglutition with aggravation in the afternoon and morning or after sleeping.

Chamomilla, in mild cases of angina pharyngea, may be useful, and rather for collateral or consensual symptoms by sympathy, where there are *sensitive, stinging, burning pains* in the larynx, with roughness of voice, constriction of the chest, hacking cough, excited by a ticklish irritation of a stinging, ulcerative kind, in the *region of the epiglottis.* It is also adapted to cases of children, or if the disease be brought on by checked perspiration; also when there is swelling of the glands, but especially the submaxillary; sensation of enlargement in the throat, with burning and shooting and deep *redness* of the parts affected; inability to swallow when lying down, and only when the head is bent backward, and *only liquids;* thirst with dryness of the mouth and throat; evening fever with shivering alternating with redness, especially of one cheek; great restlessness, constant chewing with gulping, grasping at the mouth with the fingers, torpor, disinclination to be covered, ill-humor, stretching about of the legs, bloated countenance. This group of symptoms is so frequently met with in children, that it is deserving of being strongly impressed upon the recollection.

Nux vomica is adapted to inflammation of the uvula, tonsils, and pharynx, especially the latter if arising from gastric derangement, indicated by eructation of a burning fluid which constantly irritates the pharynx. These varieties are often connected with catarrhal complaints. When the uvula itself is affected, *nux vomica* is the remedy; the symptoms are stinging pains in the uvula and submaxillary gland during deglutition, and the sensation of a plug, which always denotes swelling of the uvula. *Nux* is also indicated when there is a sensation of a plug, when swallowing the *saliva only* and *not* when swallowing food or drink. In *chronic* induration of the tonsils *nux* is a very efficient remedy. *Nux* is also indicated if there is a *scraping* and sore feeling in the fauces and larynx, causing *constant hawking;* an inspiration of cool air produces a feeling of excoriation in the throat; dry cough, headache, and pains in the hypochondria when coughing; small ulcers having a putrid smell in the mouth and throat. *Nux* very promptly relieves an inflammation of the throat which originates from a cold and is only slightly perceptible by painful deglutition. It has also been found serviceable in cases of angina by metastasis in epidemic scarlatina, when the disease, becoming seated in the pharynx and fauces, assumes a *nervous* character, and is often accompanied by numerous fetid small ulcers in the cavity and the fauces; much thirst and great weakness.

Pulsatilla is indicated when the inflamed surfaces are of a dark red with varicose enlargement of the bloodvessels; pressure with feeling of dryness in the back part of the throat; slight redness of the palate, tonsils, and uvula, which feel as if covered with *tenacious mucus,* with a sensation as if the parts were swelled; raw feeling, lancinating sore throat, no pain on deglutition, or when inspiring air; shiverings with heat towards evening until midnight; excessive darting, tearing pains in the throat, and often a stinging pain in the ears.

Ignatia is called for when there is a feeling of a plug in the throat, with red and inflammatory swelling of the tonsils and palate. It is scarcely ever demanded if there is stinging during deglutition, but is serviceable in most cases where a stinging is felt between the acts of deglutition, when the fauces and tonsils are inflamed and red, the latter covered with small ulcers; the interior of the cheeks may be inflamed; bad taste and fetid smell from the mouth; in the afternoon heat with red cheeks, at the same time chilliness and coldness of the feet, tearing in the forehead, restless sleep, sad and whining mood. *Ignatia* has proved curative in malignant inflammation of the throat, a vicarious symptom of scarlatina; the children complain of a plug in the throat, and bleed at the nose.

Dulcamara is specific for angina when produced by exposure to wet and when the secretion of mucus is excessive. *Dulcamara* acts more promptly and effectually if preceded by *mercurius,* or if given in alternation with *bell.* and *merc.*

Bryonia for shooting and dryness in the throat with an excoriated feeling which prevents speaking, with great sensibility and pricking sensation when touched or on turning the head; pain and difficulty in swallowing, as if a hard body were in the throat; shivering and coldness with or without thirst; also a pressive sensation in the back of the throat, dry cough, dyspnœa, copious secretion of saliva, nasal catarrh, constipation, irritability. *Bryonia* is given with advantage after *aconite.*

Rhus often is indicated when *bryonia* does not relieve, and instead of irritability the mood is plaintive; if deglutition be obstructed, as if from contraction, with pressure and shooting while swallowing, with pulsative pains at the bottom of the pharynx; and if in consequence of the severity of the disease, there is great

debility with pain, and a swollen feeling as if the parts were bruised, especially when speaking.

Cantharides when the tonsils and fauces are inflamed, with numerous vesicles; an astringent sensation in the pharynx, and burning, which sometimes extends down the œsophagus into the stomach. *Cantharides* answers well at the commencement of some cases of angina, or at the conclusion of the disease, especially when there is suppuration and destruction of the mucous membrane.

Should *chamomilla*, *ignatia*, *nux vomica*, or *pulsatilla* not produce the effects of their indications, *capsicum* may be resorted to if there be fever with throbbing and thirst, spasmodic constriction of the throat, with pressive pains, excoriation, and ulceration in the mouth and throat; continued wish to lie down and sleep, with dread of open air and cold; also cough, which causes much pain, as of a swelling, or dull aching, as if an abscess would burst in the throat. Ptyalism, drawing pain in the throat between acts of deglutition, dryness of the mouth, or a feeling of contraction in the curtain of the palate during deglutition, are also indicative of this medicine, which may be also employed when there is tickling and roughness, which causes frequent sneezing, with a discharge of thin mucus from the nostrils. If the sore throat be complicated with gastric or rheumatic symptoms, a dose repeated in six (6) hours, will often change the character of the disease.

Baryta carb. should be given if the throat feels raw when swallowing, with pain in the neck when touched, with penetrating pains on empty deglutition; constriction of the throat, with sensation during deglutition of a plug in the region of the larynx, or as if a morsal of food had lodged there; chilliness, heat, and sensation of bruising in the limbs, succeeded by inflammation of the throat, with considerable swelling of the palate and tonsils, which passes into suppuration, preventing the jaws from being opened, with dark-brown urine, and sleeplessness. Chronic disposition to inflamed throat, and indurated tonsils resembling scirrhus.

Post-pharyngeal Abscess.—Inflammation of the connective tissue in the posterior portion of the pharynx, whether occasioned by disease of the bones of the vertebræ or otherwise, sometimes terminates in suppuration, the tumor bulging forward into the pharynx, and causing, in accordance with its size, symptoms of suffocation. If the bone is diseased, the prognosis is bad; if the inflammation has been produced by ordinary causes, and the pus is discharged by the mouth, a cure may result. In several instances I have succeeded in drawing off the fluid with the aspirator, although, when the children are young, I have found it very difficult to keep the needle in position.

Prof. Bókai of Pesth, in a paper in *Jahrbuch für Kinderheilkunde*,* gives the particulars of 144 cases of this disease, observed and treated by him, in the Children's Hospital at Pesth, between the years 1854 and 1876. Of these, 129 were idiopathic; 3 were secondary to abscesses in the neck; 4 were secondary to spondylitis cervicalis; 7 occurred during the course of scarlet fever, and ought properly to be classed with the idiopathic cases, as the anatomical processes were the same in both; and 1 case was of traumatic origin. In addition, he observed 43 cases of lymphadonitis retropharyngealis, which he classes with the idiopathic retropharyngeal abscesses, because he believes that the latter always result from the former.

In idiopathic retropharyngeal abscesses, Prof. Bókai always found at first a firm tumor, as large as a hazel-nut or a pigeon's egg, behind one or other tonsil, rarely in the middle of the retropharyngeal space. These tumors could be felt externally by deep pressure near the angle of the jaw. Later they became soft and elastic, fluctuated, and gave exit to pus when opened. Only 11 of the 144 cases proved fatal. Spontaneous opening of the abscess occurred in 19 cases. In two cases, pus got into the trachea, and asphyxiated the children, but respiratory movements and

* N. Y. Medical Record, Nov. 18th, 1876.

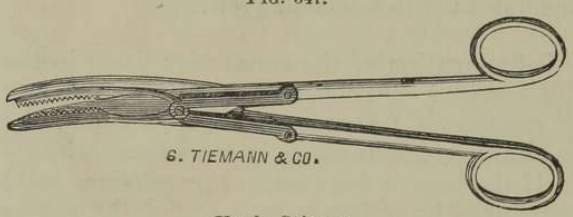
cough were excited by the application of electricity, and life was restored. Facial paralysis occurred in 3 cases.

Elongation of the Uvula.—The uvula frequently becomes elongated from various causes, sometimes from an angina, sometimes from inflammatory action, and in some cases from sympathetic action from gastric derangements. Some persons are more predisposed to the disorder than others, and if the elongation is not removed, severe sympathetic irritation may extend to the throat and lungs.

The symptoms are dry hacking cough, caused by titillation in the throat, which is worse when lying down. A constant desire for deglutition, and oftentimes nausea is occasioned by the constant tickling. Children are often subject to the affection, and the very common expression, having "the palate down," finds an explanation in this unnatural growth.

Treatment.—Homœopathy has medicines which in the majority of instances will relieve this annoying affection. Those chiefly to be relied upon are acon., bell., coffea, ignat., lachesis, nux vom., and phosphorus. As there are generally but few symptoms, the selection of the medicine must depend upon the peculiar idiosyncrasy of each patient. Great temporary relief is obtained, especially at night, when the cough prevents sleep, from taking small pieces of ice or gargling the throat with cold water. The medicines which have given me most satisfaction are cham., ignat., coffea, and nux vomica. My usual practice, however, is to end the trouble by excising the lower part of the uvula. A pair of forceps will readily seize the end of the uvula, which being drawn forward, may be cut off at its lower half with a pair of long-handled scissors, such as are found in the uterine sets. An instrument was devised some years since by Dr. Sims, of Philadelphia, which seized and held the uvula while being removed. Fig. 347 shows the scissors with a slight modification.

Fig. 347.



Uvula Scissors.

Spasm and Œdema of the Glottis.—The glottis or upper part of the larynx is sometimes affected with spasm, the aperture closing, and often producing fatal dyspnœa. The symptoms are well marked when the disease is fully established, but the attacks are insidious, beginning merely with a short dyspnœa, which lasts but a moment and is often overlooked. As the disorder advances, a sudden whistling, crowing noise is made during the efforts of deglutition, coughing, or sneezing. The face becomes purple, the veins turgid, and all the symptoms of death from suffocation are present. If the spasm soon subsides, in a short time the patient regains his ordinary appearance, and all symptoms disappear until another attack follows.

The disease may be caused by injuries from and the presence of foreign bodies in the air-passages, or the pressure of tumors or aneurisms upon the nervus vagus.

Treatment.—The medicines are chiefly bromine, iodine, spong., cuprum, plumbum, and moschus.

Dr. Carroll Dunham has advised bromine water. In the cases which have come under my care, iodine has always been most satisfactory. To persons liable to returns, I always advise that a small vial of chloroform and a handkerchief be kept in readiness; a few inhalations will generally relieve the spasm. If the spasm should be caused by the pressure of a

tumor, or should be so great as to present symptoms of imminent danger, tracheotomy must be immediately resorted to. The inhalation of nitrate of amyl has been used with success.

Œdema of the Glottis.—This disease, which so often proves fatal, notwithstanding the most skilful treatment, consists of a serous infiltration of the submucous cellular tissue of the glottis and adjacent structures. There is no vascularity in the swelling, which is of a yellowish color, like the surface of an ordinary blister. It may occur during an attack of scarlatina, small-pox, tonsillitis, or typhoid fever, or from the inhalation of steam, or flame, or the swallowing of hot liquids. Its effect is to produce mechanical obstruction during inspiration, while expiration remains unembarrassed. The dyspnœa is very marked, and constantly increases as the disease advances. The voice is much altered, and a dry, croupy, convulsive cough with frequent paroxysms of suffocation soon exhaust the strength of the patient. With the above symptoms are a sense of fulness in the throat, with great soreness, but an almost entire absence of pain. As the symptoms are very alarming and distressing, some relief must be soon gained, or a fatal termination will speedily follow.

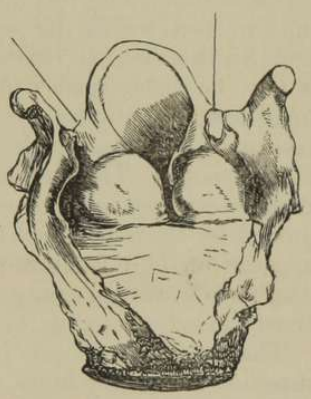
Among the homœopathic medicines, one remedy, iodine, offers special inducements for its use. It can be administered in the form of inhalations of vapor or spray; used in like manner, bromine may afford relief. Other medicines to be remembered are apis, lach., musk and rhus tox.

When the symptoms are very urgent, the swollen parts should be freely scarified with a long probe-pointed bistoury,* thus giving vent to the effusion, after which the iodine vapor may again be used.

If, however, these means fail, and the waning strength and dark livid hue of the skin show that the blood is becoming carbonized, then the operation of tracheotomy must be performed, and many desperate cases have recovered after this procedure.

The cut (Fig. 348) well represents œdema of the glottis.

Fig. 348.



Œdema Glottidis.

CHAPTER XXXIV.

INJURIES AND DISEASES OF THE JAWS.

Abscess of the Antrum Highmorianum.—Abscesses of the antrum highmorianum, fortunately for mankind, are not of very frequent occurrence, as they are in the majority of instances tedious in their cure, and productive of much pain. The disease may arise from blows on the face, chronic inflammation of the pituitary membrane lining the nostrils, exposure to a cold, and damp atmosphere, but more frequently from decayed teeth, which by the irritation they occasion in the membrane lining the cavity, produce the inflammatory process which terminates in the formation of pus.

* A knife admirably adapted for this purpose has been invented by Dr. Buck, of New York.

This affection in its early stages is very difficult to diagnose, and the first intimation that the patient receives of the disease is pain, which is most generally referred to a carious tooth, and laboring under such a mistake, several teeth are often extracted ; this, however, does not relieve the suffering, unless one of the fangs has penetrated through the floor of the antrum, and being removed, allows free exit to the matter that has been secreted and accumulated in the cavity. If this is not the case the pain continues, extending farther up, and more in the direction of the nose and orbit, than is the case in ordinary toothache ; but even this circumstance does not lead the patient or the practitioner to suspect the true nature of the affection ; in fact, such pain may often be present in facial neuralgia, without any disease of the antrum whatsoever. The sufferings of the patient continue for a length of time, increasing in violence, until finally a tumor becomes perceptible below the malar bone ; this enlargement may extend over the whole cheek, but there is a circumscribed hardness situated above the posterior molars. The pus may be evacuated through the cheek, or the matter may move towards the palate, forming a swelling there, and rendering the bone in the vicinity carious, unless the patient be relieved ; or a portion of it may be discharged through the nose, when the patient is lying with his head low, and on the side opposite to that which is affected ; or, as in many instances, the matter may trickle down between the fang and the socket of the tooth. The pus that is thus discharged is often so extremely fetid that no one can enter the room occupied by the patient without being disgusted by the odor, and the patient is rendered disagreeable to himself on account of the matter flowing into the mouth and throat when lying down. The pain is severe and generally throbbing ; sometimes it remits, but for a short period, returning again with increased violence.

The formation of pus in the antrum is often attended with disease of the superior maxillary bone, and is in all instances tedious, and in many cases difficult to cure.

The first step in the treatment must be to evacuate the pus, after which the surgeon can more readily ascertain the condition of the cavity, whether there be caries, or if any morbid growth be present within ; the selection of remedial measures consequently being rendered more certain.

All the grinding teeth of the superior maxillary bone, excepting the first molar, correspond with the floor of the antrum. These teeth sometimes extend into it, and the fangs are only covered by the membrane lining the cavity ; therefore, the simplest method of evacuating the pus is by drawing one of the teeth. A caries, or a continued toothache in one of the molars, should decide the practitioner which tooth to extract ; but if all appear to be sound, the direction is, to gently strike each one of them, and that which appears most tender, or gives rise to most pain, should be selected.

The third or fourth molar most generally is extracted, after which operation, if the pus is discharged, no further operation is required ; if the matter does not follow the removal of the tooth, a stilet or small trocar must be pushed into the cavity to produce the desired effect. After the evacuation of the pus, a probe may be gently inserted into the antrum, and the condition of the bone, etc., ascertained. After the contents of the cavity have been discharged, it should be cleansed by means of an injection thrown into the part from a small syringe, with a somewhat curved pipe. A piece of bougie must also be worn, to allow the matter that collects to be evacuated, and hepar, ars., lyc. or silic. be administered, or other medicines (mentioned in the Chapter upon Abscesses) employed, according to the presenting symptoms.

"Dr. Gullen, of Weimar, from experience in several cases, strongly rec-

ommends ars. and lyc. in this complaint. Arsenic generally removes the dreadful throbbing, divulsive pain, which assumes the quotidian type for the most part; and lyc. is useful in arresting the thick yellow discharge, which frequently continues after the pain has ceased. Dr. Gullen recommends the higher dilutions of both these remedies, and the use of silic. after the discharge has abated."*

To obviate the necessity of extracting teeth, La Morier, of Montpellier, proposed to perforate the antrum above the alveolar processes, immediately over the third grinder; but, says Dr. Gibson, "the disease, however, so seldom occurs without being accompanied or caused by carious teeth, that such an operation, though practicable, can scarcely ever be rendered necessary."

After the evacuation of the pus, the cavity must be carefully examined by means of gentle probing. If the internal lining membrane be diseased, calc. c., mez., or phos. ac. may prove serviceable, if other symptoms correspond; should, however, the affection have been produced by the decayed tooth, its extraction and the discharge of the matter will afford great relief, and the exciting cause being removed, the medicines will doubtless exert their beneficial actions. But too frequently the disease has extended itself, not only to the membrane lining the cavity, but also to the bone itself; in such instances, the treatment, of course, must be directed to the carious bone.

The medicines that have proved most serviceable for disease of the osseous structure, are: calc., lyc., merc., phos. ac., silic., staphis., sulph.; or, ars., asaf., aur., hepar, nit. ac.

From numerous cases that have been recorded, we learn, that phosph. is an excellent medicinal agent for diseases of the bones, particularly caries or necrosis. Long ago, the *British Journal of Homœopathy*† gave an interesting account of a child that became affected with diseased bones from the vapor of phosphorus. Such testimony as this should at once lead the practitioners of our school to investigate more thoroughly the action of our medicines, as in these instances especially, the power of drugs over diseases is distinctly perceptible.

Aurum and **nit. acid** are excellent medicines when the patient has previously been affected with syphilis; **mez.** will be found efficacious in mitigating, and often arresting, the intolerable *burning* pains which are present, particularly at *night*.

This medicine, perhaps, is better adapted to the disease when the bone itself has not been implicated, but when the whole lining membrane of the cavity is in an abnormal condition. Mezereum acts more particularly on periosteum than on *bone*. It is adapted to dull, crampy pain, and tearing in the malar bone, with anguish, paleness of the face, continued chilliness, sometimes cold sweat, constant thirst, tongue coated white, want of appetite, pale urine, and frequent small pulse.

Kali hydriodicum is a medicine that has been frequently overlooked in the treatment of this disease; it is suitable not only to those cases that have originated from the syphilitic poison, but is likewise serviceable when there is a violent darting pain extending to the ears, or when there is a constant *grumbling* sensation in the tooth and face, when there is excessive accumulation of saliva, with importunate thirst night and day.

As palliatives for the pain that is often so severe as to be almost unbearable, spigelia, nux vom., china, or phosph., will be found of much service.

Spigelia must be administered when there is a pressure experienced in the region of the antrum, with darting and tearing pains, accompanied with burning.

* British Journal of Homœopathy, vol. i, p. 407. † Vol. vi, p. 284.

Nux vom. is indicated when there are tearing pains in the malar bones, with continual painful soreness of the teeth, together with *boring* and gnawing pains.

China will relieve the pains when they are cutting and burning, or when there is a drawing pressure in the molars, with sensation of numbness in the side, or when there is a beating or throbbing in the malar bone, with fine stitches through it.

Phosph., when there is burning and throbbing in the region of the antrum; also when there is a continual dull, aching pain (grumbling) in the molars, with jerking and tearings.

Mercurius is an important medicine, and is well suited to the disease after the pus has been evacuated, and when there is caries of the bone; when the pain extends to the ears, is darting and tearing, and particularly unbearable at night.

Teucrium is warmly commended for diseases of the antrum. *Staphisagria* will also prove serviceable, not only for the darting pains in the antrum, but also for any unnatural bony formation. In addition to the medicines already mentioned, *sulph.*, *carbo v.*, *antim. crud* may be indicated in this affection.

Tumors of the Antrum.—There are several varieties of tumors affecting the antrum, the chief of which are fibroid and encephaloid. The description of these tumors will be found in the chapter on this subject. The remedy is removal. Formerly it was supposed necessary to excise the whole bone, but recent operations termed the osteoplastic, mostly performed by the German surgeons, have given most brilliant results.

Osteoplastic Operation for Exposing the Cavity of the Antrum for the Removal of Tumors.—The patient having been thoroughly etherized, enter the knife a few lines below the inner canthus of the eye, and carry it down to the ala of the nose. This incision must extend through the periosteum down to the bone. With a fine saw, such as is seen in Fig. 296, the nasal process must be divided; the instrument is then temporarily relinquished, and the knife again entered at the superior extremity of the first incision, and carried paraliel with the lower margin of the lid, a little beyond the external canthus. The saw is now resumed, and the bone freely divided. Again the knife must be used, with its point entering the lower end of the first incision, passing around the ala nasi, and terminating within the nostril; its course must then be changed, by bringing the edge directly downward, thus dividing the upper lip. The saw is then introduced within the nostril, and the hard palate divided; now by inserting a strong elevator into the last incision, the bone may be turned directly outward. This latter proceeding requires considerable force, but when the bone is displaced, the whole cavity is fully exposed, and any tumor or abnormal growth which may exist within the antrum or nares can readily be removed. The bone is then replaced, and may be held *in situ*, either by silver wire around the teeth, or wire sutures through the bone itself. The skin-flaps are then approximated in the usual manner, and comparatively little deformity follows the operation.

Frendelenberg recommended, in 1869, what he termed prophylactic tracheotomy, with tamponing of the trachea, in all bloody operations upon the larynx, or in the buccal, nasal, or faucial cavities, thus preventing the escape of blood into the air-tubes. Edmund Rose, more recently recommended that, for the same purpose, the patient should be placed in the supine position, with the head thrown backward almost to a right angle, and that the operation be made with the parts in this position. By the old methods there is always more or less danger from suffocation, and Nussbaum noticed the fact, that even the frequent sponging of the fauces to prevent such untoward occurrence was followed by abscesses and irritation of the parts.

There is said to be but little danger in retaining the head in this position for a length of time, and that its evil results have been very much overestimated. This is proven by the position (standing on the head) taken by gymnasts in their performances, but to make the matter more cer-

tain, experiments were made by several physicians and medical students, who found that the position could be maintained for three-quarters of an hour without inconvenience, save some unpleasant feeling during the first few minutes, and that conversation and discussion were kept up during the time.

The position would also appear to favor the administration of anæsthetics, for recent experiments have proved that neither death nor asphyxia has ever been known to occur to patients in the inverted position, indeed, when danger threatens during the administration of anæsthetics, Nélaton has especially recommended the suspension of the patient. During anæsthesia the cerebral bloodvessels are in a state of anæmia. There can be no doubt that often venous hæmorrhage may be increased by this position of the body, and to prevent this Volkmann frequently performs the division of the soft structures with the patient in the ordinary posture.

Those who have performed operations in Rose's position say, that they appear more bloody because all the blood runs on the floor and is seen, and which certainly is preferable to having the fluid pass unnoticed into the trachea.

Rose operated successfully in this manner for cleft palate restoration of the nose (rhinoplasty), and also resected the upper and lower maxillary bones. Burow removed an alveolar sarcoma of the hard palate. Hahn extracted a ball from the upper maxilla. Maas extirpated the larynx and removed a cancerous tongue, and others have, with the patient in this position, exsected the nerves and performed tracheotomy.

Epulis.—This is a peculiar recurrent fibroid or fibroplastic growth arising from the jaw. It first appears in the form of a small papilla, which gives but little pain; it grows rapidly in some instances, and may have two or three lobes, which appear attached to the gum by a pedicle, whereas they really, in all instances, are attached to the periosteum and bone. Epulis may be distinguished from myeloid tumor by its density, its similarity to surrounding tissues, its tolerance of manipulation, the comparatively healthy condition of adjacent structures, and the absence of sympathetic irritation of the neighboring glands; there is also little tendency to ulceration. It is flabby, does not readily bleed, and if cut off speedily recurs. Even the actual cautery has but little effect upon it. I have applied the hot iron many times to cases that have come under my observation, with but temporary relief. The only sure method is to remove a portion of the bone from which the disease springs.

Cystic Tumors.—Cysts are sometimes developed in the jaw-bones. I mean *primary* cysts, not those tumors which are found from degeneration of certain forms of tumor. In these cases, as the cysts enlarge the bones expand, and form a covering for the tumor. The fluid found in them is serous, gelatinous, sometimes even sanguinolent. The most peculiar variety, and that to which attention is especially directed, is known "as *dentigerous cyst.*" In such cases the cysts are associated with a diseased condition of the fang of the tooth. They may occur also from the misplacement of teeth, or from the presence of supernumerary teeth. A singular fact also is noticed, in that the disease only is known to attack the permanent teeth. The cysts are called by Holmes "*tooth-bearing*," and are actually to be looked upon as complications of the natural process of dentition, and are found to occur when there is a deviation in the anatomical distribution of the teeth. Jourdain records the case of a girl, in which the first and second molars (permanent) on the right side were inverted, and a serous cyst had formed in the cavity of the antrum around them. The pressure of the tumor had distorted the face and closed the nostril. There are also other interest-

ing cases on record, all going to prove the fact of the *deviation of the second set of teeth* being the chief factor in the production of the disease. The symptoms of course are local. There is at times, after a long continuance of the disease, some constitutional disturbance, the bone expands, and there is a kind of "crackling" or "crepitation" of the tumor under the finger. If the bone becomes sufficiently thinned there is a sense of fluctuation experienced.

The chief sign, which may be regarded almost as pathognomonic, is this: If a patient presents himself with a tumor, with some fluctuation about the jaw, and the mouth is carefully examined, and the teeth are found *wanting, or not arranged in their anatomical order*, and the absence cannot be accounted for by accident or extraction, then the diagnosis of a *dentigerous cyst* would be pretty generally correct.

Treatment.—The cyst must be evacuated, and the teeth or tooth removed; then a portion of the expanded bone should be cut away from the tumor, and the balance will be, in time, removed by absorption. The tooth is generally discovered at the bottom of the cyst.

Necrosis of the jaw-bones is by no means an uncommon affection. It is noticed often in children after severe forms of exanthematous affections the disease making its appearance on the decline of the fever. The swelling commences about the gums, suppuration rapidly follows, a fearful fetor emanates from the mouth, and in some instances the entire bone is destroyed. In many cases the reproductive power appears to be as great as the disintegrating process, and the entire mass of dead bone is thrown off as a sequestrum, and a new bone, not so perfect in its contour as the old one is formed. I have seen an example of this kind. In the majority of cases, however, the disease is confined to the alveolus.

Phosphorus necrosis, not so common since the improved method of manufacturing matches has been introduced, was first clearly described in England, by Dr. Wilks, in *Guy's Hospital Reports.* I have seen several cases of it in my own practice, and in a case wherein I removed the entire lower jaw, the patient had been in the habit of holding the illuminating ends of matches in the mouth; indeed, after the removal of the bone, small portions of the sticks were found in the alveolar sockets. In this disease, the pain is first referred to the teeth, the patient complaining of toothache. In a short time, and without very much pain, the bone appears to enlarge. During this period, the constitutional symptoms are well marked; there are rigors, sweats, loss of appetite, emaciation, and great depression. Necrosis rapidly supervenes with great fetor. The teeth become loose and drop out, and fluctuating points are observed in the gum. The point where the pus is discharged varies in different cases, but when it is carried off, as is usual, the patient's sufferings are greatly relieved. Many sinuses form, leading hither and thither throughout the bone, and the swelling in some cases becomes perfectly enormous, puffing the face to the forehead, shutting the eyes and nose, and everting the lips. Around the diseased bone a large amount of exudation takes place, which is fibro-plastic in its nature.

A peculiarity of phosphorus disease, and one of especial interest to our school of medicine, is the liability of those affected to suffer with different diseases of the lungs and bronchi. Asthma, especially, has been noticed as a complication.

If portions only of bone are diseased, they may be removed with the chisel and gouge; if the entire bone is affected it must be taken away.

For the medicines for necrosis, the reader is referred to the Chapter on Diseases of the Bones.

Excision of the Upper Jaw.—There are a variety of tumors, both sim-

ple and malignant, solid and semi-solid, which, growing upon the superior maxillary bone, demand its removal. Besides these affections, caries and necrosis, especially that known as "match-makers' disease," and abnormal conditions of the antrum, call for excision of either a portion or the whole of the bone.

The method of Sir William Fergusson is often adopted. In this the upper lip is divided to some distance within the nostril. The incision is then carried around the ala of the nose up to the inner angle of the eye, and from thence parallel with the lower margin of the lid to the external canthus. By this means the large vessels and nerves are avoided. The hard palate is then sawn through and other bony attachments severed, either with bone-cutters or the saw, and the bone is thus removed. The lion-jawed forceps will be found most useful in steadying the bone and in breaking it away from its attachments. The surgeon must ever bear in mind, while performing any operation for the removal of this bone, the course of the internal maxillary artery, as fatal hæmorrhage might ensue were it divided low down.

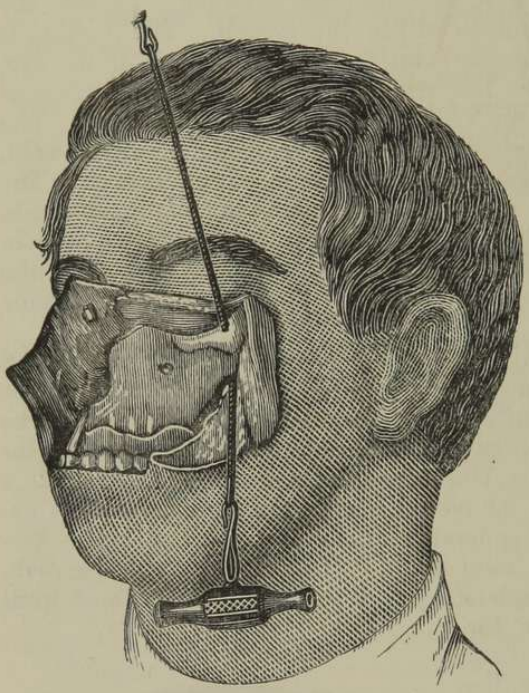
Another operation is that, I think originally devised by Mr. Liston, and which in four cases I have practiced with success, and although in the first incision there is generally quite profuse hæmorrhage, it can usually be arrested by acupressure. The operation is as follows: Make the first incision by entering the knife at the outer commissure of the lip and make a curvilinear cut, the convexity of which is toward the angle of the jaw extending to the centre of the malar bone. From this cut a second is carried beneath the lower lid to the inner angle of the eye, as seen in Fig. 349, which was made from a photograph of a patient of mine, who suffered from malignant disease of the upper jaw and from which he subsequently died. The soft structures must then be dissected off, and the bone entirely denuded of its covering. The palatine process of the bone must then be sawn through, and the junction with the malar bone separated with the chain-saw, as seen in Fig. 350, and other bony connections severed, until the whole mass of bone can be taken from its place. During these operations, chisels, gouges, and various bone forceps are always required. According to Dr. Chisholm (*Medical Record*, April 1st, 1873), the operation of Dieffenbach is far superior to all others for removing the upper jaw. In the communication referred to, he states a remarkable fact, that in the recent works of Holmes, Erichsen, Fergusson, Gross, and Gant, the operation is not even mentioned; and I must confess that it was entirely new to myself.

Fig. 349.

Dr. Chisholm thus describes the mode of procedure: "Commencing at the root of the nose, an incision slits the nose and the upper lip in the median line; a short incision joining the first at right angles extends from the root of the nose to the inner angle of the eye. The lower lid being drawn downward the knife is carried along the entire length of the conjunctival cul-de-sac, separating this lid from its orbital connection, and

utilizing the entire length of the lower lid in the horizontal flap. When the flap, as defined by the vertical and horizontal incisions, is dissected up, it will lay bare the entire front, and, if necessary, the side of the face, without having divided any large bloodvessel or important nerve branch. With such an exposure the superior maxillary bone can be isolated with great ease, as every surface of contact with neighboring bones can be clearly brought into view. With no additional incision I found no difficulty in removing from the living subject the superior maxilla, malar and palate bones, which enabled me to extirpate a large fibroid with extensive adhesions to the roof of the pharynx.

Fig. 350.

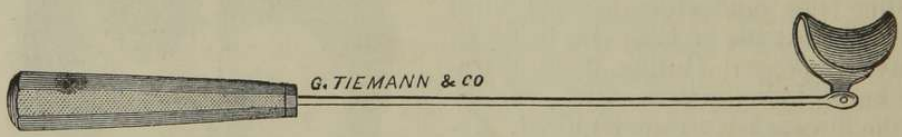


"After the removal of the maxilla, when the flap is brought back to its normal position, and carefully adjusted by several points of suture, union speedily ensues. This operation leaves so little deformity, that, in the majority of cases, the line of the incision will escape detection unless the scar be sought."

Dr. D. H. Goodwillie, of New York, has published an interesting monograph on *Resection of the Maxillary Bones without External Incision*, and has invented some useful instruments for operations of this kind.

Fig. 351 shows a cheek-holder, which can be used at any angle.

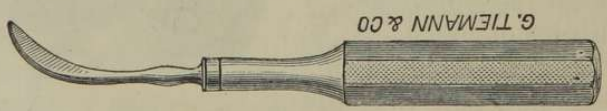
Fig. 351.



Figs. 352 and 353 illustrate periosteotomes for denuding bone.

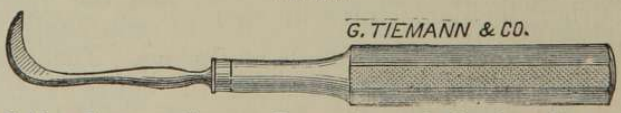
And Fig. 354 represents an oval saw, consisting of a handle fixed with a

Fig. 352.



U shank, so contrived that knives and saws of different sizes may be set into it, and which can be made to cut in four directions.

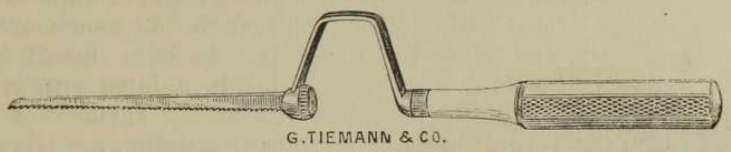
Fig. 353.



Excision of the Lower Jaw.—Resection of the jaw is now a standard

operation in surgery, and is frequently performed. Prof. Valentine Mott was the first to excise half of the bone, at its articulation on one side, for osteo-sarcoma; and I am of the opinion that he never laid claim to any-

FIG. 354.

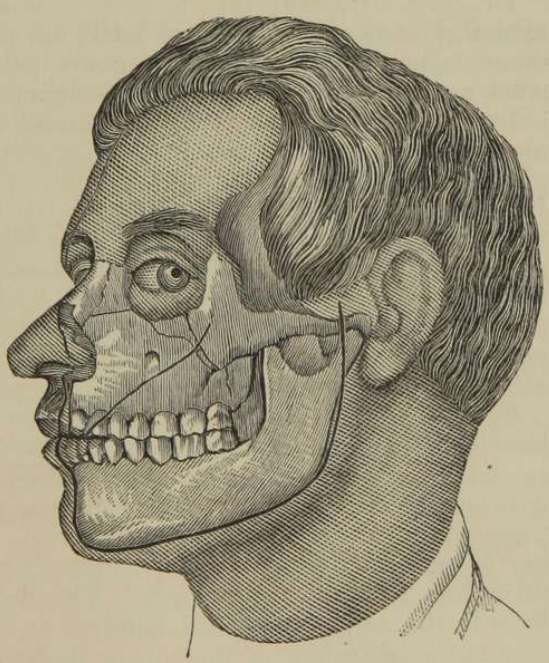


thing further. His first operation was performed November 17th, 1821. Velpeau, in his *Operative Surgery*, gives the credit to Dupuytren; for in vol. ii, p. 713, he says: "Nevertheless, facts of this kind had remained without application until Dupuytren came to the determination to amputate almost the entire body of a cancerous lower jaw, by a method entirely new, and which has been received into practice under the title of a surgical conquest."

The priority of *resection* belongs, however, to a Western surgeon, Dr. W. H. Deaderick, of Rogersville, Tenn., who performed the operation, February 6th, 1810, for a tumor of the bone, on a patient aged fourteen years. In some instances it may be necessary to disarticulate the bone on both sides. This operation was first performed in Europe, by Walther, of Bonn, in 1826, and in this country by Carnochan, of New York, in 1851.

There are several methods of removing the inferior maxillary. An incision may be commenced at the mesian line of the lower lip, and carried to the chin; from this, another incision can be carried around the lower margin of the body and ramus of the bone (Fig. 355). This large flap must be dissected up, the facial artery secured, and the bone sawn through at a point some distance beyond the diseased portion. Holding that part to be removed with a pair of lion forceps, the structures connecting the jaw with the mouth must be dissected away, keeping the edge of the knife close to the bone. If the disease has extended to the articulation, much additional care is necessary; and it is well, as we approach the joint, to separate the soft parts with an instrument devised for the purpose by Dr. Gross. Having reached the zygoma, with a pair of scissors with round ends carefully snip the tendon of the temporal muscle from its connection with the coronoid process, and then turn the bone outward, to more fully expose the joint, and move the internal surface as much as possible from the internal maxillary artery, which lies in close proximity. Then, care-

FIG. 355.



Incisions for Removal of the Jaw.

fully open the capsular ligament of the joint in front, turn out the condyle, and the removal is completed. Do not imagine that this is all easy of execution. Many difficulties may arise, which often complicate the proceeding. There is a great tendency of the tongue to fall backward, and close the glottis; and when the entire jaw is to be removed, as a precautionary measure, a needle, armed with a strong cord, should be passed through the tongue near its tip, and given to an assistant to hold during the entire operation. When the flaps are brought down, a large acupressure pin should be passed through the integument, near the submaxillary glands, and caught into the several ends of the glossi muscles, and these pinned down to the neck until a sufficient period has elapsed for their adhesion. The wound must be thoroughly washed out before the edges are united, and the greatest nicety is necessary in coaptating the vermilion border of the lip. There is another accident to which I would have attention directed: it is the escape of blood into the trachea; this sometimes causes much embarrassment, and there should always be on hand several sponge probangs, to clear the throat of clots, should it become necessary.

Some surgeons prefer leaving the border of the lip entire, and begin the incision below the vermilion edge. Again, large portions of the bone have been removed by what is termed the single linear incision, which extends around the jaw on a line corresponding to the lower margin of its body.

Excision of the Entire Lower Jaw.—In some cases, either for tumors or diseases of the bone itself, it may be necessary to remove the entire lower jaw.

It is in the removal of this bone that periosteal surgery has made some of its most wonderful triumphs. The celebrated case of Dr. James R. Wood, in which the bone was reproduced entire, is well known. The new jaw, obtained after the death of the patient, a number of years after the operation, travelled all over Europe, the admiration of all surgeons.* Dr. Gouley† has collected valuable statistics of this operation.

Dr. R. A. McLean‡ reports reproduction of bone four months after exsection of half of the inferior maxilla of a child four years of age. It is, therefore, necessary, if practicable, to elevate the periosteum, and retain as much as possible thereof, if we wish for reproduction of bone.

In the month of May, 1867, I was requested to see a lad suffering from necrosis of the inferior maxillary bone, and, if necessary, to take such surgical measures into consideration as would prove most efficient for his relief. Upon visiting the patient, I found the boy in apparently good health, but with an excessively swollen face. Upon depressing the lower lip, the symphysis of the inferior maxillary, entirely necrosed, could be seen, and was movable in a vertical direction; lateral motion, however, was so slight, that, at the first examination, it was doubtful whether the diseased action had as yet involved the entire bone; further and more minute investigation decided me in the opinion that its complete excision was the only resource.

Operation.—An incision was commenced at the middle of the vermilion border of the lower lip, and carried down to the chin; from this point, a second cut was made along the lower border of the bone almost to the condyle on the left side, and a similar division was effected on the right cheek. These flaps were dissected up, and the bone was found bare. In endeavoring to remove the left ramus, it broke, but with slight traction with the pliers the part was taken away. The right side was much more firmly fixed at the articulation, and required an extension of the external incision, and a separation of the soft parts from the bone, together with some prying with the handles of the bone-forceps before it could be enucleated.

* Lancet, June 2d, 1877.

† Transactions of the International Congress, Philadelphia, p. 605.

‡ Western Lancet, April, 1877; Monthly Abstract of Medical Science, June, 1877.

It came away entire, and after the extraction of some spiculæ, and the ligation of several vessels, the wound—a gaping and extensive one—was brought together and held in position by interrupted sutures. I was informed by letter, that the cuts healed almost entirely by first intention, and in the remarkably short space of twelve or fourteen days.

The following cut (Fig. 356), copied from a photograph taken two years after the operation, shows the appearance of the boy. A strong fibro-cartilage, which may have ere this become ossified, had formed, and the patient was in the enjoyment of perfect health.

Fig. 356.

The Author's Case of Removal of the entire Lower Jaw.

The most difficult and critical part of the operation is the *disarticulation* of the bone. After the flaps have been made as directed, the tendon of the temporal muscle must be divided at its insertion into the coronoid process. With blunt instruments or periosteum knives the structures are to be separated on the inside of the mouth, keeping the instruments close to the bone, to prevent injury to the internal maxillary artery, which is in very close proximity to the ramus. The joint then must be opened from the outside and a little forward, and the condyle of the bone turned forward by depressing the bone. If the bone is turned outward, the artery may be twisted around the condyle and accidentally severed, giving rise to very severe and troublesome hæmorrhage. This will be very materially facilitated by sawing the bone through at the symphysis, seizing the fragment with a lion forceps and rotating it outward.

Drs. Beebe, Beckwith, Franklin, and others have removed, successfully, parts of the inferior maxillary bone.

The after-treatment consists in the application of carbolated calendula, or a solution of the latter, to the parts. The pins ought to be removed on the third to the fifth day.

Mr. Stanley,* before operating on the lower jaw, took the precaution to apply an acupressure pin to the facial artery, which effectually checked the hæmorrhage. On several occasions I have adopted this procedure.

It appears from an examination of surgical literature, that immense tumors, bony and others, have been removed with the entire bone, or portions of it, with complete success.

Excision of the Symphysis of the Inferior Maxillary.—The patient, a man of thirty-four years of age, presented himself at my residence, telling me that he had come for advice respecting a severe disease of the mouth, which had troubled him for years. He stated that he was not aware of ever having syphilitic disease, but had frequently been salivated. The odor from his mouth was so fetid that it rendered him disagreeable to himself, and disgusting to others. Upon looking at the disease, after carefully syringing the mouth with a warm solution of the chlorate of potash, extensive necrosis of the lower jaw was found, extending from the angle of the left side to the second bicuspid tooth of the right side. The incisor and canine teeth had fallen out, and the bone, as far as could be seen, was in a state of disorganization. He readily consented to an operation, which was performed by making a single linear incision on the inferior margin of the inferior maxillary bone, and having entirely loosened the integument and subjacent structures, a chain-saw was passed just behind the angle on the left side, and the bone sawn through. The left facial artery was tied,

* *Vide* Simpson on Acupressure.

but that vessel was not divided on the right side. Drawing the jaw a little forward and holding it with a lion forceps, the chain-saw was again applied on the right side, and the bone easily removed. The flap was brought down and held in place by wire sutures, and the patient made a good recovery.

In removal of portions of the jaw, the chief aim must be to take away *all* the diseased mass, and if the periosteum is not dead, to allow it to remain. In this instance, the membrane was entirely gone.

Dr. E. C. Franklin has reported* a very successful case of removal of a large osteo-sarcoma of a portion of the lower jaw, in which I assisted. The patient made an excellent recovery, and improved soon after the operation. Sometimes portions of the jaw, such as the alveolar processes, are diseased, or are the seat of tumor, and have to be removed. Dr. Gross has reported the excision of these processes as curing very persistent neuralgia, which resisted all other treatment. For removal of this part of the bone, the pliers are generally sufficient, and those invented by Dr. D. H. Agnew, are the most convenient for the purpose. After the operation, instead of fastening the ligature, which has been used for retaining the tongue, to adhesive plaster applied to some part of the face and neck, a much better plan is to pin the subglossal muscles to the integument of the neck, by means of a good-sized acupressure pin, which may be removed in a few days.

Anchylosis of the Inferior Maxillary.—Anchylosis of the lower jaw may occur in three localities:

First. The head of the condyle may become fixed in its glenoid cavity. This is the most frequent form, examples of which are recorded by Sandifort, Blandin, Cruveilheir, Howslip, Holscher, Hyrtle, and others.

Second. The coronoid process may attach itself to the zygomatic arch; of this but two observations are recorded (*Museum of Anatomy*, vol. iv), and by Sebastian, in his essay on anchylosis, published at Groningen, 1826.

Third. Alveolar processes may become conjoined; of these there are four examples on record, which are to be found in *Walther's Museum of Anatomy*, in *Rust's Magazine*, and in *Bennett's* cited from Kunholz, and in the *British and Foreign Medico-Chirurgical Review.*

Of the fifteen cases of anchylosis collected by Dr. Lewis, both sides of the jaw were affected in seven cases, and one side in eight. In the three examples of osseous connection of the alveoli, the incisors were somewhat separated. It has been supposed by Cruveilheir and others that anchylosis of one side entails that of the other, by the complete immobility it induces; but in seven of the fifteen cases quoted, the joint on one side remained quite free. How little prolonged immobility is a cause of anchylosis may be judged by the case now recorded, in which it had continued seven years, and by others in which it had lasted for nearly a quarter of a century.

This immobility of the inferior maxillary bone, causing closing of the jaws, is an affection which fortunately is of comparatively rare occurrence; and as gradually the employment of poisonous doses of mercury is becoming unfavorably regarded by the allopathic portion of the profession, there is no doubt that such unfortunate occurrences will be still less frequent.

Speaking of this deformity, Dr. Gross (*Operative Surgery*, vol. ii, p. 584) remarks: "The most common cause, according to my observation, is profuse pytalism, followed by gangrene of the lips, cheek, and jaw, and the formation of a firm, dense, unyielding inodular tissue, by which the lower jaw is closed and tightly pressed against the upper. Such an occurrence used to be extremely frequent in our Southwestern States during the prevalence of the calomel practice, as it was termed, but is now fortunately rapidly diminishing."

* Transactions of the Hom. Med. Society of the State of New York, p. 101.

The same author appears to have encountered quite a number of such cases during his residence in Kentucky, and upon referring to Dr. Mott's record, which he has published in the appendix to *Velpeau's Surgery*, it will be perceived that many persons suffering from this affection who applied to him for relief, resided in the Southern and Western portions of the United States. The prevalence, therefore, of such disorders in the West and South, can very truly be attributed to the too free exhibition of mercurials in the fevers peculiar to those sections of country.

Besides these abuses of mercury just referred to, other causes may be enumerated, as anchylosis of the temporo-maxillary articulation, in consequence either of arthritic disease or traumatic lesion, in either of which cases, an effusion of plastic element may be thrown out around the joint, which finally may be converted into cartilaginous or osseous formations, effectually impeding the motion of the jaws. Again, the pressure of a neighboring tumor may produce a similar result, and an entire osseous connection may take place between the jaws in any part where the previous disease has manifested itself, either between the ramus of the inferior and the boss of the superior maxillary, or between the alveolar processes; or, as Mott observes, "by means of a bony plate which extends from the coronoid process to the superior maxillary bone."

From no matter which of the above-mentioned causes the closure proceeds, it is certainly a difficult and tedious affection to treat, and the prognosis is very doubtful. A patient presents himself with very imperfect speech, partial or total immobility of the jaws, the gums, cheeks, and lips grown firmly together, with considerable deformity of the chin, and says to you, or rather endeavors to say to you: "Doctor, what can you do for me?" If the surgeon understands his calling, is acquainted with surgical literature, and the experience of those who have treated such diseases, he will say, "I do not know." The humiliation of such a confession will not be of long duration, and will be infinitely more pleasing to the poor patient than a broken promise of immediate and permanent relief. A prognosis cannot be hastily formed in such cases, because it is impossible to state certainly by what means the jaws are closed; perhaps it may be one, perhaps another; or, as in the case about to be recorded, two or three substances may firmly unite the maxillæ. In his chapter on this subject, Dr. Mott says: "It is in our opinion an important surgical subject, and especially so since it is one which is frequently very difficult to treat." Gross, also, in his article, writes as follows: "When the immobility depends upon the presence of inodular tissue, the proper remedy is excision of the offending substance, an operation which is both tedious, painful, and bloody, and unfortunately not often followed by any but the most transient relief, owing to the tendency of the parts to reproduce the adhesions, however carefully and thoroughly they may have been removed. . . . . The great difficulty, however, is *the obscurity of the diagnosis.*"

In general, however, it may be considered that the joint is affected with spurious anchylosis, true synostosis not having occurred within the capsule, while along some portions of the bone osseous connections may have been thrown out, while, nevertheless, muscular contractions, fibrous tissue, cicatrices, or even fibrous degeneration of the articular cartilages, may hold the jaw perfectly immovable. In the diagnosis of such cases it is well to bear in mind the advice of Brodhurst,* who thus writes: "False anchylosis is the rule; it is so common, that adhesions should always be held to be fibrous until they are proved to be bony. Immobility alone is not a

* Practical Observations on the Diseases of the Joints involving Anchylosis, and on the Treatment for the Restoration of Motion. London, John Churchill, 1861.

sign of synostosis; it not unfrequently exists where the adhesions are fibrous. And even where chloroform has been administered immobility may be as great as before. . . . Whenever the muscles can be thrown into action, so as to render the tendons prominent and tense about a joint, the adhesions are not bony."

With these remarks upon the affection, we will proceed to the details of a case, presuming, however, that in many instances, when there is complete immobility of the temporo-maxillary articulations, there also exists more or less deformity of the face, and sometimes quite hideous appearances presented by former loss of the soft parts in the vicinity of the mouth.

Mary C——, a resident of a small town in the interior of Illinois, was sent to me by a physician of that State, to ascertain if any means could be devised to alleviate her condition, which certainly was extremely distressing.

About nine years ago she supposed herself to have been severely salivated. At all events, from cross-questioning, I learned that there was profuse pytalism, and, to use her own expression, "a great sore appeared on the inside of the right cheek," the gum being affected and the bone being involved. Her friends stated that her life was one of acute and continued suffering for two years, during which period there was a constant discharge from the diseased surfaces of a thin, sanious fluid, of such offensive character that she was disgusting to herself and her attendants, and an object of pity to all who were acquainted with her condition. For about twelve months all efforts to heal this ulceration proved ineffectual, until finally, disheartened at the unsuccessful attempts of a scientific profession, she made application to a root doctor, who, by the use of a vegetable salve, healed the sore, but neglected the precaution of interposing foreign material between the ulcerated surfaces of the cheek and gum. The result was, as should have been anticipated, firm adhesion of the cheek to the gum of both jaws, which, by the contraction of the cicatrix, were drawn tightly together, until finally, when the healing process was completed, the cheek of the right side presented a hard, unyielding surface, with a scar from three to four inches in length, and resembling cartilage on its lower border. The inferior maxilla was drawn backwards, the teeth of the lower jaw were forced upwards under those of the upper, the chin shortened, and the line of the inferior maxillary, on the right side, impaired, it curving slightly inwards. These adhesions extended to the vermilion border of the lips on the same side, and the commissure of the mouth was converted from an angle to a semicircular border of firm tissue connected to both jaws, and about half an inch to the right of the original point of commissure.

After this portion of the sore had healed, leaving the parts in the condition mentioned, disease attacked the globe of the right eye, ulceration and perforation of the tunics followed, the humors were evacuated and sight was necessarily destroyed; necrosis of the external angular and orbital process of the frontal bone then supervened, pieces of which came away with the discharge. The entire eye was now destroyed, and the upper lid, throughout a part of its extent, had grown to the bone. In about twelve months these ulcerations were healed—by what means I am not aware—and since that period to the present, a space of over seven years, this poor woman has been unable to move her jaws; her speech being necessarily much impaired, and the power of mastication entirely wanting. During all this time she has subsisted by taking liquid nourishment (soup, tea, coffee, milk), etc., through a slight irregularity of the teeth of the left side, and has enjoyed tolerable health.

During this period several teeth and pieces of necrosed bone were cast off into the cavity of the mouth; these *she was obliged to swallow*, from total inability to open the jaws to a width sufficient to expel them.

Fig. 357, taken from a photograph, represents the case.

There are several instruments which are well adapted to open the mouth in cases of anchylosis of the inferior maxillary which are far superior to the old instrument of Scultetus, among which I may mention that of Goodwillie (Fig. 358), and that of Westmoreland (Fig. 359).

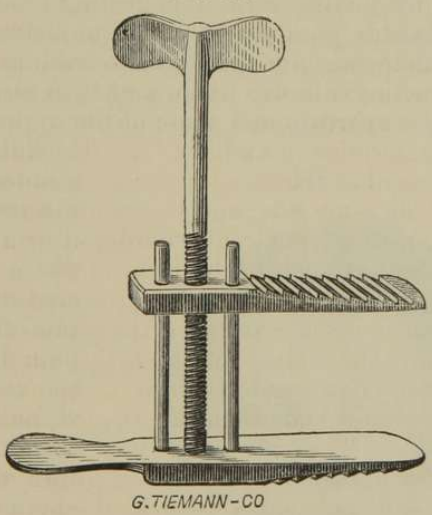
Fig. 357.

The Author's Case of Anchylosis of the Jaw, with destruction of orbit, eye, and cheek.

Though it was a question as to the character and quantity of the substance that held the jaws so firmly together, I determined, at all hazards, to risk an operation that might perhaps relieve the miserable condition of the patient; and, accordingly, the patient, having been placed fully under the influence of chloroform, and being seated under a window, I proceeded to dissect up the cheek from the jaws. It was thought advisable to make the whole of this separation without an external wound, which would necessarily be torn apart, or at least put upon considerable strain at every forcible attempt to depress the inferior maxilla. The adhesions were extremely dense, extending in firm cartilaginous bands from jaw to jaw. There was considerable flow of blood during this operation, after which the endeavor was made to depress the lower jaw, and although

Fig. 358.

Fig. 359.



all the force I could command was applied in various ways, not the slightest movement could be accomplished.

In these frequent trials, portions of bone came away from the right side of the jaw and one of the lateral incisors was broken.

The operation was here discontinued, as it was evident that bony union had been effected; the osseous bridge being distinctly felt by the finger. It was then concluded to defer any further operative procedure for the

present, and a piece of gutta-percha was inserted between the raw surfaces to prevent reunion of the parts.

On the next day, the wound began to discharge a most unhealthy and ill-conditioned matter of great fetor; the apartment which she occupied was noisome from the smell, and it became necessary to use disinfectants to counteract the effluvia. The next day I removed the gutta-percha from the cheeks, took away several portions of loose bone, ordered the mouth to be syringed with calendula water two or three times during the day, and with weak creasote water at night. A thin, small stream of water could be poured into the mouth between the irregularities of the teeth on the left side, through which, however, the thin blade of a small spatula could not pass, but the closure on the right side was so perfect that no fluid could find entrance, no matter how small the stream or how forcibly impelled.

During the next few days, the fetor from the wound began to be less intense, and the discharge to assume a more healthy aspect, during which time I had prepared some iron wedges, quite long, and with a gentle bevel, coming to a fine edge, and the instrument recommended by Dr. Mott to be used in these operations. On the next day, the patient being under the influence of chloroform, by gradual but very forcible pressure, the wedge was entered on the sound side and the jaw very slightly depressed; but the extension appeared to be only on that side, and to be caused by the strain on the tendon of the temporal and fibres of the masseter.

These operations were continued daily for a week, the patient being at each period under anæsthetic influence, but complaining bitterly at each time of the severe pain. Several teeth were broken during these procedures, and were afterwards extracted. During this period, the wounds from the recent dissection had almost healed. The fetor had disappeared, and I accordingly determined to sever the bony bridge of connection between the jaws. This was effected, first, by the introduction of a small awl, then by a chisel and a metacarpal saw, the latter being used from within outwards, with the back of the instrument to the cheek. Notwithstanding, there was not the slightest trace of motion.

By extracting a molar tooth, and by a powerful force applied to the left side, a slight aperture was made on the right side, into which a thin slip of hickory wood was inserted; this was allowed to remain for two days and the operation again repeated, each time a larger wedge being forced between the jaws. This process was continued for about ten days, at each time the patient suffering very severe pain from the traction, although in the majority of the operations she was almost fully under the influence of chloroform. Toward the end of the fifth week from the date of the first operation, the plug was taken out for several hours, and the patient was ordered to chew hard biscuit, etc. This order, however, at first was not obeyed, because of the inability of the muscles to perform their functions after so many years of quiescence. The power, however, gradually returned, and she began to masticate well and to speak much better, although

Fig. 360.

the rounded aperture at the right commissure of the lips prevented perfect articulation.

This was remedied by a V-shaped incision, the apex toward the ear, but so unyielding was the texture that the insertion of the pins through it was a matter of time and difficulty. However, the wound was brought carefully together after some delay, and has healed perfectly, leaving a very slight scar, and one far less observable than the hard, shining cicatrix, already mentioned as resulting from the treatment of the former ulcerations. Before this operation, and to prevent any closure of the jaws resulting from the healing process, a wedge of hickory was inserted on the sound side and allowed to remain. The wound healed very well, though slowly, from the diminished circulation of the part, and on the night of the sixth day I extracted the first pin. During this period I regularly inserted the wedge at night, and had the patient move the jaws, either in masticating or talking, during the day.

In a few days more the second pin was removed, and the patient allowed to depart to her home, after being under treatment seven weeks, and almost daily undergoing severe operative processes.

Fig. 360 represents a second case that came under my observation, and since I have had six others. I have found, from persistent trial, that, after the removal of the inodular tissue, hickory wedges of different sizes, pressed firmly between the teeth, are better than forcible dilatation.

CHAPTER XXXV.

INJURIES AND DISEASES OF THE NECK.

Cut Throat.—It is not by any means as well understood as it should be, that very many of the incisions which are usually made by suicides or murderers in the neck are not fatal. Because of the prevalent opinion, that if the windpipe is opened, death is inevitable, therefore the incisions are generally made in the front of the neck, and the great vessels and nerves of the lateral portions being intact, the patient recovers.

Holmes asserts that of 158 unselected cases the wound was situated,

Above the hyoid bone in	11 cases.
Through the thyro-hyoid membrane in	45 "
Through the thyroid cartilage in	35 "
Through the crico-thyroid membrane in	26 "
Into the trachea in	41 "

The respiratory tract was opened in about two-thirds of the cases. However, there is often considerable bleeding from the thyroid arteries and severed veins. Death, also, may ensue from the flowing of blood into the air-passages and lungs.

Treatment.—The first care of the surgeon, of course, is to arrest the bleeding, and then wait a considerable time to learn that no internal hæmorrhage is taking place. If the cut has been made high up, at the junction of the neck and chin, a portion of the epiglottis may be cut off; if a part is left hanging, it should be excised. If the wound is lower down, the rings of the trachea may be brought together by passing fine silver wire through the perichondrium, and twisting it, allowing the ends to protrude through the wound.

If muscles are severed, they must be treated in like manner.

The head must then be placed in such position that there be no traction on the sutures, and the parts covered with compresses wet with a solution of calendula and water.

Torticollis—Wry Neck.—This distortion of the neck and consequent unnatural position of the head may be either congenital or acquired, paralytic or spastic. Sometimes the manipulations of the accoucheur during a tedious labor may produce it. When thus noticed it increases gradually, the head being drawn from one side or the other, until great deformity results. In other cases it may arise from scrofula, rheumatism, or from the sloughing consequent upon burns, lacerated or gunshot wounds. The head leans to the side of the contracted muscles, and may be drawn slightly forward. The chin is directed to one side, and the ear approaches the shoulder. The affected muscles are first and most frequently the sterno-mastoid, also the trapezius and scaleni. The fascia sometimes plays an important part in the affection.

The sterno-mastoid and trapezius muscles are supplied by the spinal accessory nerve, and many causes exciting an irritation of its tract may produce torticollis. Indeed, a reflex irritation from the pneumogastric has been known to produce the spasmodic variety of this disease. There may be also a clonic torticollis and a tonic torticollis, and the surgeon must be careful not to mistake the tonic contraction which occurs on one side for the paralytic condition of the other. There is a very peculiar form of this affection noticed by Dr. Mills;* it is "bilateral spasm of the muscles supplied by the accessorius; it is not common, and, when it does occur, is a most striking and curious affection, causing peculiar and alternate or synchronous movements of the head—a form of the nodding or salaam convulsions particularly observed in children."

Treatment.—If torticolllis arise from improper positions assumed by the patient, braces or other mechanical means to prevent an indulgence in the pernicious habit must be employed. If the inclination of the head is caused by glandular swellings, the medicines that are suitable for such indurations will probably rectify the evil. Among these may be rhus, carbo an., or conium.

If wry neck is occasioned by rheumatic or other inflammatory affections, it may be advantageously treated with bry., puls., bell., acon., etc. For pains as if the cervical vertebræ were dislocated, which are often felt in the affected part, bry., nux vom., and cinnabar may be suitable. For the contraction of single tendons of the cervical muscles, natrum muriat., rhus tox., stram., hyos., dulc., zincum, selen., or arsenicum, are appropriate medicines.

Fig. 361.

In the absence of any mechanical contrivance, adhesive plaster well applied, a band around the forehead to which a second extending to the back is attached, will often meet all the indications. An extemporaneous apparatus may be made by a skull-cap made of stout cloth, and having an india-rubber band attached thereto, near the forehead; this band must extend to the back, and be fastened to a strap extending around the thorax.

* Spasmodic Torticollis, Am. Journal of the Medical Sciences, Oct. 1877, p. 431.

The instrument makers construct excellent props and supports, which are much preferable to the old-fashioned one of Jorg. In most cases, however, the subcutaneous division of the tendons at fault, may be practiced. If only the sternal portion of the sterno-mastoid should be the tendon affected, which can be ascertained by its spastic rigidity, the patient being well etherized, the finger of the left hand must be inserted under the tendon, and a delicate tenotome passed flatwise beneath the tendon, the edge of the knife is turned forward, an assistant makes traction on the head, and the tendon often snaps when divided. If the clavicular portion of the sterno-mastoid is also to be divided, a second puncture must be made, and this had better be somewhat further above the bone than the puncture made at the sternal end, as the fibres come more closely over the bone at the clavicular than the sternal margin. After having made this puncture with the sharp-pointed knife, it must be relinquished, and a probe pointed tenotome substituted; this must be introduced flatwise, and the cutting edge turned forward, and with a sawing motion of the handle the fibres divided. Fig. 361 shows the introduction of the instrument in division of the clavicular fibres. After the attachments have been divided, either of the following may be used. Fig. 362 represents a most perfect form of apparatus made by Mr. Reynders.

This apparatus consists of a well-padded pelvic band, *a*, to which an up-

Fig. 362.

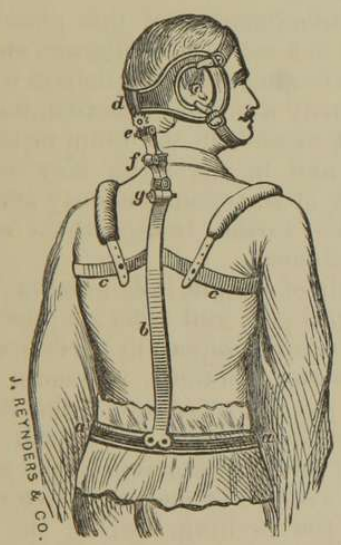
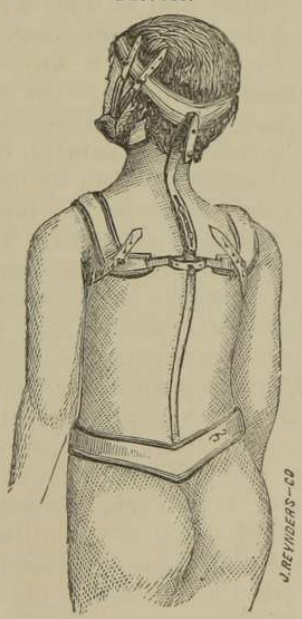


Fig. 363.



right steel bar, *b*, is attached, passing upwards along the spine to the upper dorsal region. A cross-bar, *c*, is attached to its upper end, passing from one axilla to the other, and fastened to two crutches, *k*, fitting well under the arms. These are connected to the pelvic band by two lateral bars, *m*, which by means of a slot and screw can be raised and lowered somewhat, at will. The part of the apparatus so far described is applied firmly to the trunk by means of straps passing over the shoulders and fastened to the axillary crossbar at *c c*. A firm hold of the head is secured by a pad (sheet steel inside), reaching almost from eye to eye backwards around the skull, with apertures for the ears, and fastened to the head by straps over the forehead and under the chin. To its back part, a steel bar is riveted, *d*, which connects the upper part of the apparatus with that applied to the trunk.

The lower end of this steel bar is ratcheted and adjusted in a slide at the upper end of the steel rod, passing up along the spine, and held in a desired position by a thumbscrew, shown near the letter *h* (on the figure). This connecting bar is intercepted by three different joints, *e*, *f*, and *g*, by which flexion can be made in any direction when worked by the key. At the joint, *g*, flexion can be made to the right or left, at *f*, forward and backward, and at *e* rotation.

The advantage of this apparatus over many others is, that firstly, a firm hold is effected on the head and trunk, and that the head can be brought in a proper position by a true and irresistible mechanism. The apparatus when worn is almost entirely hidden under the clothing, and patients cannot very easily withdraw themselves from its action.

Markoe's Apparatus, Fig. 363, is, principally, the same as the one above-named. A ball and clamp socket-joint allows movements of the head into the proper position. A short stem projects backwards from the back of the headband, terminating in a ball, which is grasped by a clamp at the end of the upright bar passing up along the spine. The pressure of this clamp is regulated by a thumbscrew, which is tightened after the head has been brought into proper position.

Diseases of the Glands of the Neck.—The *parotid gland* is subject to inflammation, abscess, and sometimes tumors, which are generally of a malignant nature, and its duct of excretion is in rare instances the seat of calcareous bodies, of wounds, and of fistulæ.

Parotitis or *mumps* is an idiopathic inflammation of this gland, and almost wholly confined to the young. It is a contagious disease, and generally appears as an epidemic, being more frequent in males than in females. Although somewhat painful, it is ordinarily a simple affection, but may become dangerous when, by metastasis, it extends to the brain or testicle; it may prove fatal in the former case, and in the latter may result in atrophy or loss of function. The severity of the symptoms may generally be controlled by bell., merc., and rhus. For further treatment the student may refer to works on the practice of medicine.

Abscess of the parotid may be the result of simple inflammation, direct injury, or of erysipelas, typhoid fever, small-pox, and other eruptive disorders. In consequence of its proximity to certain important nerve branches, it proves a very painful affection. In many instances, by reason of the firmness of its coverings, the presence of pus is exceedingly difficult to determine, and may be allowed to burrow itself along the sheath of the muscles or large cervical vessels, causing much destruction in the cellular tissue. This disastrous condition may be avoided by making a free vertical incision in the most prominent part of the swelling, keeping the wound open until the abscess is obliterated. The administration of the proper remedies will materially hasten the cure.

Gangrene may very rarely appear in this gland during a severe attack of erysipelas, scarlatina, small-pox, or typhoid fever, especially when they assume the adynamic type. When this complication does occur the yeast or charcoal poultice should be applied, and the homœopathic remedy administered. Arsen., carbo veg., or lach., are most frequently demanded. For further treatment see Gangrene and Mortification.

Extirpation of the parotid should only be attempted when it becomes the seat of a *simple* or *benign* growth. These tumors, in common with those situated in the submaxillary gland, are usually of a fibro-cartilaginous nature. They are mostly encysted, have a peculiar, hard, elastic feel, and often attain a great size; their early removal is always advisable.

In performing the operation of *extirpation* the surgeon makes an incision

directly over the tumor, well down to the capsule, and then endeavors to enucleate the mass. It will be necessary to proceed with the greatest caution when attempting to free the deepseated parts, lest the facial nerve, or the internal carotid artery, or the jugular vein be wounded. The danger of this occurrence should be explained to the patient previous to the operation. In total extirpation of the gland the motor branch of the seventh pair of nerves is divided, resulting sometimes in temporary and sometimes in permanent paralysis of the face on that side. It is always well to remove the gland from *below upward*, for by this means the external carotid is brought into view during the first stage of the operation and can be placed under control.

Malignant tumors of the parotid should be rarely disturbed; on examination they seem *fixed*, *diffuse*, and *deeply seated*. Any attempt at motion of the part causes pain, and paralysis of the facial nerve is generally present. They are of a fibrous, scirrhous, melanotic, or encephaloid character, and prove fatal by constitutional irritation, or by ulceration and profuse discharge.

The *duct of Steno*—the excretory canal of the parotid—may suffer in face wounds, or from ulceration, abscess, or gangrene. Such an occurrence is very unfortunate, as it may establish an exceedingly obstinate form of salivary fistula. If the canal is divided by a wound the ends should be carefully adjusted and held in place by the twisted suture and a compress. This will ordinarily effect a cure. When the fistula is the result of the other causes mentioned, a cure is not so readily obtained, but may often be accomplished by cauterizing the parts, causing the external orifice to close by granulation. If, however, the oral end of the duct is obstructed, it will be necessary either to open it by a probe passed through the fistula into the mouth, or by forming a new opening near the oral end of the duct. This should be kept open by a seton, till a free channel for the saliva is established, when, upon the removal of the seton, the external opening will contract and close itself. If the process of cicatrization is tardy, it may be hastened by the application of caustics. Should these measures fail, a plastic operation may be resorted to.

A *salivary calculus* may sometimes obstruct this duct. If the attending symptoms are very severe it must be removed by opening the duct within the mouth.

The submaxillary gland occupies a position so well protected that it is rarely the subject of any disease demanding surgical interference. It is subject to enlargement and indurations caused by decaying teeth, cancer of tongue, or affections of the neighboring lymphatics; but this condition will usually subside on removal of the cause of irritation.

In common with the parotid, it may be attacked by the same forms of malignant disease to which that gland is subject. A careful distinction should be made between simple and malignant disease of this organ; for in the former case, the removal of the cause is followed by speedy recovery, while in the latter, no permanent benefit may be expected.

Operations in this region involve the facial artery, and the sublingual artery and hypoglossal nerve are to be be avoided.

Calcareous formations are occasionally found in the excretory duct of this gland also, and give rise to a similar list of symptoms as those found in obstruction of Steno's duct; swelling of the side of the tongue and jaw, with pain and difficulty of mastication.

Goitre, Bronchocele or Derbyshire Neck is a chronic enlargement of the thyroid gland. It usually affects both lobes (see Fig. 364); in some cases it is confined to the isthmus of the gland. The swelling varies in size

from a slight enlargement of the natural structure, to the bulk of an adult head; and Alibert relates a case in which the hypertrophied gland hung as low as the thigh. Goitre seems to be endemic in certain parts of Switzerland and England. It is more common in women than in men, and in some cases seems to be hereditary. It is found associated with cretinism, and also with the malady described by Prof. Flint as "exophthalmic goitre," but more generally known as Basedow's or Graves's disease.

FIG. 364.

Other tumors of the neck may be mistaken for goitre, but the latter may readily be diagnosed, by directing the patient to imitate the action of swallowing, and if the tumor follows the motions of the larynx and trachea, and at the same time occupies the natural situation of the thyroid gland, there can be very little doubt of its nature. The causes of the disease have not been as yet satisfactorily explained. By many it is supposed, though erroneously, to be of a scrofulous nature. Unwholesome diet, intermittent fevers, and the drinking of snow-water, have been imagined by others, to give rise to it; but all these causes are extremely hypothetical.

Treatment.—The principal medicine in the treatment of this disease is iodine, which has been used by allopathic practitioners from a remote date, but with inconsiderable success from its improper administration; indeed, in many instances, the drug, instead of ameliorating, aggravated the affection. The iod. should be used from the 3d to the 6th potency, and, according to Mr. Cameron,* repeated every second day.

Natr. carb., repeated a few times, has relieved a globular and somewhat indurated enlargement of the upper part of the thyroid gland. In another case *calc. carb.* afforded speedy relief. *Staphis.*, together with *lyc.*, have also been of great service. *Spongia* is also a medicine of great power in producing relief, if it does not cure the disease.

In Hale's *New Remedies*, at page 771, phytolacca dec. is said to be efficacious in curing goitre. At page 817, in same work, podophyllum is spoken of as equally successful, and iris vers. would seem from its provings to be useful.

Dr. Craig has found sal ammoniac more successful than any remedy heretofore tried.

M. Maumene, a French chemist, says, in countries where goitre prevails, fluorides are contained in the water; he has proved it and has artificially produced it with fluoride of potassium in animals.

Dr. Blakeley refers to a case where mercurius prot., 3d, a powder every three hours, and mercurius prot., 12th, one powder every night, and an ointment applied to the swelling, of mercurius prot., 1st, grs. x, adips 1 oz., effected a cure.

In addition to these medicines a judicious hygienic treatment should be adopted. In districts where chalk, lime, or magnesia abound, the water

* *Vide* a very interesting and highly important paper on Bronchocele, by H. Cameron, Esq , M.R.C.S.E., British Journal of Homœopathy, vol. iii, p. 469.

should be filtered or distilled before using. The practice of placing the solid *iodine* in the room occupied by the patient, and thus keeping the air impregnated by its exhalations, has produced very happy results. An ointment of *iodine* may be applied with benefit oftentimes, and Dr. Mouat, of Bengal, speaks (*Ind. Annals of Medical Science*, 1857) very highly in favor of an ointment composed of *biniodide of mercury*, three drachms to one pound of lard. This is to be rubbed upon the tumor thoroughly, then the patient allows the rays of the sun to fall upon the parts as long as it can be endured. Then another application is made, and in many instances no further interference is necessary. He reports an almost incredible number of cases cured by this method. I have used this treatment with success in two cases, substituting the heat from a kitchen-range for the rays of the sun, and administering iodine internally.

Some surgeons have recommended and practiced the injection of tincture of iodine into the tumor, while others speak favorably of the use of the seton. At the present, *electrolysis* is perhaps the most successful method of treating goitre (*vide* chapter on that subject).

Extirpation of the gland has occasionally been practiced, but the danger from excessive hæmorrhage is so very great that the operation is scarcely justifiable. Dr. W. W. Green, of Maine, has reported three operations successfully performed by him.

Ligation of the arteries which supply the gland (*"starvation of the tumor"*) has been tried with varying results, the cases reported as cured by this method being few in number.

In exceptional cases the tumor may so compress the trachea as to make the operation of tracheotomy necessary.

I have received from my friend, Dr. E. J. Whitney, of Brooklyn, a synopsis of Dr. Mackenzie's treatment of goitre. Dr. Whitney spent a season in London visiting Dr. Mackenzie's clinics, and speaks highly of the success of the treatment; he informs me that Dr. Mackenzie divides bronchocele into *seven* classes: 1. *Adenoid* or *simple*. 2. *Fibrous*. 3. *Cystic*. 4. *Fibro-cystic*. 5. *Fibro-nodular*. 6. *Colloid*. 7. *Vascular*.

The first class require little treatment except of a constitutional character, as the disposition of these growths tends toward recovery without local interference.

In *fibrous* bronchocele, the treatment consists of a seton passed transversely through the whole of the gland. The seton is composed of from six to twelve threads of cotton twine, according to the size of the tumor, and its insertion may be rendered comparatively painless by applying a spray of ether to the points of entrance and exit of the needle. These threads are allowed to remain until suppuration is well established, when they must be withdrawn and the tumor treated as an abscess.

The *cystic* bronchocele varies greatly in size, but is always of a globular or ovoid form. The first step in the treatment of this variety, empties the cyst by entering a small trocar as near the median line as possible, and at the most dependent portion of the tumor; having pierced the wall of the cyst, the trocar may be withdrawn, and the canula stopped by a key or plug. If the growth should be multilocular, the canula may be moved about *within* the tumor, breaking down the walls of the several cysts, which having been accomplished, the plug is removed, and the fluid contents allowed to escape through the tube. Now inject into the sac about one drachm of a solution of ferri perchloridi, ℥ij of the salt, to water ℥j, replace the plug and confine the canula in position by adhesive plaster. This process is repeated at intervals of two or three days, until suppuration takes place, when the tube is removed and a poultice applied, as in abscess.

When several cysts exist, by opening them within the tumor much disfigurement from scars may be avoided. It will be seen that the treatment consists in converting the tumor into a chronic abscess, and then following with the appropriate after-treatment.

Mackenzie states that out of 39 cases of cystic goitre, 38 underwent this operation, and it proved *successful in every instance.*

In *fibro-cystic* bronchocele the treatment is a judicious combination of the seton and puncture.

The *fibro-nodular* variety has not been treated with much success.

Colloid bronchocele has been treated with electricity, but the results are not satisfactory. It is believed, however, that the seton could be used with great benefit.

The seventh form, the *vascular* bronchocele, is so extremely rare that no treatment is recommended. It is very improbable that a case would be met with in the course of a long and extended practice.

Rupture of the Œsophagus.—The œsophagus may be *ruptured* during life, and the solution of continuity may be occasioned in different ways. The most common causes are perforations made by abscesses, or by aneurisms, or by the sharp projections of foreign bodies, or sloughing from caustics. These cases are not by any means uncommon. There are, however, others in which, either by straining during vomiting, or from the endeavor to expel impacted bodies, a rupture of the gullet takes place. Dr. George C. Allen, of Boston, has recorded such a case, and Dr. Fitz* has given much time to looking up its literature. He finds Boerhaave, Ziesner, Mr. Jno. Dryden, Kade, and others, who have reported cases of ruptured œsophagus, find that pain is not a very prominent early symptom, and that nausea and vomiting and sometimes vomiting of blood are always present. In conclusion he remarks, " The patient falls into a condition of great exhaustion after the violent straining, from which he rallies in the course of twenty-four hours, when fever is evident. The emphysema advances, the patient has difficulty of breathing, there may be orthopnœa even, also slight cyanosis, and death may occur within fifty hours, or may be postponed seven or eight days. When the disease assumes a protracted course, it is essentially a gangrene of the mediastinum, combined with gangrenous pleurisy ; there are continued fever, great prostration, mild delirium, pains in the stomach and chest, and bloody stools after a time. Tetanic convulsions may occur, if the inflammation in the mediastinum involves the nerves along the spine."

All these symptoms, however, are equivocal, and Hamberger says, " We must admit that up to the present, the diagnosis is first made on the corpse, and often contrary to all expectation." In the treatment little can be done, but small quantities of food must be taken at a time. If by any means a proper tube could be passed from the mouth to the stomach, and the patient fed through it, an opportunity might be given for the rent to heal. I am not aware that this method has been tried, or even recommended by any one, but it strikes me as feasible.

Œsophagitis, Inflammatio Œsophagi.—This is a disease of infrequent occurrence and cannot be seen by an examination. There is local pain either behind the trachea and between the shoulderblades towards the cardia, along the spine, under the sternum or xiphoid cartilage; the pain is constant, and of an aching, stinging, and burning kind. There is very little fever, although much thirst, which the patient cannot gratify in consequence of the pain occasioned by swallowing. Food also passes with great pain and difficulty, and is at times thrown upward in conse-

* American Journal of the Medical Sciences, January, 1877, p. 17.

quence of a spasmodic action of the parts; there is also nausea, vomiting, much tenacious mucus in the mouth, hiccough with anguish, distorted and pale face, pulse small and contracted, congestion of blood to the head, convulsions.

Belladonna is indicated when there is violent lancinating pain when breathing or swallowing; also stitches when swallowing or when not swallowing; soreness when spitting; when swallowing, a sensation is perceived as if the parts were *too narrow;* short-lasting but frequently-recurring contraction of the œsophagus, more during than between the acts of deglutition; a determination of blood to the head, flushed face, dry tongue.

Arnica, if there be a burning in the back part of the throat, with stinging and darting when swallowing, in persons of a nervous temperament. The pain is increased by talking; pain is severe, producing delirium.

Cocculus.—Great sensitiveness of the throat; the food when passing seeming as if *spiced or peppered;* dryness of the œsophagus; also with a feeling of heat from the stomach; burning in the œsophagus extending to the velum pendulum palati, accompanied with shuddering about the head; a sort of choking constriction in the upper part of the œsophagus, oppressing the breathing and causing cough; with the burning in the œsophagus there is also a taste of sulphur.

Arsenicum.—Constriction of the œsophagus and sensation as if it were closed, with painful, difficult deglutition as if from paralysis of the parts, accompanied with debility; or substances being swallowed seem arrested and produce a sensation of pressure; great dryness of the throat, with desire to drink; the pains in the œsophagus are also felt while sleeping, and are accompanied with shuddering and chilliness.

Sabadilla.—The throat feels sore and swollen when swallowing; sticking sensation as if from tightness, with sharp scraping; in order to breathe freely the patient is obliged to hawk; *constrictive* feeling *deep* in the throat.

Rhus rad.—Sensation of excoriation, with pricking; hot and raw feeling in the throat; painful deglutition, particularly on the right side; sharp pain when swallowing; feeling of hardness, soreness, and contraction of the throat during deglutition; dryness of the throat; pain slightly burning in the back; burning in the œsophagus. This medicine promises to be invaluable in a great number of diseases, and particularly in the one we are now considering. To Dr. Joslin, of New York, we are principally indebted for the precise and admirable proving of this drug.

Rhus tox.—Sensation of a swelling in the throat when talking, or when quiet; a bruised pain in the throat; when swallowing, a pain as if from pressure, and accompanied with a stitch as if some pointed article had been stuck in; stitch when yawning or swallowing, as if a pin were swallowed; stinging in the throat during deglutition when the throat is dry, but pressure when the throat is moist.

Daphne mezereum.—Aching pain in the throat when swallowing; also in the back of the throat between acts of deglutition; tongue white, yellow.

Laurocerasus.—Dull pain in throat, extending to the *right scapula;* painful feeling in the throat as of a drawing downwards; sticking in the throat as from a *peg,* extending to the left side of the back; burning in the throat, with roughness and accumulation of tenacious mucus; spasm, heat, and pain in the œsophagus; pain in the palate at the same time, with burning in the throat.

Carbo vegetabilis.—Scraping sensation in the throat, with roughness, and rawness, and feeling of dryness when swallowing; fulness and pressure in the œsophagus, even between the acts of swallowing, as if it were closed or contracted; difficult deglutition as if from spasm, without pain; *feeling of coldness down the throat;* sensation of sticking and as if something were lodged in the throat.

Mercurius solubilis.—Difficult deglutition; constant desire to swallow; spasmodic difficulty in swallowing, with danger of suffocation; painful pressure in the throat and dryness, compelling constant swallowing; continually aching pain in the œsophagus, more violent when eating, as if the food passed over raw flesh, with burning pain; aching pain in the œsophagus by paroxysms, as if an ulcer would form.

Stricture of the Œsophagus is a disease possessed of much interest both to the surgeon and the physician. Its causes are various: sometimes they are attributable to the action of irritants; sometimes to injuries; at times to compression from external growths, and more frequently to an irritation of the tube arising from chronic indigestion.

When we consider the anatomical structure of the œsophagus, and the great variety of substances that are taken into the stomach, both hot and cold; sour and sweet; the rich compounds of the kitchen, the highly seasoned articles of the restaurant, or the more delicate, though not less indigestible aliment of the confectioner, all of which pass over the mucous membrane of the tube, it is really a matter of surprise that more disease is not developed in this portion of the alimentary tract.

So far as my observation and reading extend, I am led to believe that stricture of the œsophagus is rarely idiopathic, being generally accompanied by disease of other portions of the digestive apparatus, notwithstanding cases have occurred in which it can be certainly attributed to the action of medicinal substances. Wolf* reports the case of a young man, aged twenty-six, who had accidentally swallowed some oil of vitriol; great inflammation followed, contraction of the œsophagus resulted and increased to such a degree that, upon his admission into the hospital, he had lost all power of swallowing—a perfect stricture having formed. No doubt many such are upon record.

There are three varieties of stricture: first, the *spasmodic;* second, the *chronic induration;* and, third, the *malignant;* the latter arising from *carcinoma*, and attended with ulceration and perforation. Many excellent authorities make but two divisions, the first being the spasmodic, the second the organic, the latter embracing the chronic induration and the malignant variety.

In *spasmodic* stricture the circular muscular fibres are the seat of the affection; the disease occurs at intervals, the patient suddenly finding himself incapable of swallowing, at the same time experiencing a sensation of choking; added to this, there is not much emaciation, although there is generally great nervous irritability of the whole system. The disease is more prevalent among females than males, and is amenable to internal medicines.

One of the most interesting cases of this kind has been published in the *North American Journal of Homœopathy*, from the pen of Dr. B. F. Joslin, Jr., of New York. The patient suffered extremely, and, notwithstanding the best-directed efforts, finally succumbed to the disorder. The post-mortem examination revealed a small, hard, osseous tumor, an inch long and half an inch in breadth, with various spiculæ of bone projecting from it, situated just above the bifurcation of the trachea; *a nerve was found very intimately connected with the anterior face of this tumor.* Dr. Joslin considers this filament to have been a cardiac branch of the pneumogastric nerve, the irritation of which, by the presence of the tumor, caused the difficulty in swallowing. The writer says, the bony tumor "did not press on the œsophagus, and was only loosely attached to the trachea; it was firmly adherent to the posterior portion of the vena cava superior; it could only be implicated in the production of the symptoms by its relations with the pneumogastric nerve."†

In *organic* stricture (Fig. 365) the symptoms are quite different: there is always accompanying indigestion, and the symptoms of dysphagia are generally the same; there is a peculiar expression of the face, the features being pointed and exhibiting the tokens of anguish and distress; emaciation is a marked symptom. The patient swallows food or drink, or at least passes it through the fauces, along the œsophagus, until it meets with the stricture,

* Ranking's Abstract, No. xviii, p. 246.

† A Singular Case of Spasmodic Stricture of the Œsophagus. By B. F. Joslin, Jr., M.D., North American Journal, No. xxxiii, p. 134.

there it remains for a moment and is regurgitated. The constant effort generally made by the patient to effect an entrance into the stomach, and the presence of the food immediately above the stricture, in time develops an enlargement of the part, so that in many cases of organic constriction, there is formed above the site of the disease an expansion or pouch. This sacculation may sometimes be enormous. Rokitansky mentions a case in which the passage was large enough to admit a man's arm. Mott* refers to a case in which a pouch was formed four inches in diameter; and there are others in which the dilatation was considerable. Such a one is reported in the *Provincial Medical and Surgical Journal*, July 28th, 1847.† The patient, a gentleman aged sixty-nine, had experienced slight dysphagia for three years, without material derangement of his general health; the difficulty of swallowing, however, gradually increased, and a stricture was discovered by the probang, opposite the cricoid cartilage. After death a pouch or bag was discovered proceeding from behind the œsophagus and passing down in front of the vertebræ. Two-thirds of this dilatation were invested with muscular fibres proceeding from the constrictors of the pharynx, which was also much enlarged. The stricture was composed of hypertrophied mucous and cellular tissue, and scarcely admitted a common-sized bougie. This case is interesting, because it points to the fact that beside the mucous and submucous tissues, muscular fibre also may enter into the formation of organic constriction; in which view, also, Gross and Miller coincide, although the former states that only in the aggravated cases, the last-named constituent assists in the formation of the stricture, while in the ordinary cases that are encountered, the mucous and submucous coats are affected, there being a deposit of plastic material in the part, causing a thickening of the tube.‡ The seat of stricture is said to be generally opposite the cricoid cartilage.

FIG. 365.

Organic Stricture of the Œsophagus.

In the *carcinomatous* stricture, or carcinoma, the disease is generally scirrhus, and begins in the submucous tissue, usually posterior to the thyroid cartilage or upper portion of the trachea. There is difficult deglutition with severe pain, often of a burning character, when swallowing, liquids being more easily managed than solids. The pain in some instances is referred to the thorax, and sometimes to a spot between the shoulders. The lancinating pains common to cancer are always present, also the constitutional symptoms belonging to cancer, viz., general emaciation, sallow, cadaverous skin, entire loss of appetite, and prostration. The patient may die of hectic, inanition, or hæmorrhage from ulceration.

Treatment.—The medicines that appear to be best adapted to the treatment of the disease are bell., hyos., and conium. These remedial agents, judging from their pathogeneses, would be the most appropriate; indeed, the latter two (hyos. and con.) are highly recommended even by allopathic

* Operative Surgery, vol. iii, p. 499. † Ranking's Abstract, 1847, p. 191.
‡ Gross's Operative Surgery, vol. ii, p. 656.

authority; others, however, may be required, among which are lyc., nux, stram., acid. sulph., verat., etc.

Dr. B. F. Joslin, of New York, has given the pathogeneses of several medicines applicable to stricture of the œsophagus. These are valuable, and we give them entire.

Mercurius. Sensation as if something had lodged in the throat. Difficult deglutition. He had to press very hard to get something down. Spasmodic difficulty in swallowing, with danger of suffocation. Aching pain in the œsophagus.

Pulsatilla. Sensation on swallowing as if the back part of the throat was narrower than usual, or closed by swelling. Sensation as if the pharynx were swollen. When swallowing he feels as though the throat were swollen. Difficulty in swallowing, as if from paralysis of the muscles of deglutition. Choking pain in the pharynx, as if from swallowing too large a morsel.

Ignatia. Sensation as if one swallowed over a lump. Strangulating sensation in the middle of the fauces, as if a large lump had lodged in the throat. Difficulty in swallowing solid or liquid food.

Belladonna. Sensation as of a lump which cannot be removed. Impeded deglutition or entire inability to swallow even liquids Short-lasting, but frequently-recurring contraction of the œsophagus. When swallowing, one experiences a sensation in the throat as though the parts were too narrow, contracted, as if nothing would go down. Pressure in the throat, with choking, ascending from the abdomen.

Nat. mur. Sensation as though a plug had lodged in the throat. Spasms in the pharynx. When swallowing she found it very difficult to get the food down, or to bring it up again, so that she came near suffocating.

For *carcinomatous stricture* the medicines are: arsen., phytolacca, apis, carbo veg., lachesis, gallium aperinum, and those which have already been noted in the Chapter on Cancer.

Should the administration of these fail to relieve the patient, they may be employed together with the use of the bougie, which instrument should be curved to correspond to the passage. The patient should be directed to throw his head well back, and to swallow while the surgeon introduces the bougie, which should be warmed, and passed steadily and gradually from the posterior part of the pharynx to the seat of stricture. The instrument is to remain a short time within the œsophagus, and the operation repeated once or twice a day, or at longer or shorter intervals, according to the judgment of the surgeon.

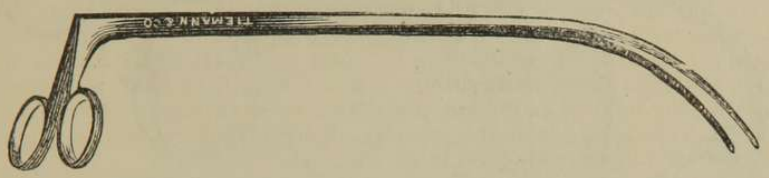
A good method of treating stricture of the œsophagus is that introduced by Jameson, who used eight or ten separate probangs, each consisting of a stick of whalebone having affixed to one of its extremities a spindle-shaped piece of ivory. The instrument first introduced is small, but after the stricture has been removed sufficiently to readily admit the passage of one probang, a larger size must be selected. The operation must be frequently repeated, each time using a larger-sized probang than formerly, until the obstruction is removed. If, however, the stricture is low down, electrolysis is decidedly *the best* method. The reader is referred to the Chapter on Electrolysis, in which a case of my own was cured by this method.

Foreign Bodies in the Œsophagus.—Extraneous matter frequently lodges in the œsophagus; particularly articles of food, portions of which, from hurry or voraciousness in swallowing, are impacted generally in the superior portion of the tube; such articles, in most instances, are beef, gristle, tripe, cheese, etc. On other occasions the patient is choked from having accidentally swallowed articles carelessly placed in the mouth, as coins, pins, needles, etc. Death has ensued from such accidents.

Treatment.—The foreign substance in many instances is lodged between the thyroid cartilage and the cornua of the os hyoides; in this situation, if

the body be large, it may be reached and extracted with the finger; if small, as a fish-bone, a pin or a needle, forceps should be employed. Fig. 366 shows Burge's forceps, which are curved, with handles at a right angle. Sometimes by tickling the fauces with a feather, or by exciting vomiting by emetics, the irritating substance can be expelled. Curved and other

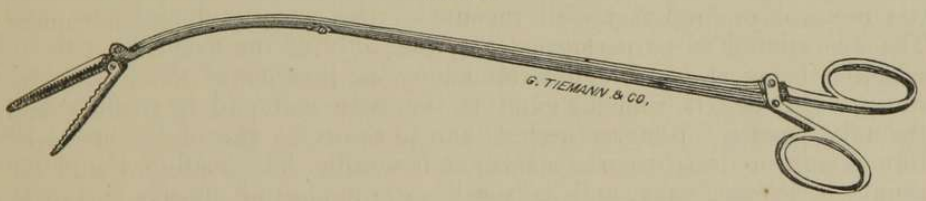
Fig. 366.



forceps have been employed, but when the surgeon is suddenly called to a patient, who is in imminent danger of suffocation, these instruments may not be at hand, and the delay occasioned in procuring them may prove fatal to the sufferer. In such instances, the handle of a spoon, the finger, or other convenient article should be selected, and the foreign substance either dislodged, withdrawn, or, if the article be digestible, forced into the stomach. The ordinary *probang*—a whalebone rod, with a round piece of sponge attached to one end, and a blunt hook to the other—is the instrument used by surgeons for this purpose.

A forceps, known as the *alligator forceps* (Fig. 367), is very useful for extracting foreign bodies. By referring to the figure, the mechanism of

Fig. 367.



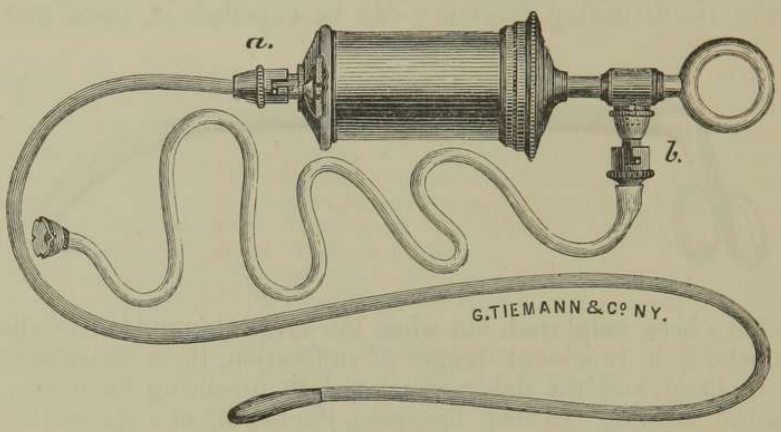
the instrument can be understood. The bristle or umbrella probang is also a serviceable instrument.

After the extraneous matter has been dislodged, the patient should gargle the throat frequently with a weak solution of arnica, and the same medicine should be administered internally.

Introduction of Tubes.—The successful passage of tubes, whether for the dilatation of stricture, or the introduction of the stomach-pump, must depend upon a knowledge of anatomy and dexterity in manipulation of the instrument. The stomach-tube should be twelve to eighteen inches in length, and should be well oiled. The patient then opening the mouth wide, with the head thrown backward, the surgeon should pass the tube directly backward to the fauces; when it touches the posterior wall of the pharynx it will, if of sufficient flexibility, be made to glide into the œsophagus and down into the stomach without difficulty. In cases of cancer of the pharynx and œsophagus, or in organic stricture, it may be necessary to inject food *into* the stomach; in cases of poisoning, the injection into the stomach of large quantities of water, and the withdrawal of the same without moving the instrument, is a great desideratum; for this purpose the stomach-pump is furnished with valves in the piston, which may be opened

and shut by turning the handle. The cut (Fig. 368) represents an improved pump, which possesses many advantages.

Fig. 368.



To *empty* the stomach use the instrument as represented in the cut.

To pump fluids *into the stomach* attach the catheter to the piston nozzle, *b*, and the soft tube to *a*.

Œsophagotomy.—It may be necessary when foreign bodies are lodged in the œsophagus to perform the operation of œsophagotomy, otherwise ulceration, perforation, and death may ensue.

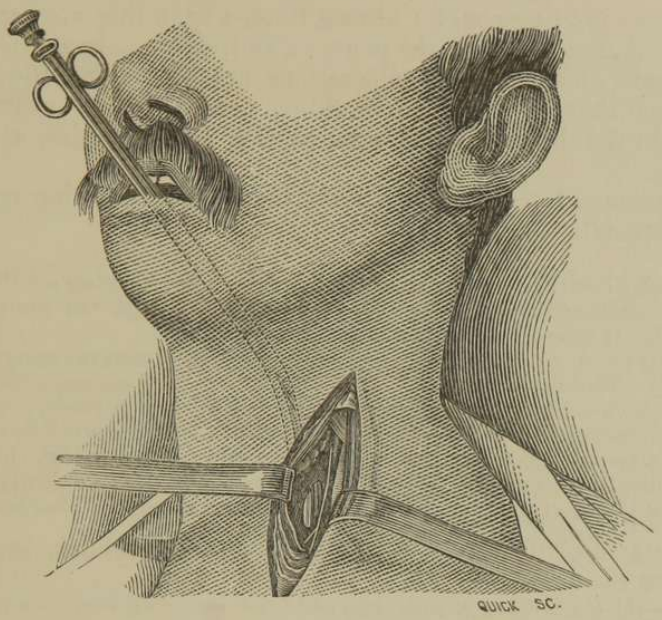
The operation is not so difficult as is generally supposed, and is often followed by most gratifying results. Of twenty-one cases performed for the removal of foreign bodies, seventeen were successful and four fatal. The operation is to be performed at either side of the neck, the point of selection being, if possible, determined by the presence of the foreign substance; if it be felt from the exterior, the incision should be made over it, the tube passing rather to the left than to the right side of the neck; the former situation might perhaps be most favorable. The head of the patient should be thrown back, and, taking the sterno-mastoid muscle as a guide, an incision four or five inches in length should be made through the integument and platysma myoides, in a line of the depression between the larynx and the sterno-mastoid, from a point near the upper border of the thyroid cartilage to near the sterno-clavicular articulation (see Fig. 369). The carotid sheath and the sterno-mastoid must be drawn outward with one retractor, and the larynx drawn inward by a second. By passing a canula into the mouth, and down to the foreign substance, a guide is made for the incision, which may be made from without, or, if the canula is armed with a trocar, it may be opened from within. The foreign body must then be brought away with the forceps. The wound should be allowed to heal, few sutures being used. For the first few days the patient must be fed through a tube passing beyond the wound.

Dr. Le Roy McLean, surgeon to the Troy Hospital, N. Y., reports* two cases of this operation, for the removal of gold and silver plates, with teeth attached, which had been accidentally swallowed. In the first case, chloroform having been administered, an incision was made on the left side of the neck, midway between the margin of the sterno-cleido-mastoid muscle and the thyroid cartilage, extending to within half an inch of the sternum.

* New York Medical Record, April 29th, 1876.

The parts containing the carotid were then separated from the trachea, and held aside by retractors, as was the left lobe of the thyroid body, after careful dissection. The inferior thyroid artery having been exposed and

FIG. 369.



pushed aside, the œsophagus was plainly seen. A large-sized lithotomy staff was then passed through the mouth, it being more easily introduced than a stomach-tube, and the œsophagus pushed well forward and to the left. This served as a guide, and held the œsophagus in position, rendering the incision into it less difficult than it otherwise would have been, owing to the spasmodic efforts of swallowing, which were very frequent after the administration of the anæsthetic. The incision was made longitudinally from the staff to the side of the cricoid cartilage, and the plate removed by the finger with some difficulty. Forty-eight hours after the operation the patient swallowed fluids readily, and 18 days later the wound had closed, and he resumed his business. After this, the voice, which had been faint and husky since the accident, gradually grew stronger, until it about reached its natural standard. In the second case, the difficulty of swallowing being felt only at intervals, and the patient suffering no essential inconvenience, the teeth were for some time supposed to have passed into the stomach, and the operation was not determined upon until eleven months from the date of the accident. It was then performed in the same manner as just described, the incision being made as near the top of the sternum as possible. The silver plate was grasped and brought up by forceps, but the teeth becoming detached, passed into the stomach, and were voided by the rectum. Thirty-two hours after the operation the patient drank half a pint of coffee without losing a drop, and his recovery was rapid and complete. The voice suffered no injury.

SURGICAL AFFECTIONS OF THE LARYNX AND TRACHEA.

Syphilitic Laryngitis.—This affection is very common, and oftentimes very intractable. The use of the laryngoscope has much facilitated the

diagnosis of the different forms of secondary syphilitic disease which are found in the larynx, and which, before the use of the instrument, were very much involved in obscurity. The more simple form of disease is that of erythema, in which slightly elevated mucous patches are seen of a dark reddish hue, accompanied by dryness of the fauces, hoarseness, and sometimes, a slight tickling cough; after a time, a syphilitic ulceration results, which extends frequently to the pharynx and throat. In the tertiary form of the disease, elevations and ulcerations are discovered throughout the mucous membrane, the former resembling condylomatous growths. They also occur in the shape of submucous patches and tubercles, which readily ulcerate.

In the treatment of erythema of the larynx the following remedies will be found especially indicated:

Aurum.—Unhealthy-looking ulcers in the throat, discharging a fetid pus; swelling of the fauces, which are sometimes covered with large red pimples. It will prove valuable if mercurial symptoms are present.

Arsen. is the remedy when the ulcers show a tendency towards gangrene, with an offensive, corroding discharge.

Kali iod. is called for in scrofulous subjects. Ulcers form readily, which are the seat of sharp lancinating pains, with a discharge of burning corrosive serum. This medicine is also particularly useful in cases of mercurial poisoning.

Mercurius will be indicated when the ulcers are small, bleed easily, and are accompanied with a purulent, fetid discharge. Also, when the characteristic pains produced by this drug are present.

Nitric acid.—The ulcers are small, round, bleed easily, with sharp, piercing pains, as from a splinter.

Sulphur.—If the patient is unhealthy, and the foregoing remedies fail to effect a perfect cure, this medicine will often hasten the recovery.

Mucous tubercles will most readily yield to argent. nit., calc., nit. ac., puls., or thuja. If the disease extend into the nose, favorable results will follow the use of argent. nit., aurum, kali c., creasot., lycop., merc. corr., nit. ac., phos. ac., puls., rhus, sepia, staph. and thuja. For *deepseated* tubercles administer arsen., carbo veg., natrum mur. and zincum.

For further treatment the student is referred to the Chapter on "Syphilis," pp. 180–187.

Foreign Bodies in the Larynx and Trachea.—Although the presence of foreign bodies in the air-passages is always to be regarded as a very serious occurrence, it is astonishing what a length of time a foreign substance may be impacted in the larynx, and the patient be even unaware of its presence, attributing the symptoms presenting to some other cause. Both Gross and Hamilton record cases of this description, and many others are upon record. In my own practice I have seen several examples of this kind. In one case, a subject to epilepsy, accidentally swallowed, during a convulsion, a plate, to which were attached two artificial teeth. He supposed he had lost them, and was shortly after seized with cough, which continued with profuse expectoration for many months, accompanied with nightsweats, emaciation, and hectic. He was seen by some of the most distinguished stethoscopists, who pronounced the case one of laryngeal phthisis. (This was before the days of laryngoscopy.) He was regarded as incurable. Upon one occasion, when a procession was passing the house, he was supported at the window; in attempting to cheer some friends whom he recognized, he was seized with a fit of coughing, and the foreign substance was expelled. The patient made a good recovery.

In another case, a child swallowed a bone button, and, with the exception of occasional attacks of dyspnœa, suffered nothing for three years,

when the button was expelled. Quite a number of such cases, in which the offending substance was removed without resorting to artificial means, are upon record.

Goodall, of Dublin, pointed out the fact that foreign bodies were more likely to lodge in the right bronchus than in the left, owing to the large size of that tube. The symptoms of foreign bodies, are those of stenosis of the air-passages, and at times there is a great deal of difficulty in diagnosing, whether these manifestations are those of disease or mechanical obstruction. There is a violent, abrupt convulsive cough, coming in paroxysms, accompanied with blueness of the face and stridulous breathing. The cough remits and recurs often upon the slightest exertion. The voice is altered, sometimes being entirely gone and at others only impaired. It must be remembered here, that death may occur, not alone from the presence of the foreign substance, but from spasm of the glottis induced by its presence. If the surgeon is unable to determine whether the foreign body is in the larynx or pharynx, the patient should be made to swallow; if the obstruction is in the latter, there will be difficulty, and *vice versa*.

Treatment.—The first thing to be done when called to see a case in which a foreign substance has become lodged in the air-passages, is to raise the patient by the heels and slap him upon the back, giving him an occasional shake. It must be borne in mind that this procedure may have a tendency to shut the glottis, and, therefore, the surgeon must be prepared for such an emergency. In general, however, it is necessary to perform *bronchotomy*.

Bronchotomy.—*Bronchotomy* is a general term applied to the operation of opening the windpipe, and includes three individual operations, known as *laryngotomy*, *tracheotomy*, and *laryngo-tracheotomy*, and which derive their names from the parts involved in the procedure. The object of either of these measures is to admit the passage of air into the lungs when some obstruction exists, or to remove some foreign body or morbid growth from within the air-passages. The conditions which render one of the above operations advisable, are *foreign bodies in the air-passages*, *acute* or *chronic laryngitis*, *œdema glottidis*, *polypi*, *tonsillitis*, *abscess of tonsils* or *pharynx*, *aneurism of the carotid artery*, and *membranous croup*. Sometimes a mass of food may become impacted in the œsophagus, and by its pressure on the trachea so obstruct respiration that an operation becomes necessary; and the same thing may be called for occasionally in *suspended animation*.

Laryngotomy is an operation by no means difficult, and is rarely demanded, except in adults when some obstruction exists above the rima glottidis. Place the patient upon the back with the head thrown backward, and the shoulders elevated; make an incision in the median line from the top of the thyroid cartilage to the base of the cricoid, dividing successively the integument and superficial fascia. The only important vessel likely to suffer is the crico-thyroid artery, which may be controlled by torsion or the ligature. It only remains to divide the crico-thyroid membrane in the line of the wound already made.

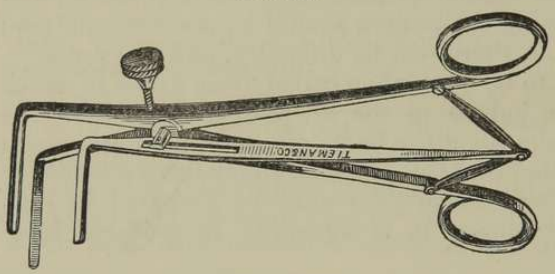
Tracheotomy.—According to Dr. Charles A. Leale,* tracheotomy was *first* successfully performed in 1782 by Dr. John Andree, of London. In 1825 Bretonneau was successful, and in 1832 Trousseau followed his example. Voss has collected 1249 cases with 249 recoveries.

According to the statistics published by Sanne in 1877, and presented by Dr. John C. Peters† to the New York Academy of Medicine, in March of the same year, in 2290 cases there were 516 recoveries.

* Medical Record, March 24th, 1877. † Loc. cit.

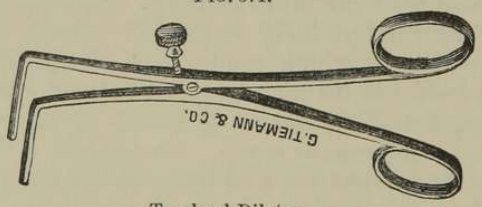
Although the above operation is simple, the difficulties attending the performance of *tracheotomy* are sufficient to warrant the utmost coolness and caution. It may be necessary to work rapidly, but hurried movements may cause most unfortunate complications. Tracheotomy in children is especially troublesome, on account of the short thick necks, and the cries and struggles by which they resist any manipulations; for this reason, an anæsthetic should be administered whenever practicable. The incision begins immediately below the cricoid cartilage, and extends for two or two and a half inches along the median line towards the top of the sternum. With the handle of the scalpel, the sterno-hyoid and sterno-thyroid muscles of each side are separated and held apart by blunt hooks; the plexus of thyroid veins are then brought to view, and drawn aside by a retractor. The left index finger serves as a very excellent guide, and should be kept constantly in the wound until the rings of the trachea are felt. When this point has been reached, the trachea may be opened by entering the knife at right angles to the plane of the wound, cutting upward in the line of the incision. Care must be taken to avoid wounding the isthmus of the thyroid gland, but if this accident should occur, the hæmorrhage is to be controlled by ligatures. The tracheal incision should be at least one inch in length, and is at once indicated by a rush of air, blood and mucus.

Fig. 370.



Tracheal Dilator.

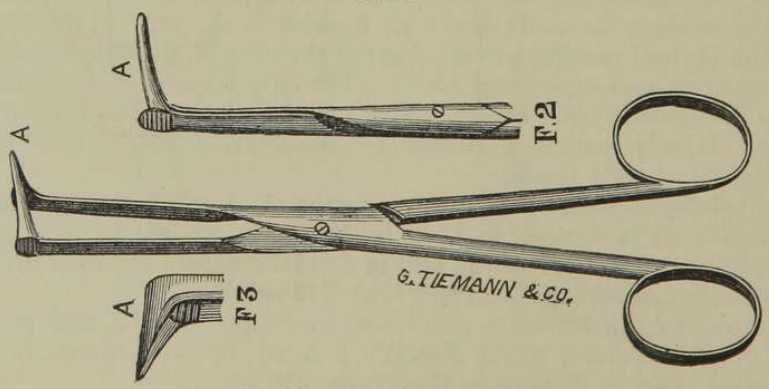
Fig. 371.



Tracheal Dilator.

As soon as the rings of the trachea are opened, a dilator, either as seen in Fig. 370, or in Fig. 371, should be introduced into the wound, and the handles opened until the trachea is sufficiently dilated to admit the tubes. Fig. 372 shows the tracheal dilator of Chassaignac.

Fig. 372.



Chassaignac's Tracheal Dilator.

Through this opening the canula (Fig. 373) with its pilot, is introduced

and confined there by tapes passing around the nape of the neck (*vide* Fig. 374). If a foreign body is the object of offence, the opening may be dilated

FIG. 373.

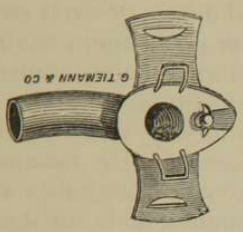
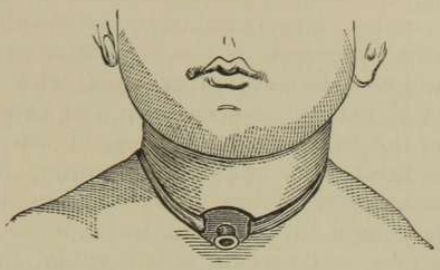
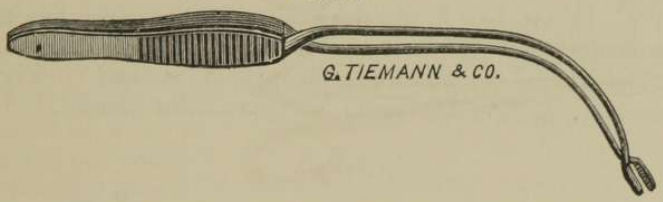


FIG. 374.



by retractors, when the body will generally be expelled, or may be sought after by the forceps (*vide* Fig. 375).

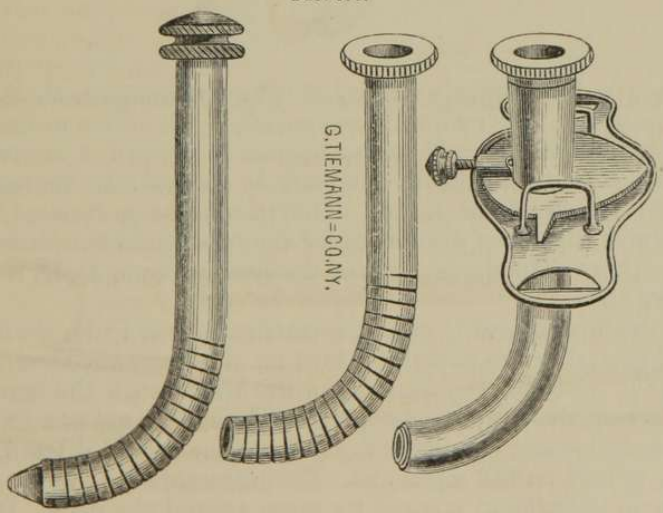
FIG. 375.



Forceps for extracting Foreign Bodies through the Canula.

Mr. Stohlmann has modified the double tube of Mr. Durham, of England. The instrument has an outer tube with a sliding portion which works in a collar and is fixed by a screw. This allows the tube to be either shortened or lengthened in accordance with the depth of the trachea. The inside tube is flexible, and is furnished with a blunt "pilot," which also bends. When the tube is entered, the "pilot" is withdrawn and the inner tube inserted in its place (*vide* Fig. 376).

FIG. 376.



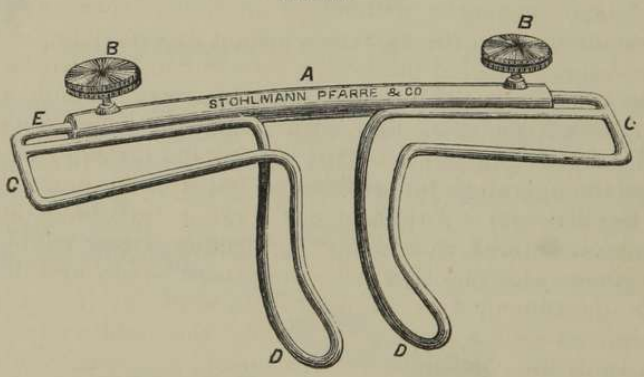
Dr. I. T. Talbot, of Boston, has performed the operation of tracheotomy many times, and thus expresses himself to me on the subject:

"My first successful case of tracheotomy was that of a lad of 5 years of age,

almost *in extremis*. The operation was performed in June, 1855. This, so far as I know, was the first successful case in this country. I have since performed the operation 41 times (42 in all), and always in cases past hope from other means. Of these, 15 have recovered. In almost every case relief was obtained, but in many cases bronchitis supervened and caused death. I early resorted to moist coverings to the tube and the generation of steam in the room; but of late I have filled the room with steam, and raised the temperature to 80° F. before the operation, and kept the atmosphere around the child in that condition until all danger is past. In this way my cases have done better, the last five having recovered. When we consider the condition of the respiration before the operation, how the air, in passing so slowly through the mouth, larynx, and trachea to the bronchia, must reach almost blood-heat, while when the operation is performed in an ordinary room, on opening the trachea the air rushes in and fills the lungs untempered, at about 30° lower temperature, and very dry also, it is not strange that capillary bronchitis follows, nor that the heat and steam should in a measure prevent this.

Dr. John C. Minor has lately devised a substitute for the tracheotomy tube, which is designed "*to hold open a wound in the trachea so that the air can pass in and out of the windpipe through the wound.*" Fig. 377 represents the instrument, with Dr. Minor's explanation thereof.

Fig. 377.



"A hollow rod, A, slightly curved, and having a screw, B, B, set at each extremity, supports the two wire retractors, C, C. The retractors are of stout German silver wire, and are so bent as to present a supporting arm, E, which is received into the hollow rod, A, and can be fastened there at any point by a turn of the screw. The transverse portions, C, of the retractors furnish a point of appliance for the tapes used to secure the instrument in position. The descending or tracheal portion, D, D, is curved like the ordinary tube.

"When this instrument is used, the tracheal arms, D, D, are first brought close together and fastened so by a turn on the screws. Then they are inserted into the wound and passed down the trachea till the transverse portion, C, C, arrests their further progress. The screws are now to be loosened —it is better to loosen only one of them—and the wound dilated sufficiently by drawing gently on the retractors. The retractors are now to be fastened and the whole instrument secured by tapes around the neck. But one caution is necessary,—never open the trachea until the hæmorrhage from the previous incision has ceased.

"Each instrument has three pairs of retractors of different sizes, and the

material from which they are constructed, while stiff enough to accomplish the object desired without bending, is, at the same time, easily bent with forceps to any curve or angle desired."

Laryngo-tracheotomy, a combination of the two operations already described, is performed when the division of the crico-thyroid membrane does not afford an opening sufficiently large to accomplish the result desired. It is readily performed by dividing the balance of the cricoid cartilage with two or three of the upper rings of the trachea. The only attendant danger consists in wounding the isthmus of the thyroid gland and the superior thyroid artery.

After these operations, the air of the room should be kept moist and warm, the wound cleaned, the tube freed of mucus, and a piece of muslin should be worn over the orifice to prevent the inhalation of foreign bodies. In the case of infants it will be found exceedingly difficult to make an opening sufficiently large below the thyroid isthmus; in which case the incision may be made immediately below the cricoid ring, and even this may be divided if more space is required.

Dr. Smith, of Bristol, Penn., has recently introduced to the profession a new method of operating for tracheotomy with new instruments. He holds that by the employment of the means he recommends the hæmorrhage is much less, and that the union of the wound is no way impeded; he says: "In the course of a series of experiments on respiration, performed some time since, I had occasion very frequently to perform tracheotomy on animals, and being generally without an assistant, experienced much delay and embarrassment from the extreme caution necessary to prevent troublesome hæmorrhage. This led me to seek for some instrument for the division of the tissues between the skin and the trachea, which should be safer than a knife, and more expeditious and certain than the fingers or the handle of the scalpel. Accordingly I had two instruments made, resembling the hook used in the operation for strabismus, but stronger and somewhat more pointed at the extremity. Taking one of these in each hand, and operating something as one would with dissecting-needles, I was enabled to divide one layer of tissue after another with the utmost safety and dispatch. The points of the instrument were so blunt as to render it almost impossible to penetrate the coats of a vessel, and hence the liability to hæmorrhage, which constitutes the chief danger in this operation, was avoided. Indeed, I have often opened the trachea almost without shedding a drop of blood, except that from the skin and from the trachea itself. In an operation recently performed upon a child by the aid of these instruments, I did not find it necessary to employ a sponge during the whole operation."

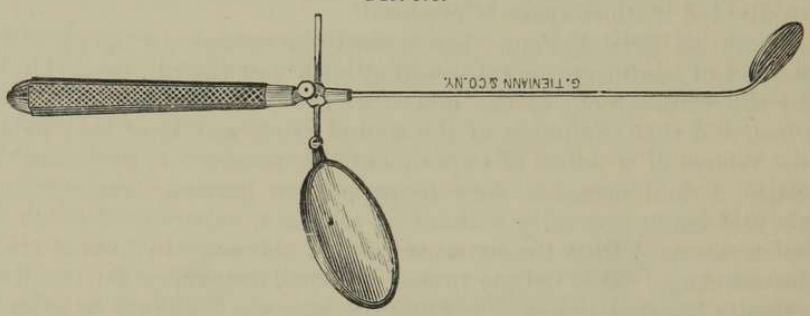
Tracheotomy with Thermo-cautery.*—The platinum knife of the thermo-cautery, at a dull red heat, is made, 1st, to slowly incise the skin and superficial fascia from above downwards, by one stroke in the median line of the neck, beginning immediately below the lower border of the cricoid cartilage; 2d, to pass slowly, as before, through the intermuscular tissue down to the trachea by a single stroke; and, 3d, the point of the knife is made to pass perpendicularly into the trachea, and the incision rapidly enlarged, and the knife withdrawn as quickly as possible. The operation requires but a minute, is attended by no hæmorrhage, and can be performed without assistance. The thermo-cautery of Paquelin was employed by MM. Poinsot and Mauriac, who have operated with success by this method.

* Monthly Abstract of Medical Science, January, 1878; London Medical Record, March 15th, 1877; Gazette Médicale de Bordeaux, Sept. 20th, 1876.

Laryngoscopy.—In 1827, Senn, of Geneva, endeavored, by means of a small mirror introduced into the mouth, to examine the larynx. In 1829, B. C. Babbington introduced the glottiscope. In 1837, M. Sellique made for Trousseau an instrument for the same purpose. In 1838, Baumes, of Lyons, invented a laryngeal speculum. Liston, in 1840, conceived the idea of examining the larynx with a small mirror in the fauces. In 1844, Warden used artificial light and a prism. Avery, in 1854, is said to have constructed a laryngoscope, but did not publish much concerning it. Garcia, in 1855, conceived the simplest method of auto-laryngoscopy, viz., standing with his back to the sun with a small mirror in the fauces. Dr. Ludwig Türck was the next to follow in the construction of the instrument, and in 1858, Czermak pursued in a great measure the suggestions of Türck and Tobold.

In Türck's laryngoscope the mirror was fitted to the forehead and supported by a spring.

FIG. 378.



Tiemann has invented an excellent mirror for the head, which may be used for any illuminating purpose.

FIG. 379.

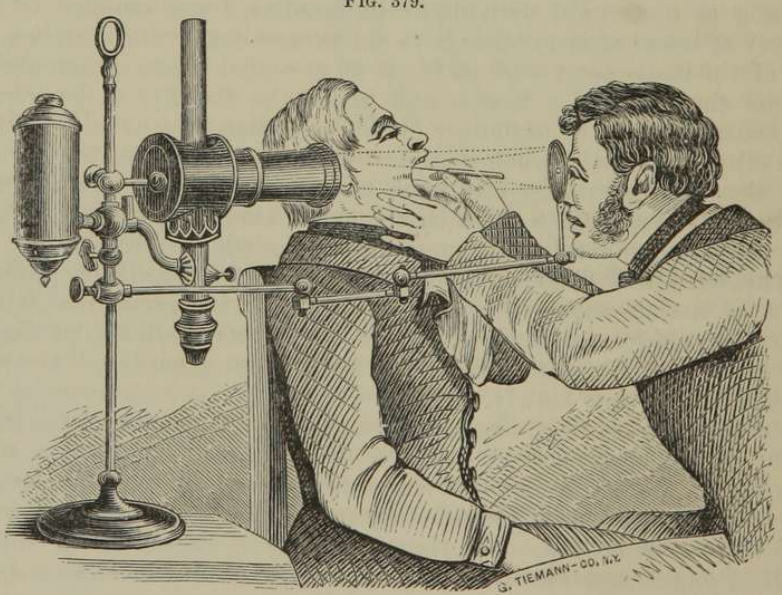


Fig. 378 represents Elsberg's pocket laryngoscope; and Fig. 379 represents the position of the patient and examiner, with illumination adapted to Tobold's.

As seen in the figure 379, the operator is seated in front of the patient who sits directly to one side and behind the instrument; the tongue is projected from the mouth and held down by a small napkin; the mirror is then thoroughly cleaned and warmed over the light. The patient opens his mouth and is requested to say "Ah!" and prolong the sound. This raises the *velum pendulum palati*, and the mirror, with a rapid though gentle movement, is placed face downwards in the fauces, holding up in a measure the palate. There must be no wavering or uncertainty in the introduction of the mirror, otherwise there may be gagging or even vomiting.

The laryngoscope, like the ophthalmoscope, has greatly facilitated the diagnosis of most laryngeal affections and insures greater certainty in the performance of surgical operations. The great point now to be established is to ascertain what medicines are homœopathic to the varied abnormal conditions, and to render unnecessary so much local treatment, to which, I am persuaded, too many laryngoscopists direct their entire attention.

Neoplasms.—There are several varieties of new growths which are found in the larynx; indeed, since the introduction of the laryngoscope, they are discovered to be much more frequent than was formerly supposed. It is asserted by some, that two per cent. of all the diseases of the larynx are local in their nature, and consist of marked growths; of these growths, in 244 cases, there were of the warty, 110; of the fibrous, 23; of the sarcomatous, 52; adenomatous, 6; cystic, 14; cartilaginous, 4; epithelioma, 19; not clearly indicated, 16. Of these, 158 were recognized during life, and 86 after death.*

Whatever be the nature of the growth in the larynx, the symptoms are much the same. There is always more or less dyspnœa caused from the size of the growth obstructing the windpipe, or from the pressure upon the laryngeal nerves; the voice becomes husky, hoarse, or even extinct; or, in some instances, there may be only spasmodic difficulty of breathing, at times the patient being perfectly well. A growth may exist for a long time in the air-passages without the patient being aware of its presence; indeed, as will be seen by referring to the figures above, many growths are not recognized during life, and are only discovered after death. Growths in the upper part of the air-passages may cause dangerous symptoms, and even death by spasm of the glottis or œdema-glottidis. In general it is found, that inspiration is more difficult than expiration, excepting perhaps in those cases in which the growth is low down, when both the acts are performed with difficulty. The cough is slight in some cases, in others more severe, and is accompanied with slight mucous or muco-purulent expectoration.

Many of the symptoms which are present from foreign bodies resemble so closely those of spasmus and œdema glottidis, or the pressure of tumors, that before the introduction of the laryngoscope great difficulty of diagnosis obtained; however, since the era of reflected light in surgery, a new age has dawned upon diseases of the larynx.

The *warty growths* generally arise from the mucous membrane of the upper part of the larynx, and often are multiple; they resemble a cauliflower in shape and are in some instances pedunculated. Sometimes portions are detached and expectorated, while at others, the growth is so rapid as to demand tracheotomy.

Polypi.—The fibro-cellular growths are round, oval, and generally pedunculated; they are solitary and partake of the nature of these tumors in other parts of the body. The symptoms are those already described.

* Holmes's System of Surgery, vol. iv, p. 575.

Adenoid Growths.—The color of this peculiar variety of abnormal formations, when examined by the laryngoscope, is at first reddish, but as they grow it becomes of a paler hue. They change more rapidly than any other of the laryngeal growths, an attack of ordinary catarrh or catarrhal laryngitis causing most rapid enlargement. When these growths are sessile, they cover quite a large extent of surface, and are lobulated. They are generally found at the base of the epiglottis, or growing from the mucous membrane, covering the arytenoid cartilages.

Cystic tumors and, indeed, *osseous growths*, together with *carcinoma*, sometimes occur in the larynx, all demanding the use of the laryngoscope.

Treatment.—I have not had much experience in the treatment of growths in the larynx, and but little with the laryngoscope, and as the use of the instrument and the treatment of those diseases which it has taught us to detect and relieve, is becoming a specialty, it is probable that ere long some member of our school will publish a full description of laryngeal affections and their treatment.

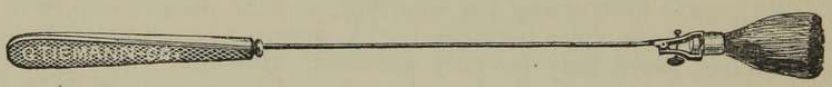
For the warty growths, I should unhesitatingly recommend, thuja, calc., sepia, lyc., or sulphur; according to the symptoms.

For the glandular, one of the different preparations of mercury, or perhaps kali iod., nit. acid, lachesis, kali bromat., calcarea, or silicea.

For the *cancerous*, those medicines which are already mentioned in the Chapter upon the Treatment of Malignant Tumors.

The *surgical treatment* varies very considerably. It may be deemed necessary, especially if the growth is large, to perform tracheotomy (*vide* page 705) before proceeding to remove the tumor, which may be done in

FIG. 380.



Seeger's Brush-holder with Flexible Stem.

one of two ways, viz., either through the natural passages by the aid of the laryngoscope, or by incisions from without. In the first method, which

FIG. 381.

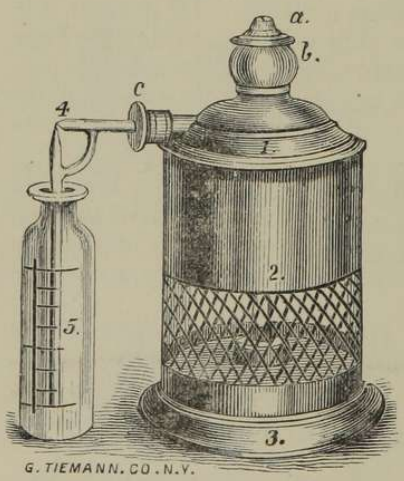
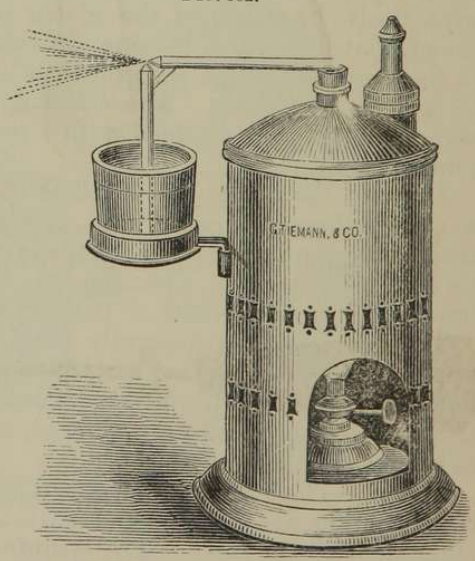


FIG. 382.



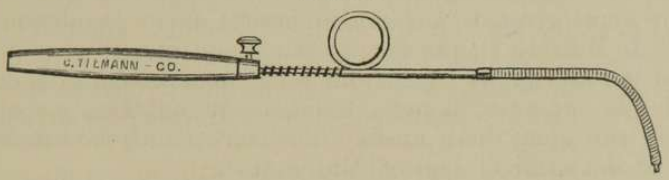
is generally preferred, the patient is seated and examined by the laryngoscope, and if caustics are to be used, the brush, as seen in Fig. 380,

applied to the parts, to thoroughly cleanse them; after this it may be desirable, in the estimation of some, to apply medicines directly to the parts by means of the atomizer.

Figs. 381–2 show the workings of the instruments. In Fig. 381 the medicated substance is placed in the graded bottle; in Fig. 382 it is placed in the cup. The chief substances inhaled are aqua picea mixed with alumina, or amm. mur., or zinci sulphat. Zincum iodium, acid tannic, and hydrarg. bichlor., have also been used. These chiefly are, however, for affections of the larynx other than foreign growths.

To growths, the solid nitrate of silver, nitric and chromic acids, the Vienna paste, and the London paste, already described in the article on "Tonsillitis," have all been successfully applied. The application, however, of all these escharotics is dangerous, and they should only be used with the greatest caution, and a concealed caustic carrier, as seen in Fig. 383, must always be employed.

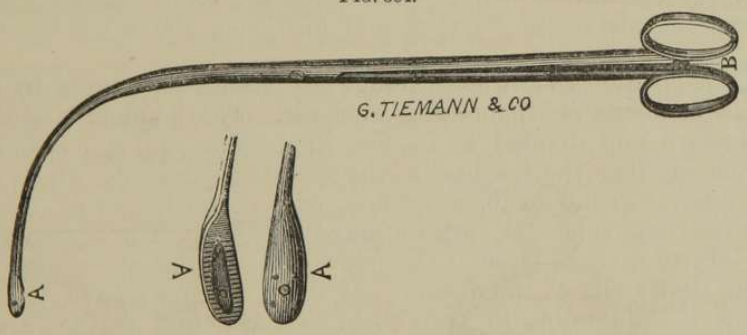
Fig. 383.



Dr. Füllgraff, of New York, reports very many successful cases of diseases and affections of the larynx cured by insufflation of different remedies. The doctor has constructed a set of tubes for his method, and thus applies directly to the part the medicine indicated.

In removing neoplasms with the forceps, it is often necessary to repeat

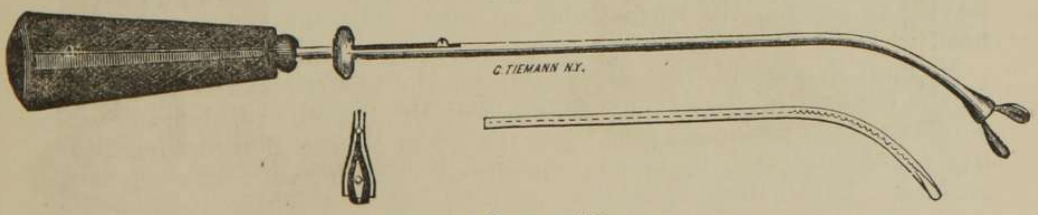
Fig. 384.



Fauvel's Laryngeal Polypus Forceps.

the operation at several sittings. Of the forceps best adapted, those called the alligator forceps, a cut of which is seen at page 701, are perhaps the best.

Fig. 385.



Tiemann's Laryngeal Scoop.

Fig. 384 shows Fauvel's laryngeal forceps, and Fig. 385 illustrates Tiemann's laryngeal scoop.

The knife is sometimes preferred to the forceps; in such cases that of Semelder, properly curved, is the best. The growth must be carefully raised before the knife is used.

The snare, and a laryngeal écraseur, the former resembling the aural or nasal polypi snare, the latter made to work with twisted annealed wire, have also been used.

Again, the *galvano-caustic* treatment is now rapidly gaining favor. I have no experience in it whatsoever, but should not hesitate to give it a trial as one of the best and safest methods.

In *using incisions from without* the cut must be in the mesian line, and the cavity of the larynx laid open, and the growth removed with the galvano-caustic wire or the écraseur. This would certainly be the best method. In these operations the cricoid cartilage should, if possible, be left intact.

Extirpation of the Larynx.—According to Paul Berger,* it was Koeberlé who made the first suggestions toward the removal or extirpation of the larynx. This was about 1856. In 1870, by experiments performed on dogs, Czerny demonstrated that the operation could be successfully performed; but to Billroth is due the credit of having made the first success. He removed the larynx, in 1873, from a patient affected with cancer; the wound healed in two months, and the patient was enabled to speak, though in monotone, with great distinctness. The contrivance for articulation has since received the name of Gussenbauer's tube.

Throughout the medical periodicals, since Billroth's exploit, there are quite a number of records of operations of this character.

The incisions must vary somewhat in accordance with the disease, but the point to be observed, is to prevent foreign matters (blood, pus, or other discharges) from entering the air-tubes. The incision should extend from the lower border of the hyoid bone to a point about an inch below the centre of the cricoid. Then, the soft parts are to be carefully dissected away from the alæ of the thyroid, and also from the thyro-hyoid membrane.

Here, the operator should stop, secure any vessels that are bleeding, and wait a few moments for the oozing to cease. The trachea is then to be pulled forward and divided at its first ring. The next step is to prevent blood from entering the trachea, as the operation proceeds, which may be done by a silver or india-rubber syphon, or a cork with a tube through it, or whatever contrivance the surgeon may think best. The lower extremity of the larynx is thus freed. The remainder of the operation depends mainly on the extent of the disease. If the upper margins of the thyroid can be left, it is advisable to keep them in the wound, as they arch over the parts and prevent the collapse of the tissues. If, however, they are diseased, they should also be removed, and the arytenoid may answer the purpose, or even the cornua may assist in holding open the parts sufficiently.

After the disease has been thus extirpated, the upper end of the trachea must be securely fastened by wire or catgut to the surrounding tissues, and leaving in position the tracheotomy, or other tube, the wound allowed to heal.

M. Paul Berger† (*Lancet*, March 3d, 1877) in compiling the operations for the removal of the larynx, states that the operation of complete removal has been performed nine times—twice by Billroth and Maas, respectively, and once each by Heine, Schmidt, Schoënborn, Bottini, and Langenbeck. In all these cases the operation was undertaken for malignant

* Hayem's Révue des Sciences Medicales, t. ix, part 1, p. 298.

† American Journal of Medical Sciences, July, 1877, p. 258.

disease. Three of the cases were entirely successful; in three, a fatal result followed; another died of collapse on the sixth day, and two died from recurrence of the disease for which the operation was undertaken.

CHAPTER XXXVI.

INJURIES AND DISEASES OF THE THORAX.

Injuries of the Chest.—In wounds of the lungs, great danger is to be apprehended from inflammation, suppuration, or hæmorrhage. The patient generally experiences, when afflicted with such injury, great dyspnœa, with a sense of suffocation. Arterial blood, mixed occasionally with clots, is expectorated, or, if the wound be extensive, there may be profuse hæmorrhage from the mouth. Inflammation always supervenes, and unless the abnormal process be prevented, profuse suppuration, hectic, and debility result.

Treatment.—If the external opening be large and the lung protrude (*pneumocele*), it should be returned by gentle pressure, and retained within the cavity by means of bandages and compresses. It is very important that the latter be moistened with a solution of arnica, as by such application bleeding may be restrained, inflammation prevented, and the healing process advanced; the internal administration of the same medicine, perhaps in alternation with aconite, if the fever be intense, will materially assist in accomplishing the same favorable result.

If the intercostal artery has been wounded, it must be ligated, even though extension of the opening be necessary. If extraneous matter have lodged within the lung or surrounding textures, it should be gently removed, otherwise profuse suppuration may follow, and the patient be destroyed. Secondary hæmorrhage may be arrested by means of the internal administration of aconite, arnica, crocus, diadema, phosphorus, and, in some instances, bryonia; the latter particularly is applicable, when, together with the cough, there is expectoration of blood-streaked mucus, with stitching or sticking pains, especially when the pleura is also attacked by the inflammatory process. Phosphorus is an important medicine, when, after granulation has commenced, there is threatened inflammation of the parenchyma of the lung, with prostration, and dulness on percussion.

The external wound should be closed with lint, plaster, and bandage, the patient kept perfectly quiet in a well-ventilated apartment, and all causes of excitement studiously avoided.

In *simple contusion*, a bandage should be placed around the chest, arnica administered internally and externally, and inflammation of the contents of the thorax combated by those means already adverted to.

Hydrothorax.—By the term hydrothorax is understood an accumulation of fluid in the cavity of the chest; empyema may also be included in this definition; but generally by the latter term surgeons understand a collection of *pus* within the thorax. In this place hydrothorax is applied to an accumulation of serous fluid in one or both pleural cavities. In the incipient stage, the symptoms are very uncertain, and may be mistaken for those of affections of the lungs, heart, etc. There is transitory oppression of the chest, after exercise, talking or ascending an eminence, with increased

dyspnœa in the evening. This condition may pass away with expectoration or profuse sweat; but it is very liable to return, particularly in the warm season. The difficulty of breathing increases, the patient is unable to lie down on account of the gravitation of the fluid within the chest; there is palpitation of the heart, livid countenance, disturbed sleep, and dulness on percussion. If the effusion is on one side only, the patient lies most comfortably on that which is affected. The above symptoms are paroxysmal; in time, sopor and insensibility supervene. There is often cough, with extreme irritation of the chest. Where the percussion-sound is faint the respiratory murmur disappears; and when there is much effusion bronchial respiration is sometimes heard. The vibrations of the thorax when talking are feeble or entirely absent.

It is important that the practitioner should remember that the diaphragm, liver, and spleen are often forced downward into the abdominal cavity, presenting appearances very analogous to those observed in ascites.

Persons of advanced age, with weak lungs, occasioned by frequently returning catarrhs, are peculiarly liable to this affection. Malformations of the thorax, curvatures of the vertebral column, and deformities of the ribs and sternum, also engender the disease.

Treatment.—Ars. alb. is one of the principal medicines; it corresponds to many of the symptoms, particularly the dyspnœa and torturing feeling of suffocation. Other indications which call for its exhibition are the complete prostration of the patient and burning thirst, together with nocturnal exacerbations.

Ipecac, pulsatilla, and **ignatia,** may, also, in some cases, be called for. **Scilla** is an efficient medicine when there is constant cough, with expectoration and dyspnœa. When there are rheumatic and constrictive pains in the chest, palpitation of the heart, restlessness, and excessive anxiety, **carbo veg.** is indicated, particularly when the disease arises from excessive loss of animal fluids.

Lycopodium should be prescribed when, together with the dyspnœa, there is excessive palpitation of the heart, occurring principally after a meal, with cold feet. Hartmann* states that he has cured hydrothorax with am. carb., one dose every four days.

Other medicines are bry., china, colch., dig., hell., kali carb., spigelia, and sometimes stannum and dulcamara.

Frequently by the exhibition of these medicines the disease is arrested.

Empyema.—Empyema is a collection of pus within the cavity of the thorax; it may be the result of acute inflammation, whether traumatic or idiopathic. The symptoms are similar to those of hydrothorax.

Empyema may result from certain inflammatory conditions, from severe contusions, and as a sequel of certain diseases. In two of the worst cases that have come under my observation, one was caused by a severe fall down a hatchway, in which the patient not only suffered from the contusion, but fractured the surgical neck of the humerus; in the other the purulent effusion followed malignant diphtheria. With reference to the diagnosis between collections of pus and the ordinary effusions, there is always some difficulty, the history of the case and the constitutional symptoms being the most reliable signs. I cannot agree with Prof. Bacceli, who makes the extraordinary statement† that the denser the fluid, the less clear will be the sound of the voice. According to all physical laws, the contrary is the case, and wherever I have had an opportunity of putting the

* Chronic Diseases, vol. i, p. 194.

† American Journal of the Medical Sciences, July, 1876.

same to actual experiment, I have found that the sounds of the voice were much more clear in empyema.

Emphysema, or a collection of air within the pleura, may be caused by wounds of the lungs, fractures of the ribs, and penetrating wounds of the chest. According to Hastings,* "There is absence of respiratory murmur upon the affected side, where it is caused by wound of the lungs, with an exceedingly clear sound on percussion, with immobility of the ribs. On the sound side there is *puerile respiration*. When the injury is dependent upon the bursting of an abscess, a *metallic tinkling* is audible, and upon directing the patient to cough, a drop of fluid falls from the orifice in the lung, and drops to the bottom of the chest with this peculiar sound; or if the chest be shaken, the fluid can be heard to splash."

Aspiration of the Thorax.—The most practical divisions of effusions into the thorax are: 1st. Those resulting from acute diseases; 2d. Those from chronic diseases; and 3d. Consisting of pus accumulations. In the first variety the effusions should, in the majority of cases, be left to nature, though there may occasionally happen cases of such severity and so imminent in danger that it may be necessary to withdraw the effused material. In the second varieties, where the fluid is gradually and steadily poured out, the danger is much greater. In empyema, there should be free drainages, not always, however, with the expectation of a radical cure (although such may take place), but for the sake of relieving the patient of distressing symptoms, and of prolonging life. I recollect preserving a patient for over three years in tolerable comfort, by repeated aspirations, and in another of giving immediate relief to most aggravated suffering. In the former case, aspiration was performed twenty-three times.

Dr. Goodheart,† of Guy's Hospital, has analyzed 350 cases of pleuritic effusions, and the results are in the main unfavorable to operation for the removal of the ordinary acute forms of the disease. For the removal of pus, the results also are not encouraging, so far as cure is concerned. In 26 cases not operated upon for the ordinary forms of effusion, there were 15 recoveries, and in 51 cases operated upon, 28 recovered and 23 died.

Dr. Wilson Fox, who has collected 15,000 cases, finds the mean mortality to be from 10 to 17 per cent. In pleurisy the ratio is greater after paracentesis. In empyema the results are sometimes encouraging, but on the whole they are not such as will lead us to expect much save temporary amelioration from the operation.

In aspiration some surgeons prefer the spaces between the seventh, eighth, or ninth ribs in which to introduce the needle. From my own experience I think I may state that it may be introduced at the spot where the fluctuation is most distinct, either on the anterior or posterior walls, high up, or low down. I have entered the needle at very many sites, and never, but in a single case, was there any untoward symptoms, and in that instance the symptoms though instantaneous and severe, lasted but a short time. The precaution of using the trocar aspiratory needle, which conceals the point after its introduction, should always be taken.

Thoracentesis.—To evacuate the fluid, the operation of thoracentesis may be preferred, and is thus performed: An incision into the chest is made, with a knife, and a canula passed into the opening; or a trocar may be thrust directly into the cavity, the stilet withdrawn, and the canula, to which an india-rubber tube is attached, the end of which tube should rest in a basin containing water, allowed to remain. In this operation care

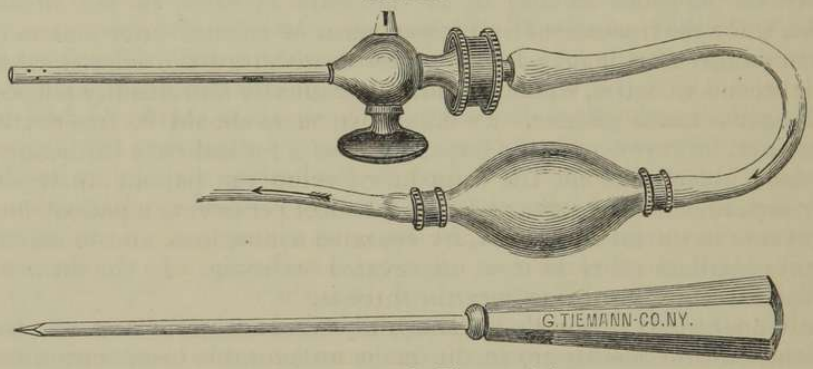
* Practice of Surgery, p. 248.

† British Medical Journal, Nov. 4th and Dec. 18th, 1877.

should be taken while passing the instrument within the cavity, that the lung be not irritated, else troublesome cough will be the consequence; the part selected for the operation should be as dependent as possible, and the patient placed with the face up, and the head and shoulders thrown back. Whichever method of operation is resorted to, the instrument should be made to pass in close proximity with the superior edge of the sixth or seventh rib, to avoid wounding the intercostal artery, which courses along the inferior margin of the bone. The opening should be valvular, in order to prevent the passage of air into the cavity; this can readily be effected by drawing tense the integument over the place of entrance; it will be found that when the instrument is withdrawn, the skin will roll over the aperture, thus forming an integumental valve.

The operation of thoracentesis is now much facilitated by the construction of instruments for the purpose. Fig. 386 shows Flint's apparatus for

FIG. 386.



Flint's Apparatus for Thoracentesis.

thoracentesis. Dr. Flint prefers the posterior portion of the chest, between the eighth and ninth ribs, for the introduction of the trocar, which is plunged into the intercostal space, withdrawn, and the tube attached. The stop-cock is to be turned while the attachment is being made; by using the hand-ball, the fluid is withdrawn.

Puncture of the Pericardium.—I have performed this operation several times with the greatest relief to the patient, in one case several times, and without any bad results. In all the cases, however, the patients succumbed to the disease, but the aspirator was a boon to them during the time they survived.

The student must remember in the performance of this operation, that the internal mammary artery runs perpendicularly behind the cartilages of the ribs about an inch and a half from the sternum. The apex of the heart can be found by marking a point about two inches below the left nipple, and about an inch towards the sternum. This point will be between the fifth and sixth ribs, at which space the bulging will generally be found. The needle should be a fine one and cautiously introduced.

Dr. Villeneuve, in the *Archives Méd. Belges*,* reports the case of a child five years old, who suffered from pericarditis with effusion, the trouble dating from a fall two months before. The symptoms becoming very alarming, and medical treatment affording no prospect of success, the tumor was punctured at its most prominent part by a Dieulafoy's aspirator, and two syringefuls of clear yellowish fluid were withdrawn. The result

* Journ. de Méd., Aug. 1875; New York Medical Record, June 8th, 1876.

was very marked relief. The wound continued open and discharging for six months. The discharge was at first clear, and afterwards became purulent. The fistula finally healed, and recovery was complete.

Apnœa from Drowning.—As soon as the body of a person who has been submerged for a length of time in water, has been recovered, the face should be turned downward, the mouth opened, and the water be allowed to drain away for a moment; then the finger should be pushed backward toward the fauces, and the effort be made to allow further escape of the fluid; the tongue may be drawn forward to favor the same result. The clothing must then be removed, the patient placed in a warm bed, and frictions to the entire body be kept up with the hands of several persons. Flannels should be wrung out of warm water and placed on those portions of the body that are not being rubbed. During this time if there are no signs of life, artificial respiration may be resorted to. There are two methods of performing artificial respiration, one known as Marshall Hall's, the other as Sylvester's.

Hall's Ready Method.—The patient is to be placed prone on the face, pressure with both hands is then gently made on the back; the body is then turned on the side, and then turned on the face again, and pressure made on the back. This manœuvre must be made about sixteen times in a minute.

Sylvester's method, which I regard as preferable, is as follows: The patient is laid on the back, or what is better, on an inclined plane; the tongue is drawn forward and the operator, standing at the head of the patient, flexes the forearms on the arm, and brings the elbows over the front of the body until they meet in front of the chest. Then the arms are rapidly drawn away from the sides of the body and upward until they meet over the head. It is by this means, expansion of the chest takes place by the pectoral muscles being drawn out, a vacuum is created, and a species of inspiration produced. The arms are then made to retrace the curve they have already taken, and again are forced to meet at the epigastrium. This motion should be made for at least fifteen minutes, at the rate of sixteen times to the minute. Each movement should thus occupy about four seconds.

Apnœa from Hanging.—A person may be suspended by the neck for five minutes and be resuscitated, provided no injury has been inflicted upon the spinal cord. Death, however, may occur almost immediately from dislocation or fracture of the first or second vertebra, causing concussion and pressure on the cord; or again, in other instances, the constriction of the jugulars may give rise to apoplexy. The patient must be immediately cut down, and frictions made to the extremities, ammonia applied to the nostrils and artificial respiration (as already directed), made for a considerable time.

Mammary Lymphangitis, although most frequently occurring in females who are nursing, may also be present in women who have never been pregnant; indeed, by some writers, we are informed that men have been affected with the disease.

A patient about to suffer from this disease, experiences for a day or two before the local inflammation manifests itself, general lassitude, restlessness, and uneasiness, together with slight soreness of the gland. Afterwards, there may be coldness of the body and shiverings; the mamma becomes enlarged, heavy, painful, and may assume a redness all over its surface, or the tint may be deeper in some parts than in others. If the glandular portion be most affected, the breast appears, when handled, to be lobulated and hard; but if the skin and cellular tissue are the seat of the disease, the

tenseness is uniform throughout. As inflammatory action proceeds, the pain becomes throbbing, extends to the axilla, and is often intense, and the patient is unable to bear the slightest pressure upon the part, even the contact of clothing aggravating the suffering. The disease is most common about two or three months after delivery, or during the weaning period, when a large quantity of milk, by distending the breasts and obstructing the lymphatic channels, gives rise to the inflammatory process which terminates in the formation of pus, thus forming *mammary abscess*. It is said that when the inflammation is confined to the integument, suppuration follows more speedily than when the true glandular substance is affected. After the symptoms have continued for four or five days, unless the progress of the inflammation has been arrested, suppuration may be expected; but there are cases in which the inflammatory process proceeds so slowly that pus is not formed for a much longer period, during which time the patient becomes much exhausted by loss of rest, excessive pain, and the accompanying fever.

The most common causes of this variety of abscess are, suppression of milk from various causes, a current of air upon the breasts, an accumulation of milk through some fault in suckling the child, or from weaning, external injuries, or stimulants which are too frequently allowed to nurses or mothers suckling their children.

There is also a somewhat peculiar abscess of the mammary gland, noticed particularly by Mr. Hey. The inflammation is very deep-seated, the process tedious, and when suppuration has supervened and the matter has extended towards the surface, it is discharged through several openings, which become fistulous, and when these sinuses are opened, a soft, purple fungus is discovered beneath them; the surrounding parts of the gland are hard and lobulated.

This form of mammary abscess is difficult to heal; the discharge continues for a length of time, hectic is superinduced, and the patient may be placed in a very precarious position.

Treatment.—In the first stages of mammary inflammation, suppuration may be prevented by medicine and by rubbing. The nurse should stand behind the patient, who should be seated in a chair; the breast should be supported by one hand of the nurse, passed under the arm of the patient, and gentle friction *from the circumference of the gland to the nipple* be continued for some time, the parts having been first covered with warm oil.

The homœopathic treatment of this disease is very efficacious, and if the medicines are employed in the early stages of the affection, resolution can be accomplished. For local treatment at this stage, the best proceeding is the following: The diseased breast is covered with a layer of cotton-wool, and a bandage is applied which is known in minor surgery as the bandage of Mayor, or the triangular bonnet of the breast. The form of the bandage is a triangle, a yard in length from one extremity to the other, and fifty centimeters (nearly twenty inches) from the apex to the base. The base of the triangle is placed obliquely under the diseased breast, then one of its extremities is directed under the corresponding armpit, and the other over the opposite shoulder, and there united behind the shoulderblade. The apex of the triangle is then lifted in front of the diseased breast, it is carried over the corresponding shoulder and firmly fixed behind. Warm applications, poultices, etc., should be employed, as they tend to increase the afflux of fluids and hasten suppuration. Other local treatment should be a light suspensory bandage, to support the tumor, in order to prevent its weight from causing additional pain. Frequent bathing with tepid water

after the abscess has been opened, that the part may be kept perfectly clean, is also essential.

If, after the chilliness, the patient experience a tensive, burning, or darting pain in the breasts, if they are somewhat swollen and red, *bryonia* should be prescribed; or, if before the symptoms above-mentioned appear, and there is only slight swelling, aconite. These two medicines are often sufficient to produce resolution; the child, however, should be allowed to suck, even though pain is produced. In some instances the breast-pump is serviceable, when the female is desirous of weaning the infant, but often its use may be dispensed with, the homœopathic treatment being sufficient to cure the affection. If the milk continue to be secreted in too great quantity, and bryonia does not relieve, puls. will be found of great service. Calc. carb. has also been used with success, and lycop. proved effectual in an obstinate case of the kind.

Belladonna must be given when there is, together with the throbbing pain, a shining erysipelatous redness. And also, when the inflammation is caused by the suppression of the milk by violent emotions, if the patient be robust, with tendency to congestions, etc. If this medicine does not relieve, and the patient complains of chilliness and shuddering, which at this stage of disease generally indicate the formation of pus, *mercurius* should be administered, or, if the symptoms require, hepar should be prescribed. If these are not sufficient and suppuration is progressing, phosph. has been highly recommended by Dr. Croserio; he says: "Since I have seen the marvellous effects of phosph. in abscess of the breasts, I have employed no other medicine when there have been evident signs of suppuration. This medicine, administered upon these circumstances, at the thirtieth dynamization, one globule in water, a teaspoonful every six hours, promptly calms the pain, procures the opening of the abscess and its cure, without leaving any visible trace of the cicatrix upon the breast."

I have also had most excellent results from this medicine. So soon as fluctuation is distinct, the abscess should be freely opened. My plan is always to use a sharp-pointed curved bistoury, and cut from within outward. The parts are then to be covered with a poultice and hepar administered. After a day or two the poultice must be removed, and a simple dressing of carbolic acid and glycerin applied.

After the pus has been evacuated, silic. is sufficient to complete the cure. This medicine is also serviceable when the discharge is serous and has continued for a length of time.

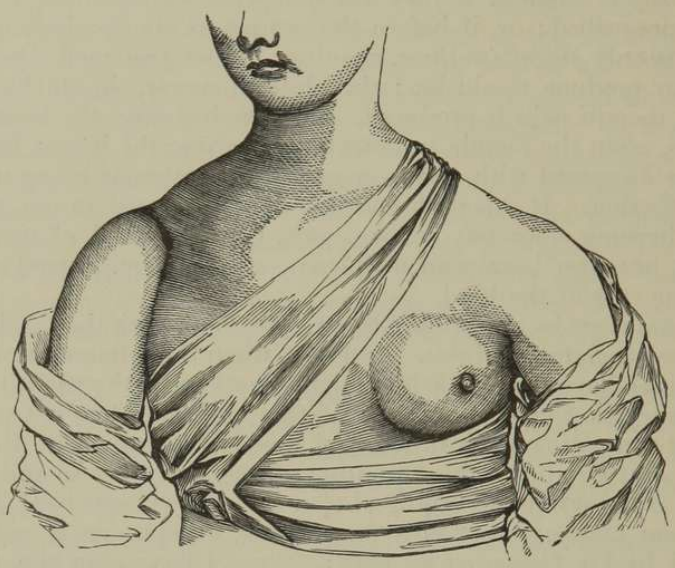
If indurations remain, conium, merc., phosph. ac., silic. or sulph. must be administered, each according to the symptoms.

If the inflammation be consequent upon bruises, arnica may be applied externally, in a weak solution, and internally in the 2d dec. dilution; and should much pain or fever be present, in alternation with it, aconite may be prescribed.

When called to treat old cases, in which there are several sinuses, I first inject the sinuses with a preparation of hydrastis ʒj to ℥j of water, and then apply over the parts compressed sponge, which I tightly strap to the breast; as the fluids exude, the sponge expands and constant pressure is thus kept up. The injection is used but once, and the medicines given internally are the 30th trit. I never yet have failed with this treatment. In the cut, Fig. 387, a very excellent method of bandaging the breast is shown. It may answer either for mammary abscess, pendulous breast, or to support the parts after the gland has been removed. It consists of a large bandage with two tails, one of which is fastened around the waist,

the other supports the breast from the opposite shoulder, and is fixed to the first behind.

Fig. 387.



Cancer of the Mammæ.—This disease frequently arises from small indurations, which are sometimes discovered in the breasts at an early age. If these do not receive timely attention they frequently enlarge and become painful at the critical period.

The usual origin and development of epithelial cancer of the mammary gland is as follows:

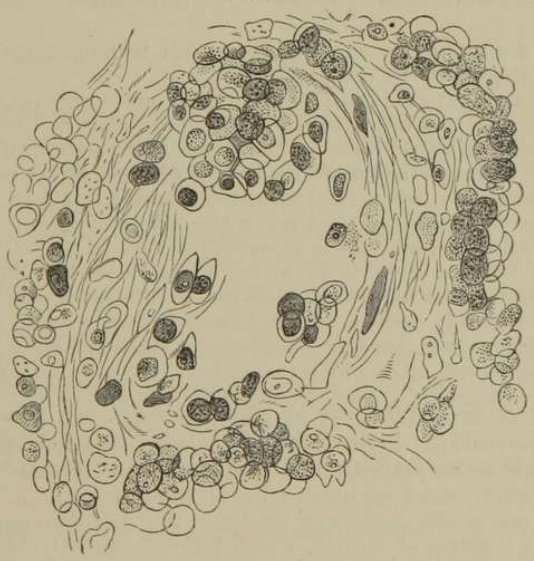
A hard tumor is discovered in the breast, appearing either spontaneously, or in consequence of pressure, shock, etc. At first the tumor is round and movable; as it increases in dimensions it becomes ragged and uneven; other swellings develop themselves, all of which appear to be united by cords of indurated cellular tissue. These tumors enlarge, combine into one, involve the whole glandular structure, and sometimes spread to the axilla. Lancinating pains at this stage are experienced, extending to the shoulder and arm, and not aggravated by pressure. The integument, if invaded by the tumor, assumes a streaked, cicatrized appearance, and the follicular glands are frequently filled with a blackish substance. The skin in a short time adheres to the tumor, which becomes elevated and inflamed. These symptoms may disappear, but finally the nipple retracts, forming a cavity, the skin breaks and reveals a spreading ulcer, with hard, dark red, shining edges, and an unclean bottom; the discharge is neither very copious nor fetid, and the ulcer resembles rather a deep fissure devoid of excrescences. The axillary, the glands in the clavicular region, and the cervical ganglia, may enlarge, provided swelling have not taken place previously. At this period, when the tumors are seated, immovable, and hard as stone, the patients complain of a troublesome feeling of heaviness, with almost constant stinging, boring, shooting, lancinating pains, the lancinations proceeding to the shoulder, and from the mammæ in various directions; also, of rheumatic pains in various parts, particularly in the loins and thighs. The reproductive process suffers considerably; the face assumes a livid appearance; the arm of the affected side commences to swell,

its movement is impeded, and at length excruciating pains and supervening colliquations produce death.

Besides these phenomena, there are a variety of conditions that may occur during the course of carcinoma of the mammæ. Sometimes the scirrhus remains for a long time latent, giving rise to no unpleasant symptoms whatsoever; at others its development is quite sudden, and it extends with rapidity, attended with severe symptoms of constitutional disturbance. Ulceration of the gland is frequently produced by external violence—a blow, a fall, or a bruise, may create suppuration and its consequences, or sometimes the ulcerative process is established immediately after the suppression of the menstrual discharge.

There are some cases on record in which cancerous ulcerations were accompanied with but slight pain; in the generality of instances, however, the suffering is severe, and the peculiar lancinating character of the pains is almost unbearable. The duration of the pain, when it is very severe, is said to be less than when it is not so excruciating, and from this circumstance a distinguishing characteristic might be drawn between acute and chronic cancer of the mammæ. The former commences with a hard, deep-seated tumor in the breast, which adheres to the integument for a time, the skin then becomes slightly discolored, the whole mamma gradually partakes of the induration; elevations may be observed in some portions of the gland, while at others there are marked depressions; the surface then becomes soft, and presents those appearances that designate the presence of fluid; the pain becomes sharper, and resembles in many respects that experienced by patients suffering from whitlow. The ulcerative process pro-

FIG. 388.



Medullary Cancer. "From a lymphatic gland—secondary to hard cancer of the breast. This form of cancer differs from the scirrhous only in the proportion of the cell element to the fibrous stroma—the cells being here seen to be still of the epithelial type, and lying close together without any visible intercellular substance." From Arnott (HOLMES).

gresses rapidly, the pains increase, the countenance exhibits an expression of anxiety and pain, the skin has a jaundiced appearance, and the patient is much debilitated and very desponding; the edges of the ulcer are raised, and present those characteristics of cancerous ulceration that have already been mentioned.

The *true scirrhus* is dry and of a cartilaginous hardness, and shrinks after having attained a certain degree of development, the contraction and shrivelling of the integument forming various indentations; the accompanying pains are not very great, and by proper treatment the disease may remain in this condition for a considerable length of time. This form of the disease is most frequently encountered in old females of a spare habit of body, and of a dry, rigid constitution. In certain cases a secondary medullary cancer may develop in the axillary glands, the breast being affected with scirrhus. (See Fig. 388.)

In the *encephaloid* cancer, the tumor is not nearly so hard as in scirrhus; the veins are much enlarged; as the tumor grows, it presents on the surface one or more purplish and fluctuating spots, which, as the tissue breaks down, give way, and hæmorrhage is the result. As soon as ulceration begins, the discharge is excessively fetid. The surface of the ulcer is covered with the peculiar brainlike substance from which the disease takes its name, hæmorrhages are frequent, the constitution breaks down rapidly, and death ensues.

Treatment.—The *scirrhous indurations* in the breasts of young girls, which arise without any assignable cause, yield to several medicines.

Cham. corresponds to the *drawing rheumatic pains* in the indurated mammary swellings; these are painfully affected by the open air, and are exacerbated at night; or to erysipelatous redness of the indurated mamma,* with drawing and tearing pain, increased by contact.

Arnica is adapted to the same group of symptoms when the nightly aggravations are absent.

Bell. is useful when the indurated mammary glands are inflamed, with burning and stinging pains, which are increased by the least motion or contact.

Arsen. is indicated by a burning pain, with tearing, decreasing by motion, aggravated by external warmth, and rendering it impossible for the patient to lie on the affected side.

Bry. is suitable for a tensive, burning pain with tearing, aggravated by contact, or by moving the arm of the affected side.

Clematis is an excellent medicine for indurated mammary glands that are painful only when touched; it is likewise useful in open cancer, with burning and throbbing in the ulcer, and stinging pains in the edges when touching them.

Conium is quite an important medicine in this disease, but it is especially serviceable during the first stages, when the indurated gland is liable to take on inflammatory action from every little cold, and when the lancinating pains are accompanied with burning and stinging, which are especially severe in the evening or at night.

Kreasotum was very serviceable in a case characterized by the following symptoms: The whole breast was indurated, blue-red, and rugged; some of the eminences were covered with a scurf; one of which, situated near the nipple, was of a large size, and fell off frequently, leaving an opening, from which a quantity of thick, dark blood was discharged, after which the patient generally fainted. *Kreas.* seemed to arrest the hæmorrhage for a long time, but it was impossible to remove the disorganization in spite of acid nit., thuja, con., or hep.; the patient finally died of hæmorrhage. Nevertheless, kreas. is a prominent remedy for carcinoma of the mammæ; but should be employed much sooner than in the above-mentioned case.

Carbo anim. is very useful in hard, painful tumors of the breast, though carbo veg. is preferable when the pains are burning, the patient complains of anxiety, want of breath and lowness of spirits, which latter frequently increases to a whining despondency.

Phosph. may prove suitable to patients with flat chests, tuberculous disposition, great sensitiveness to cool weather; increase of pain; pain in the nape of the neck, stiffness of the arms at every change of weather, etc.

Phytolacca, hydrast., chimaphila, and other medicines, have also been highly spoken of. See pages 220–22.

But perhaps the medicines best adapted to cancer, not only when it

* For an interesting account of the pathological changes that occur in the mamma to produce an induration of the gland, see Association Medical Journal, July, 1858.

affects the mamma, but in any other organ, are arsenicum and conium; the former has been used, and with more or less success, from a very remote date; and the famed "cancer curers" of the present day, no doubt following the example of their predecessors, employ the arsenical pastes. Conium also is a superior medicine, and should always be remembered in the treatment of this affection, particularly when some contusion or abrasion of surface has hastened forward the carcinoma. The prognosis is always to be formed with the greatest foresight and judgment, but in the generality of cases, it has always been found unfavorable.

There has been much stress laid by writers upon the treatment of scirrhus of the mammæ, and indeed other forms of carcinoma, by the application of pressure, and there have been several instruments invented for maintaining the requisite amount of compression; by this method it is said that portions of the tumor are gradually absorbed, and that its further growth is much retarded. The application of all stimulating plasters, pressure, friction, etc., are worse than useless; they only tend to hasten the inflammatory process in the tumor, and must therefore always be considered as dangerous in the extreme. It is in these malignant and incurable affections that some practitioners of our school suppose that they may, without dereliction of duty, depart from the law which guides them in the treatment of other diseases, but all deviations invariably fail to produce the desired effect; and finally, in the generality of instances, to ameliorate the distressing accompanying symptoms, the surgeon is obliged to return to those medicines whose symptoms correspond to those which it is the object to remove.

The treatment must always be commenced as early as possible; the medicines must be exhibited steadily and for a length of time, and the patient observe the most rigid dietetic rules. If, after a repeated trial of different medicines, no impression whatever be made either upon the size, color, hardness, or weight of the tumor, the question of amputation of the breast at once arises in the mind of the surgeon, and surely it is one of a perplexing nature. Hartmann in his *Chronic Diseases* makes a strong assertion concerning the removal of scirrhus. He says that all operations are useless, or worse than useless, that a cure has *never* been effected, and that all patients that are supposed to have survived an operation were not afflicted with true scirrhus, but only with indurated glands.* Although Hartmann was an acute observer, and no doubt a thorough homœopathic physician, yet it can scarcely be allowed that all the most scientific, accomplished, and thoroughly educated physicians and surgeons of the "old school" could possibly be so egregiously mistaken; and although followers of Hahnemann, still we must respect the extraordinary talent and learning of those who are considered the most accomplished surgeons in the world, and allow freely that they understand as well as ourselves the difference between a true carcinomatous tumor and merely "an indurated gland." This is a question, however, that must be settled in the mind of every conscientious practitioner; but it is necessary in this work to subjoin the prognosis with reference to the operation, and the manner of extirpating the diseased structure.† The following is quoted from a celebrated English surgeon, and bears the stamp of great prudence and skill, as well as experience in

* Hartmann appears to be partially correct in his statement. See article "Statistics of Cancer," published in Clymer's Medical Examiner, August 5th, 1843, p 179.

† For a very interesting paper on this subject, see a lecture, delivered at St. George's Hospital, by Sir B. Brodie. Huston's Medical Examiner, September 21st, 1844, p. 217.

the disease; of course the homœopathic practitioner must first use those medicines faithfully that appear to correspond to the disease, and must be guided according to the result of his treatment, with reference to the operation.

"Some, taking an abstract view of the subject, entertain a question as to the expediency of operating at all in carcinoma; inclining to regard the affection as wholly constitutional, and not to be eradicated, or even restrained, by removal of only a local portion of it. This view we do not propose to consider; but, with the majority of the profession, granting that the disease is constitutional as well as local, and that in most cases it shows more of the former than of the latter character; granting that very many cases occur—doubtless the majority—in which operation is inexpedient; and granting that in all cases, looking to the constitutional vice, we can never be certain of immunity from return, and must invariably issue a guarded prognosis accordingly; still we are of opinion, that there are cases often presenting themselves to the surgeon of extensive practice, in which it is his bounden duty, by operation, to afford his patient the chance either of a definite or radical cure, or at least of a postponement and palliation of the malady. Such cases are those in which the tumor is yet small and comparatively circumscribed; the lymphatics unchanged either in the immediate vicinity or at a distance; the integuments and muscles free from incorporation; the patient not far advanced in years; and the cachexy as yet but little indicated, if at all. On the other hand, affections of the lymphatics already begun, even though to a trifling extent, contra-indicate operation; for, according to experience, reproduction is sure to follow, even when the surgeon is certain that not only the tumor itself, but the adjoining changed structure as well, lymphatic or not, has been thoroughly taken away. Incorporated skin and muscle can be removed by wide and free incision; yet in such cases it is often difficult, if not impossible, to say that what is left is sound, free from lodgment of the *materies morbi* already in its texture; and, in these circumstances, experience again speaks loudly in favor of return. In the very aged, a carcinoma may exist for years in a latent or indolent condition; still occult and still of small size and circumscribed, the seat of little uneasiness, and attended with but little disorder of the system; indeed, the patient may die ultimately of disease to all appearances totally unconnected with carcinoma. Under such circumstances, operation is withheld, and the tumor is left undisturbed, and guarded carefully from excitement."

For further information in regard to this subject, as well as to other tumors which affect the mammæ, the student must refer to the Chapter upon "Tumors" and the "Treatment of Cancer," as space forbids their repetition here. The most frequently encountered growths are, fibroid cystic, fibro-cystic, and adenomatous. In regard to the *diagnosis* of all tumors of the breast, the fact of their *being capsuled or not*, is of great import.

In a treatise on *Innocent Tumors of the Breast*, by Labbé and Coyne,* the relation between cancerous and these non-malignant growths is clearly set forth. It is there shown that the microscopical characteristics of a growth at any particular time, are not sufficient in and of themselves to determine definitely as to the malignity of that growth, for the pathology of tumors is thoroughly to be known only by clinical study combined with anatomo-pathological study. It is further held, that the idea of a *specific* morphological element or "cancer cell" (as held and taught by Lebert and others, in 1854), is without foundation, for what was called the

* *Vide* American Journal of Medical Sciences, July, 1877, p. 137.

"cancer cell," is not always found in the cancerous, and may often be found in the non-cancerous tumors. Mode of life rather than structure, is to be consulted in the diagnosis and classification of all, and especially of cancerous tumors. All benignant tumors of the breast have, however, one common character: they are limited by a fibrous capsule, whose formation is explained by the anatomy of the breast, and by the point of departure of the morbid processes, and they derive their origin from a modification of the parts that compose the primitive lobule of the mammary gland. The conclusions arrived at regarding these benignant growths, may be summed up as follows: 1. A group of tumors exists in the breast that may be called benignant tumors. The character of benignity they all offer in different degree, is due to the special anatomical fact that they are clearly limited by a fibrous capsule that isolates them from the rest of the gland and the surrounding tissues. 2. These growths are of different classes, varying in anatomical character, and in the symptoms shown in each, but all benignant as compared with cancer. 3. Simple enucleation constitutes an incomplete operation; partial or,—as in the case of sarcomas, myxomas, or any voluminous tumors of rapid development,—total amputation of the breast must be resorted to for a complete operation.

Amputation of the Breast.—When it becomes necessary to remove a mamma, the operation should be performed in the following manner: The patient should be placed on a table of proper height, the light being so arranged that it will fall directly upon the part to be removed. As soon as anæsthesia is complete, the arm is drawn away from the body, and held in that position by an assistant. The surgeon then marking with his eye the part to be removed, makes an incision through the integument only, around the outer portion of the gland. In the generality of instances this cut should have its concavity toward the centre of the sternum. The second incision should be made above the tumor, and should join the first at its extremities, thus making an oval incision, which should embrace the tumor and two inches around it. The knife is then carried quickly below the tumor in the line of the first incision, down to the pectoral muscle, and the tumor dissected out. After removal, the wound should be carefully examined, and every particle of suspicious tissue removed. If the axillary glands are enlarged, or even present a doubtful appearance, the incision should be extended and their removal effected. After the tumor has been removed, it is my invariable custom to spray the parts thoroughly with Lister's solution of carbolic acid. I also would lay great stress on the importance of ligating all the arterial twigs which bleed. It takes a little more time, but saves trouble afterward. If the breast has been pendant and large, and sufficient healthy structure has been left, the wound may be approximated; if not, the edges must be brought as nearly together as possible with straps, and the breast supported by a sling, tied upon the opposite shoulder.

CHAPTER XXXVII.

INJURIES AND DISEASES OF THE ABDOMEN.

Wounds of the Abdominal Viscera.—Wounds of the *abdominal viscera* have generally been considered as perilous as those of other parts of the body; the danger, however, must obviously depend on the organ that is

wounded, and the extent of the injury inflicted. Superficial wounds of the abdominal muscles, or their integuments, are seldom of much consequence, and should be treated according to common principles. When the wound is penetrating and extends deeply into the cavity, the peritoneum is involved. Inflammation of this membrane constitutes the chief source of danger in all wounds of the abdomen. But though this membrane is so liable to inflammatory action, cases have occurred in which balls, swords, or bayonets have passed entirely through the abdomen, transfixing the peritoneum, and several convolutions of intestine, without proving fatal, and giving rise to but few untoward symptoms.

The most certain sign that an intestine is wounded, is a discharge of blood from the anus, or of fæces, bile, or food from the wound; the absence of such signs, however, is no proof that the viscera are intact. Where there is an absence of all symptoms, and especially of those of shock, the chances are that the viscera are not involved.

Wounds of the *duodenum* are much more dangerous than those of the larger intestines, as there is greater difficulty in nourishing the patient, and more risk of effusion.

Wounds of the *stomach* may be known by the seat of injury, great depression, vomiting of blood, and by the matter that escapes. In wounds of the intestines, fæces sometimes are extravasated into the peritoneal sac, giving rise to excruciating pain. In these wounds, the danger always is imminent.

Wounds of the *substance of the liver* are almost certainly fatal, from the great vascularity of the organ. From slight injury of this viscus, patients, however, often recover.

Wounds of the *kidneys* may be suspected from the position and direction of the injury, and a discharge of bloody urine; this accident is dangerous from three causes,—hæmorrhage, inflammation, and profuse and continued suppuration.

Treatment of Wounds of the Abdomen.—When the surgeon is called upon to treat a wound of the abdomen, probing should be dispensed with as much as possible—such examinations made thoughtlessly, are productive of great mischief. If an intestine protrude, it should be replaced; or, if this be impracticable on account of the distension of the gut with flatus, etc., a dose of nux vomica should be prescribed; or, if there be considerable vomiting, and cold, clammy skin, and great prostration, a dose or two of veratrum in alternation with the nux. When the distension abates, and vomiting and other symptoms are relieved, the intestine should be returned, and the lips of the wound brought together and retained by adhesive straps. If, from the extent of the injury, straps are not sufficient, a suture may be required, although it is better, if possible, to avoid its use.

If there be no solution of continuity of the external parietes, and the peritoneum has sustained injury from external violence, arnica should be prescribed internally, and at the same time a diluted tincture of the medicine should be externally applied. If either from blows or from wounds the symptoms of peritoneal inflammation arise—which are, painful tension and tumefaction of the abdomen, with excessive sensibility to touch, and frequently ischuria and constipation—aconite, bell., bry., should be employed in accordance with the presenting symptoms. Nux vom. is the proper medicine when there is painful sensibility and distension of the abdomen, with vomiting and other symptoms of gastric derangement, together with ischuria.

Mercurius should be employed when there is quick, weak pulse, nocturnal sweats, and prostration.

When the features are collapsed, and there is rapid sinking of the vital

energies, and if the inflammation appear to have extended to the upper portion of the alimentary canal, with vomiting of blackish matter, *arsenicum* is plainly indicated; in other instances, carbo veg. is equally demanded.

If the kidney is the seat of injury, the wound should be treated in accordance with principles already laid down; and the inflammation of the gland combated with the means employed in the treatment of nephritis.

If the intestine or part of the stomach that protrudes from the wound is divided, the parts may be brought together with fine silver wire, or carbolized animal ligatures, which may be cut off close to the knot, and returned into the abdominal cavity. In the performance of this operation, care should be taken to bring the edges together in such a manner, that the two surfaces of the outer or serous membrane be opposed to each other, as adhesion does not take place as well between mucous surfaces.

Artificial Anus.—An *artificial anus* not unfrequently follows gunshot wounds of the intestines; or it may be the sequence of a penetrating wound, an abscess, or ulceration. "In all examples of this description I have seen," writes Dr. Gibson,* "spontaneous cures have taken place, after the contents of the bowels have been discharged, for several weeks, through the fistulous opening."

There are two varieties of artificial anus: one in which the adhesion takes place between the outer wall of the gut to the internal parietes of the abdomen, the side of the intestine having previously sloughed; in this variety the canal still remains open. In the second variety the adhesions take place in the same manner, but a knuckle of intestine having sloughed, there remains a membranous partition between the two portions of the canal formed by the inner wall having been folded upon itself.

Treatment.—The first variety generally gets well, as already mentioned, spontaneously. For the second, the following is the operation of Physick. It consists in passing a ligature through the septum and tying it upon the tissues; this ligature is allowed to remain eight or ten days, by which time adhesions are generally formed between the peritoneal surfaces, when as much of the septum may be cut away as is necessary.

Dupuytren's enterotome consists of a forceps with oval fenestrated blades, which are made with a screw in order to compress the septum.

The principal medicines in this affection are, calcarea, causticum, phosph., silic., and sulph.

Abscess of the Abdominal Parietes.—When, as a consequence of wound or contusion, *abscess of the abdominal parietes* takes place, the location of the secreted matter is generally between the layers of tissues constituting the walls of the abdomen. In the first stages of this affection, a hard and painful tumor is observed, which increases in size, becomes softer, and, in some instances, fluctuation may be distinctly felt.

The seat of these abscesses is generally in the posterior abdominal walls, the lumbar and iliac regions, the anterior parietes being not generally affected, unless the disease is connected with abscess of the internal organs, as the appendix vermiformis, liver, spleen, etc.

I have seen but one case of anterior abdominal parietal abscess, and that was in consultation with Dr. T. F. Allen, of New York. The purulent collection was immense; the pus had formed between the oblique muscles, and required a deep incision for its exit. The patient made a good recovery.

In this variety of abscess there is great tendency of the pus to burrow, and if the tumor does not give way internally, it may find its way between

* Institutes and Practice of Medicine, vol. i, p. 185.

the aponeuroses and along sheaths and tendons, and discharge far away from the original site of the inflammation.

If, however, suppuration be the result of a wound, a free incision should be made as soon as possible; indeed, some surgeons recommend that an opening be made with a knife in the most prominent part of the tumor, before the inflammatory process terminates in suppuration, and thus avoid the great danger of the contents of the abscess being emptied into the cavity of the abdomen, and often, as a further result, ulceration of the intestines. This, however, is not a warrantable proceeding. The case must be carefully watched, and when symptoms of suppuration begin to show themselves, an exploring needle, or the aspirator should be used. After this, a free incision should be made and the pus evacuated.

Hepatitis—Empresma Hepatitis—Inflammatio Hepatis—Inflammatio Jecinoris.—The symptoms of hepatitis are a dull heavy pain occurring in the right side, increased by pressure, cough, or deep inspiration, sometimes relieved by bending the body forwards; the pain may be either stinging, cutting, burning, tensive, dull, or aching; sometimes an acute pain is experienced in the right shoulder, clavicle, or arm, as though numb; the same want of feeling is sometimes experienced in the entire right half of the body; pain along the vertebral column. If the size and consistence of the liver be increased, it projects beyond the false ribs, and extends more or less into the abdomen; the pulse is hard and frequent; the patient lies on the right side, being often unable to rest either on the left, or on his back; respiration and digestion are interfered with; sometimes a slight, dry or hollow, and deep cough is present; the conjunctiva and the skin acquire a yellow tinge; there is also constipation, the fæces being grayish and discolored. Sometimes the hepatic region is covered over with red spots, and a throbbing may also attend the disease (in the hypogastric region). If the convex surface be affected, the disease simulates pneumonia or pleurisy; if the concave, gastric symptoms predominate. The disease may assume a chronic form. The terminations of inflamed liver are various: it may end in resolution, suppuration, or gangrene. When resolution takes place the symptoms disappear gradually; when it suppurates, hectic fever comes on, also tumefaction and increased weight in the hepatic region; and if adhesion take place between the peritoneal covering of the liver and the peritoneum proper, the matter finds its way externally. In India, where this organ is so frequently affected, the disposition to the formation of abscesses is very great, the pus forming in the innermost part of the organ. The liver enlarges from *hyperæmia;* it also becomes *hypertrophied*, or its tissues exceed a healthy size. It also becomes *atrophied* from defective nutrition. It also becomes *softened*, or indurated, or assumes a yellow color (cirrhosis of the liver), also granulated and tuberculated; these granulations being found to vary in size from that of a large shot to a cherry, and are found both at the surface, and within the organ; the liver itself is less than natural and shrivelled, and its tissue more dense. These granulations are red, brown, but sometimes yellow; some are of a beautiful canary color.

There is also *melanosis of the liver*, or that condition wherein the tissue is converted into a black, hard, homogeneous substance, near which ulcers or cavities form, owing to the softening of this substance itself, or of some other morbid tissue, of tubercles especially.

Inflammation of the liver is distinguished from pneumonia by the pleuritic pains being less severe, and chiefly confined to the course of the phrenic nerve (ascending to the top of the shoulder); by the pain in hepatitis being increased by pressure, while in pneumonia this is not the case; by the difficulty in pneumonia of lying on the affected side, the reverse being

true in hepatitis; by the sallow countenance; by the dryness of the cough. From gastritis and enteritis it is distinguished by the seat of the disease, which is discovered by tenderness upon pressure, by the sympathetic pain of the clavicle and shoulder, by the prostration being less, by the greater fulness of the pulse, by the color of the stools and urine.

The causes of hepatitis are all those which induce inflammation: emetics, violent operation of cathartics, acrid bile, biliary concretions, external injuries, passions of the mind, intense heat, the inordinate use of spirituous drinks, metastasis of piles, of inflamed joints, diarrhœa, dysentery, etc.

Treatment.—This should begin with *aconite*, especially if the fever be very high, and the pains in the liver *shooting*, and the pulse *full, accelerated*, and *irregular*, more so than when it is *hard* and *frequent*. If icteric symptoms be present, and the disease be produced by chagrin, *chamomilla* affords prompt relief; also if the pains are pressive and not severe; tightness under the ribs and in the stomach; dyspnœa; pain *not increased* by pressure, movement, or breathing; yellow color of the skin; bitter taste in the mouth; thick yellow-coated tongue; great anguish, moaning.

Bryonia.—When the pain is oppressive, increased by touch, coughing, moving, breathing, especially upon inspiring, with spasmodic oppression of the breast; the breathing at the same time hurried; thick, yellowish coating on the tongue; constipation; if there be great vascular and *nervous* excitement, a congestive condition, the fever increasing at night; if there be tumefaction over the hepatic region, with a burning sensation; if cold or chagrin be the exciting cause.

Belladonna.—For pressive pains reaching to the chest and shoulder, or extending across the epigastrium; fulness at the pit of the stomach; dyspnœa; restless nights; vertigo; congestion to the head, with dimness of vision; burning thirst; consciousness, restlessness, sleeplessness. It is exactly suited to those cases where the inflammation exists chiefly in the lower surface of the liver, when the pain is increased by cough, pressure, inspiration; the pains resembling those of pleuritis, and extending to the shoulder and neck; intolerable tension across the abdomen above the umbilicus, producing dyspnœa, cough, hiccough. *Belladonna* is well suited after the synochal symptoms have been lessened by *aconite;* it is also given with advantage in alternation with *bryonia*, and in chronic cases where there is sensitiveness in the region of the liver.

After *belladonna*, **mercurius** is frequently required; pressive-aching pains compelling the patient to change his position from the right side, also violent lancinating and burning pains in the convex surface of the liver, extending to the dorsal spine; the pains are sometimes increased by movement; face red and bloated, lips burning and dry, white-coated and moist tongue; shivering with distinct discoloration of the skin and eyes, much thirst, bitter taste in the mouth, want of appetite; bright-red urine, small in quantity; pulse frequent and hard; the pains and fever increase early in the morning; also *in enlargement and hardening of the liver, and when suppuration has taken place.*

Nux vomica.—For extremely violent, oppressive, and at the same time lancinating pains in the region of the liver, extending to the back, or frequent prickings in the region of the liver, with frequent chilliness in that region, and often a throbbing pain in it; patient cannot bear contact; sensation of an internal heat in the whole body, with considerable thirst, especially at night, and frequent, hard pulse; sleeplessness, bitter taste, constipation; patient cannot bear to be covered in consequence of the anguish and heat and difficulty of breathing, which latter symptom is, however, increased by the removal of the coverings; the stomach feels painful as if bruised by blows; breathing difficult, short and painful, the patient sometimes being obliged to lie on the back; nausea or vomiting. Also for induration and enlargement, and when there are gastric symptoms in the chronic form.

Pulsatilla.—*For loose, greenish and slimy evacuations from the bowels; at night frequent paroxysms of anguish;* nausea, yellow tongue, bitter taste, tension in the hypochondriac region; dyspnœa.

China.—For *sticking pain in the hepatic region*, with *great sensitiveness of the surface when touched*, as if from *subcutaneous* ulceration; swelling of the affected region; red cheeks; quick, hard pulse; swelled veins of the head, with pressive

cephalalgia; thick yellow-coated tongue; bitter taste; also when the complaint is worse every other day.

Sepia.—For *aching, sticking tightness in the right hypochondrium*, increased by turning to one side, by contact, and inspiring; dyspnœa, anguish, and palpitation of the heart; restless nights. Also when chagrin has produced the complaint in individuals of gentle tempers.

Cocculus.—For stinging and violent aching pains in the right hypochondrium, increased by coughing, breathing or stooping; insufferable pain from contact, and extending to the epigastrium; vomiting increases the pain very much, water and mucus being thrown up; thirst, burning heat, and redness of the face.

Sulphur.—In acute cases, and especially if the disease become chronic, when the shootings continue; and in cases where other medicines, in a reasonable time, have produced no effect, or after having done some good, cease to produce further improvement.

Lycopodium is also well adapted to many cases which have assumed a chronic state. Other remedies for chronic affections of the liver, are: *aurum, magnes. mur., natrum, alumina, calc carb., silex, ambra;* for enlargement, *arsenic, graphites, iodine, ignatia, chelidonium;* in hepatic abscess, *silex, belladonna, hepar, mercurius.*

Diseases of the Gall-bladder.—The gall-bladder is a membranous pear-shaped reservoir, situate in a superficial depression at the inferior surface of the right lobe of the liver. It receives, by the hepatic and cystic ducts, a portion of the bile secreted by the liver when the stomach is empty; which becomes in it more thick, acrid, and bitter. It receives the cystic artery; its veins empty into the vena porta; the hepatic plexus supplies its nerves; and its lymphatic vessels unite with those of the liver. Idiopathic inflammation of this receptacle is not of frequent occurrence, but it is a concomitant of affections of the liver, and also of biliary calculi. Its symptoms are described as sudden, acute, agonizing pain at the margin of the false ribs, increased by pressure, by inspiration, and lying on the back; the patient can scarcely straighten himself, and lies on the left side with the lower limbs drawn up; the paroxysm of pain continues a few hours, and as it subsides, jaundice appears; dyspeptic symptoms and vomiting are present; fever, small contracted pulse; great thirst; no shivering, nor heat of skin. The intensity of the disease may render it fatal, or the gall-bladder may be perforated and the bile be poured into the peritoneal cavity, producing fatal peritonitis. The remedies for this disease appear to be those adapted to biliary calculi, the consideration of which, therefore, we at once commence.

Calculi Fellei seu Biliarii—Gall-stones.—These stones are not of infrequent formation; when in the gall-bladder they are not necessarily productive of uneasiness, but in their passage through the ducts they give rise to what is denominated "hepatic colic." When in the gall-bladder their presence is made known by pressive pain in the right epigastric region, extending towards the side and back, with some disorder of the stomach, sometimes by cramps with vomiting; the skin becomes at the same time yellowish. Collections so large as to be detected by external examination, and even producing enlargement under the cartilages of the ribs, have in some instances occasioned very little inconvenience. But when moving through the ducts, the paroxysms of pain are intense in the region of the stomach and liver. There is also vomiting; the abdominal muscles become violently contracted, the extremities cold and the body covered with sweat. A diagnostic sign of the disease is the pulse not being altered. After these symptoms have lasted awhile, there may be an interval of rest, to be followed by a recurrence of the symptoms. If the fæces be now examined, biliary calculi will be observed. These stones consist of a peculiar fatty matter, coloring matter, cholesterin combined with soda, picromel, mucus,

soda, phosphate of soda, phosphate of lime, and chloride of sodium. Some again are found of almost pure cholesterin, which is an inodorous, insipid substance, in white shining scales, fusible and crystallizing on cooling in radiated fibres. Others are composed of resinous matter, the real nature of which is not ascertained. The greatest number, however, consist of thickened bile and cholesterin. Young children are not often affected; persons aged between 40 and 50 are most obnoxious to the disease; women suffer more frequently than men.

Causes: quantities of fat, animal food, sedentary life, scanty use of water as a drink, choleric temperament.

Treatment.—In the beginning of the disease, particularly if it be produced by *chagrin while eating*, give chamomilla. Its administration is called for by painful pressure in the epigastrium and hypochondrium, especially after eating, with regurgitation of the food, preceded by bitter, bilious vomiting, violent headache, and restlessness.

Colocynth may be indicated when there is painful pressure in the pit of the stomach, vomiting of bile, and acute colicky pains, if these symptoms have been brought on by wounded pride. *Chamomilla* and *colocynth* both failing, *digitalis* has succeeded. Its indications are the yellow skin, together with frequent fainting, excessive green vomiting, sudden prostration, white fæces and dark-colored urine.

Nux vomica and **nux moschata** are often of use.

Arsenic is specific, when the patient is afflicted with deathlike paleness, loss of consciousness, continued fainting, fruitless efforts to vomit. In such cases Hartmann has seen reaction take place in five minutes, and recovery follow. He likewise recommends *arsenic* for cramps of the stomach, constant colicky pains, extremely violent, accompanied with furious burning in the affected parts, frequent vomiting, excessive debility, constipation, and pain evidently expressed by the features. *Cuprum*, *china*, *veratrum*, and *laurocerasus* sometimes may answer.

I wish in this place to call especial attention to two remedies which I have used with the utmost success in this disease. The one highly recommended by Dr. Thayer, of Boston, the other by Dr. Kimball, of New Jersey. They are china and berberis. I have given them with the most surprising results, and believe I may say I have cured almost every case, and some that have presented themselves have been most alarming and chronic. The china I give in the third decimal trituration; the barberry in infusion.

Hepatic Abscess.—The frequency of occurrence of hepatic abscess is less under homœopathic than allopathic treatment, because by the administration of homœopathic medicines, the inflammation existing in the liver is generally subdued before suppuration ensues.

There are, however, cases that, notwithstanding the best-directed efforts to procure resolution, terminate in suppuration, and among these may be classed those inflammations that are occasioned by wounds, or other injuries; or when the disease is present in individuals who are weakened by some constitutional affection, biliary concretions, or the presence of worms in the biliary ducts.

Kirkland* relates a remarkable instance of the latter; and also Dr. Thomas Bond,† and Dr. Gibson,‡ of Philadelphia. The latter gentleman writes: "A very beautiful preparation, made by the late Dr. Wesenhall, of Maryland, of a liver, the substance and ducts of which are filled and perforated in every direction, by numerous and very large lumbrici, which destroyed the child by irritation and suppuration, is contained in my surgical cabinet deposited in the University."

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* Inquiry into the Present State of Medical Science, vol. iii, p. 186.

† Medical Observations and Inquiries, vol. i, p. 68.

‡ Gibson's Institutes and Practice of Surgery, vol. i, p. 209.

In abscess of the liver, or rather before suppuration has been established, the patient experiences a stinging, burning pain in the right hypochondrium, below and around the false ribs, frequently extending to the epigastric region or sternum, and in some instances, even to the thorax. This pain may be very severe, or it may be a continual, dull aching pain, aggravated by lying on the affected side, or by any external pressure; there is also more or less pain experienced in the right shoulder.

There are also present gastric symptoms, such as hiccough, loathing, eructations, attended with anguish, or there may be nausea, vomiting, bitter taste, yellow tongue, etc. Rigors generally precede the immediate formation of pus, and swelling may appear in the right side, and as the disease progresses, fluctuation may be perceived. The pus may burrow in various directions, in accordance with the situation of the abscess; it may proceed to the region of the hip, along the dorsal vertebræ, or it may be discharged into the transverse colon, stomach, duodenum, or into the lung; the latter is a very unfavorable situation, as the patient frequently dies of hectic.*

After the abscess has opened, the pus that is discharged changes its character; at first it is thick and creamy, but after a short time it becomes greenish, fetid, or of a dark-brown color. Large cavities are formed in the liver, and in some instances the whole structure of the organ may be destroyed, and there are cases on record where this has been the case, as has been revealed by post-mortem examinations.

It is well known that there are many points of exit through which hepatic pus may pass, and patients have been known to recover after the rupture of large hepatic abscesses; on the other hand the operation is attended with some risk, and not many have survived its performance, I mean recovered their wonted health. Again, we know that many at once succumb to the inflammatory action engendered by the purulent matter from the liver escaping into other parts of the body.

It is interesting to observe how many points have been the site of rupture of large hepatic abscesses. Cragie† says that, besides the abscess discharging into the abdominal cavity, the pus may pass through the air-cells into the bronchi, by the adhesive process into some part of the intestinal canal, the stomach, transverse arch of the colon, or even the duodenum; and Rokitansky,‡ with his usual system and accurateness, mentions several other outlets, as into the gall-bladder, or one of the larger branches of the hepatic duct, through the diaphragm into the pericardium, and even into large vessels, as the vena cava. He mentions a case in which communication was established between a hepatic abscess and the vena portæ and the duodenum.

Another hazard is much to be dreaded. On this point Budd§ writes: "A source of far greater danger is the circumstance which has been before noticed, that the inflammation which leads to abscess is often confined to the substance of the liver, and does not involve its capsule. As the abscess approaches the surface, adhesive inflammation of the peritoneum immediately above it usually takes place, and a small quantity of lymph is poured out, which causes adhesions between the wall of the abscess and the parts with which it is brought into contact. These adhesions are often of very small extent; sometimes they do not form at all, and as I have before remarked, the abscess bursts into the cavity of the peritoneum, causing speedy

* Sometimes the abscess has discharged itself into the pericardium. See London Lancet, August, 1845, p. 154.

† Pathological Anatomy, 859, 860.

‡ Ibid., vol. ii, p. 108.

§ Diseases of the Liver, p. 323.

collapse and death. By opening an abscess of the liver before adhesions have formed, we may be directly instrumental in bringing on this fatal issue; the pus may escape into the cavity of the peritoneum, and the patient die in a few hours, obviously in consequence of the operation." Another danger is also encountered in allowing air to enter the cavity of the abscess; then decomposition of both air and pus results, and fresh inflammatory action is developed.

In a case of my own I was for a time rather puzzled, because the pus was dark-brown or reddish. Upon consulting some authorities upon the subject, I found that the suppurative process in the liver generally ended in the formation of the ordinary purulent matter. Budd* says: "The matter in a hepatic abscess is usually *white* or *yellowish*, and is *free from odor*, unless it is in close proximity to the lungs, where it sometimes becomes decomposed and fetid from the admission of air." He then goes on to state that many of the older writers described the pus of abscesses of the liver as being generally red or claret-colored; but, according to his experience, such observations are incorrect. It is well to bear this statement in mind in order to explain wherein Mr. Budd is right, and wherein also the "old writers" are perfectly correct. This will appear from the following facts. Rokitansky† states: "In reference to its contents, the hepatic abscess presents considerable differences at different periods, depending in part upon the communication established in the biliary vessels; and a large abscess of long standing invariably contains pus, mixed with a considerable amount of bile, which arises from a *communication which is established between the larger gall ducts.*" Jones and Sieveking‡ have also the following, which is worthy of remark in this connection: "When an enlarging abscess reaches a hepatic duct branch, it does not set up inflammation in its walls and cause its obstruction, but it ulcerates through its tunic, and establishes a communication between the efferent channel and its own cavity. Hence it occurs that the pus contained in large abscesses is always mingled with a considerable amount of bile, while that of the smaller or recent abscesses is almost pure."

From these facts we would draw the deduction that in the majority of cases examined by Mr. Budd, the abscesses were recent and of rather limited extent, while the observations of the older authors were probably based upon the appearances derived from large collections of hepatic pus.

In the present case the admixture of the bile no doubt was the cause of the peculiar color of the liquid, and the explanation is readily found, as mentioned in the above quotations, in the destruction of the walls of the vaginal hepatic ducts.

We may here pause for a moment, to speak of the various methods that have been devised for the opening of these abscesses, premising the remark that the aspirator is the instrument *par excellence*, but I have met with three cases in which, though I introduced the largest needle, the fluid was so thick that the suction of the air-pump failed to relieve. In such cases other methods must be employed. We must recollect the dangers that are to be encountered in the operation; these are mainly two, the first being the risk that adhesion has not taken place between the peritoneum and the wall of the abscess; and that by the puncture an opening may be made that would allow a certain quantity of pus to escape into the cavity of the peritoneum, thereby causing inflammatory action and speedy death;

* Suppurative Inflammation of the Liver, p. 107.
† Pathological Anatomy, vol. ii, p. 107.
‡ Ibid., p. 510–511.

and secondly, the danger of the admission of air into the cavity, thereby setting up decomposition of the pus already formed, and exciting the pyogenic membrane lining the abscess to fresh production of purulent matter. To obviate the first difficulty, viz., the discharge of pus into the peritoneal cavity, the following process has been devised by Dr. Graves, and is recommended by other surgeons, viz.: to make free incisions through the muscular parietes of the abdomen, and to press to the bottom of the wounds thus made, pledgets of lint, thereby exciting adhesive inflammation between the reflected layer of the peritoneum and that covering the abscess, thus making sure that no pus can enter the abdominal cavity after the puncture of the abscess. The admission of air into the cavity can also be prevented, first, by making a valvular opening, or by having screwed to the canula a bladder with a stop-cock attached (as recommended in the puncture of the thoracic walls); by turning the valve the air is prevented from passing through the canula, and the bladder may be emptied at pleasure, taking, however, the precaution of drawing the integument well over the spot at which the puncture is to be made, and holding it firmly in that position while the trocar is entered obliquely, it will readily be perceived that so soon as the canula is withdrawn, the skin by its natural elasticity will retract to its usual position, and thus effectually close the opening.

Treatment.—Besides the medicines which have been already detailed, others must be given, especially in the earlier stages, with the hope of producing resolution. The most serviceable in effecting such a result are, chiefly, acon., bell., bry., cham., merc., nux vom., sulph. The indications for their use will be found in any work upon the homœopathic practice of medicine.

The medicines that are best adapted to hepatic *abscess* are, ars., bell., hepar, merc., silic., sulph. If the matter has made its way towards the surface of the body, the prognosis is more favorable than when it is discharged into any of the surrounding tissues or organs. If the pus has commenced to form, hepar should be administered, or if the process of formation be slow, merc. and silic. may hasten the suppuration, and allay the pain; the latter is the best medicine, particularly when there is hardness of the surrounding parts, with distension, or if there is a continual stitching pain below the floating ribs; but mercurius is to be preferred, when there is burning in the region of the liver, with distension from within outwards, accompanied with perspiration, that is excited by the slightest motion.

If the swelling appear to protrude through the intercostal spaces, the pus should be immediately evacuated, by means of the lancet or aspirator, or trocar; if this be not done, the matter may be discharged in another direction, and give rise to very unfavorable symptoms.

If, after the opening is made, the discharge continue, and become thin, sanious, and unhealthy, ars., carb. veg. or nit. acid must be administered; the directions for their use have been already mentioned in a preceding portion of this work. If the opening have a tendency to become fistulous, calc., silic., sulph. or phosph. should be exhibited.

In all cases, the patient should be kept at perfect rest, and if extremely weak, a moderate stimulus should be allowed.

In some instances, where there is a large quantity of pus, it should be evacuated by openings, made at different times, as in the case just recorded, at longer or shorter intervals; to determine this, however, the general constitutional symptoms of the patient must be taken into consideration. If he be robust and previously healthy, and the inflammation has gone through

its stages rapidly though completely, there need be no fear in allowing free vent to the purulent secretion. If, however, the patient has been long suffering from previous disease, the constitution generally weak, temperament nervous, and the signs of a chronic hepatitis have been present, care should be taken that the removal of a large quantity of matter does not produce the most alarming spmptoms of debility and exhaustion; it is then better to practice the method recommended by Abernethy, already alluded to in the Chapter upon Abscess, or apply the aspirator.

Ascites.—By ascites is understood a dropsical effusion in the cavity of the peritoneum; it may be complicated with hydrothorax, or general anasarca. Dyspnœa, cough, dryness of the skin, diminished secretion of urine, loss of appetite, constipation of the bowels, and prostration of strength, are symptoms which are generally present in the commencement of the affection; these are succeeded by general fulness of the abdomen, and by a sense of fluctuation easily recognized by percussion, which should be performed by pressing one hand on the side of the abdomen and striking it with the other on the opposite side.

The causes of ascites generally are disease of the viscera of the abdomen, particularly of the liver, pancreas, spleen, etc. In some instances, a very large amount of fluid collects in the cavity of the peritoneum.

The prognosis in this affection depends upon the nature of the case, and the age and temperament of the patient. When combined with organic disease of the abdominal viscera, or when occurring in individuals of a sickly constitution, or in persons of advanced age, apprehensions may be entertained of an unfavorable termination.

Treatment.—The principal medicines in the treatment of ascites, are ars., apocy. cann., bry., china, hell., ledum, lyc., merc. sol., sulph., apis mel., digital., iris v., senec. grac.

In some instances, in the first stages of the disease, aconite is useful to allay vascular excitement; after which hellebore should be prescribed, if there is a tendency to torpor, prostration, extremely scanty secretion of urine, with shooting pains in the extremities.

Arsenicum is indicated when there is extreme debility, and in cases connected with organic affection of the abdominal or thoracic organs; when the patient emaciates, and there is stiffness and immobility of the limbs, with aggravation of the sufferings at night.

China should be employed when the disease can be traced to losses of the animal fluids; when there is paleness of the skin, short cough, with expectoration.

Digitalis should be employed if there is excessive nausea, palpitation of the heart, etc. A dingy and livid complexion points to **ferr. acet.**

Mercurius is the appropriate medicine when there is disorganization of the abdominal glandular system, with occasional paroxysms of pain.

Other medicines are euphorb., solanum, kali carb., conium, sulph., iod., zincum, ol. tereb.

Paracentesis Abdominis.—This operation is frequently called for in the advanced stages of the disease, to palliate the sufferings of the patient. It is performed in the following manner:

The patient is seated on the side of the bed, or on a chair, the bladder having been previously evacuated, and a broad bandage placed around the abdomen in the following manner: Its middle should be on the anterior wall of the abdomen, and its ends should be of sufficient length to be brought around the body and firmly held by an assistant. In the centre of this band, in the lower part of the abdomen, and directly opposite the linea alba, an opening should be made, sufficiently large to admit of the introduction of the trocar,

which with its canula should be thrust through the abdominal parietes at the point aforesaid, in an oblique direction; and after it has pierced through the integuments the trocar should be withdrawn, allowing the canula to remain, through which the fluid generally passes in a continued stream. If the intestine or omentum obstruct the passage of the fluid, it should be gently removed by the introduction of a probe through the canula; and if, after a considerable portion of the water has been withdrawn, the stream lessens, the bandage may be tightened by traction made upon its extremities, which compressing the abdominal parietes forces out the remaining fluid.

Care, however, is necessary in the performance of this operation, that the evacuation of the abnormal secretion be not too speedily effected, lest the patient, already somewhat debilitated by the evacuation of so large an amount of fluid, incur great risk from extreme prostration; indeed, in most instances, when the water has been withdrawn slowly, towards the end of the operation a feeling of faintness is experienced, to relieve which, a small quantity of brandy and water is required, after which china or arsenicum may be administered.

Obstruction of the Bowels.—There are very many causes which give rise to obstruction of the bowels, exclusive of hernia, which will receive special attention in another place. Of these, besides the congenital malformations, we have foreign substances lodged in the bowels, twists, false membranes, invagination of the intestines, as the mechanical causes; and as the result of diseased or unhealthy action, there is constipation, chronic peritonitis, strictures, and tumors. Substances taken into the stomach of an indigestible nature often form a nucleus around which other matter forms, and thus the bowel is occluded. The pits or stones of fruit, large quantities of undigested food, occasion such obstruction. In one of my cases there was complete impaction and fecal vomiting, occasioned by a large quantity of green apples being taken into the stomach.

When twists cause the symptoms, the rotation is usually found either in the sigmoid flexure, the cæcum or small intestine, and the pain is aggravated from the first; it is agonizing, and it is circumscribed and accompanied with constipation; the abdomen soon distends, and the convolutions of the intestines may be distinctly seen. The pain is most severe, and is paroxysmal in its nature; there is vomiting, first of ingesta, then of bile, and afterwards of fæces. Finally, entire gangrene of the intestine or perforation takes place. In twists of the bowels, a predisposition to such a condition exists which may be either congenital or acquired, and which consists in a large, flabby, or loose mesentery.

Again, strangulation may be occasioned by false membrane binding down two portions of the intestine, or a loop of omentum may twist around the small intestine, giving rise to alarming symptoms.

Intussusception of the bowels or *invagination*, as it is sometimes called, consists in an inversion of the intestinal tube into the gut immediately below, in the same manner as we invert the top of a stocking when we desire to draw it over the foot. In rare instances the lower part of a gut is pushed into the upper part of the tube. The symptoms of the affection are much the same: great desire to go to stool, with the passage of blood and mucus. The pain is generally located in the region of the ileo-cœcal valve, and there is vomiting of ingesta, bile, and fæces.

After the invagination has continued for a time, a change rapidly takes place in the implicated intestine; congestion and inflammation supervene, and often the entire peritoneum is involved, giving rise to extensive peritonitis. Finally, the constricted portion may become gangrenous and the slough be passed per anum and the patient recover. Holmes records a

case in which eight inches of the ileum, the cœcum with its appendix, with four inches of colon were passed by the rectum and the patient recovered, the bowels acting regularly.

Constipation is also another cause of obstruction of the bowels. The following table, taken from Mr. Hinton, will show the causes of intestinal obstruction in 135 cases in the order of their frequency.

Diseased uterus,		1		Brought up,	19
Stricture of ileum,		1			
Cancer of small intestine,		2		Calculi, foreign bodies,	7
				Doubtful,	8
INTERNAL HERNIÆ:				Peritoneal adhesions,	9
Inguinal, high up,	1			Stricture sigmoid flexure,	10
Diaphragmatic,	2	8		" colon,	11
Mesocolic,	2			" rectum,	11
Obturator,	3			Intussusception,	24
Fecal accumulation,		3		By bands, adherent diverticula, etc,	36
Twist of sigmoid flexure,		4			
		19			135

Treatment.—In the treatment of any of these varieties of obstruction, it may be laid down as a rule that *drastic* purgatives do harm, even when the case is that of constipation. As homœopathists, knowing the value of certain medicines in relieving strangulation and restoring the peristaltic action of the intestines, we can in many instances relieve intussusception. All the mechanical means of relief must come from the anus upward, excepting in those very rare cases in which the invagination takes place from below upward, and the injection must be made through the long tube, passed as nearly as possible to the seat of stricture, and the injection pumped into the abdominal cavity in large quantities (by the gallon if necessary). The injection should contain soap and ox gall.

If we have reason to expect that there is obstruction from twist, convolution or invagination, opium, plumbum, nux, verat., acon., bella. may in some instances be required.

The dioscorea villosa, given in the form of decoction, a wineglassful at a time, has produced in four of my cases more marked results than any other medicine. Inflation of the intestines with air, after the suggestion of Hippocrates, has proved curative. The best method of performing this is by an ordinary good-sized bellows.

If we have reason to believe that impaction of fæces causes the obstruction, olive oil may be given in considerable quantities with the injection as already mentioned. I have known these means result in a cure of a most severe and aggravated case.

If all medicinal means fail, then the surgeon has the alternative of operative procedure, in *abdominal section*, which, although a *dernier ressort*, I consider justifiable in some cases, and although in the two instances in which I have resorted to it, death ensued, there was in one case some days' relief from suffering; the other died in a few hours from shock. In cutting down upon the abdominal parietes, an incision four or five inches in length should be made below the umbilicus in the linea alba; the peritoneum should be raised on a director and carefully cut through, and the obstructed portion of the bowel patiently sought after, and the twist or the invagination carefully removed.

Three cases of this operation were described by Mr. Howard Marsh, Messrs. Hilton Fagge, H. G. Howse, and Mr. Hutchinson respectively,

at a meeting of the Royal Medical and Chirurgical Society of London.* Two of them were successful; one being an infant seven months old, that had been complaining for thirteen days, the other an adult with intussusception without symptoms of strangulation, and without hæmorrhage from the bowels. In each the bowel was withdrawn from the abdominal cavity before reduction was effected. In the infant's case, at least one-half of the colon and an equal part of the small intestine were invaginated. In the adult, the length of the included bowel was eighteen inches. Both recovered without an untoward symptom. The third case (Mr. Hutchinson's), was that of an infant six months old, in whom the intussusception involved the whole length of the colon and ileo-cœcal valve. Considerable difficulty was encountered in replacing the intestines within the abdomen. They were accordingly punctured in two or three places, and to these punctures the operator attributed the fatal issue, which took place within six hours afterward from peritonitis.

Mr. Howard Marsh reports a successful case of abdominal section for intussusception in an infant seven months old. Mr. Henry Howse also reports a case in which he had operated similarly upon an adult with cure resulting. Mr. Jonathan Hutchinson reports a case in which death resulted after reduction. He advises that the lower end of the intussusception should be first sought and brought into the wound. The sheath should be drawn "downwards from off its contents," instead of drawing the contents "upwards from within the sheath." In a discussion in the Royal Medical and Chirurgical Society, it was brought out that failure to reduce by all other means, and the appearance of blood in the stools, formed the justifiable indications for section of the abdomen. There was a difference of opinion upon the length of the incision, Mr. J. Hutchinson saying that he would not make a larger incision than was absolutely necessary. Dr. Sands,† of New York, has also lately made a most successful operation.

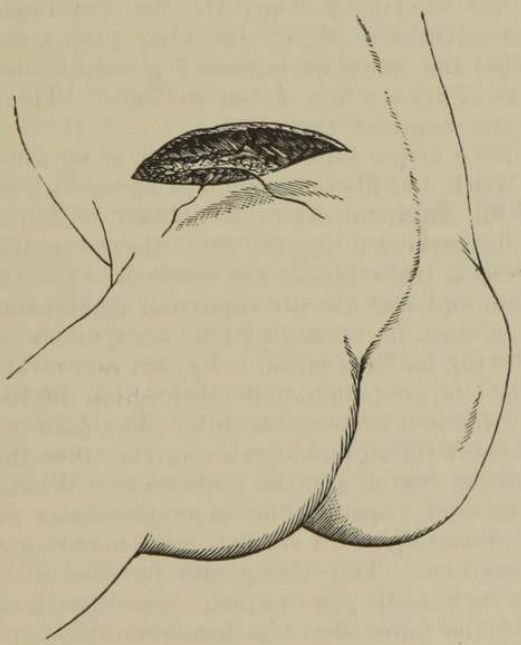
Formation of an Artificial Anus—Colotomy.—There are three operations which can be resorted to for the formation of artificial anus,—one of which is known as Littre's, one as Callisen's, and the third as Amussat's. The first consists in opening the abdomen and peritoneum, and the formation of an artificial anus in these walls by opening the gut and stitching the cut surfaces to the parietes of the belly; the second (Callisen's) consists in opening the *left* loin, and should the obstruction be found seated higher than the rectum, this is the operation which should be preferred; or, if the trouble should exist in the sigmoid flexure or the transverse colon, then the operation of Amussat should take the preference. Whether it be the right or left loin that is to be opened, the same principles guide us, with the difference that Callisen advised a vertical incision, while Amussat preferred and used the transverse. This latter may be used on either side. The operation is thus performed: The patient should be placed on his side and a cushion beneath the back, that the loin should be in a measure bent. The quadratus lumborum and the latissimus dorsi muscles must be sought after and their location fixed. An incision six inches in length should be made in front of the latissimus, or in the outer border of the quadratus muscle; this latter can be found by remembering that it is located about half an inch posterior to the centre of the crest of the ilium. The integument and fascia are now to be divided, the latter upon a director. The abdominal muscles are then carefully to be cut through. During this pro-

* Lancet, December 18th, 1875.

† Month. Abs. of Med. Science, February, 1876; Med. Times and Gazette, January 8th, 1876.

ceeding there may be some hæmorrhage from muscular branches; the vessels must all be carefully secured before further steps are proceeded with. We next come down upon the transversalis fascia, which must be raised and divided upon a director, after which we generally encounter some adipose tissue, which must also be opened in the same manner; beneath this last layer the gut is found. The intestine should now be hooked up with a stout curved needle, and two strong ligatures passed through one lip of the wound into the gut and out again through the other lip of the wound. These ligatures should only pass through integument and gut, the muscles being left out of the way. By this means the intestine is brought up even with the cut surfaces. A longitudinal incision should then be made in the intestine over the ligatures, and, in the majority of cases, a great gush of feculent matter and gas passes out. The centre of each ligature should afterwards be drawn out and divided, thus making four ligatures, two on each side, which, when tied, fix the margins of the gut to the abdominal walls; to make the whole more secure, an additional suture or two may be made, and the artificial anus is complete. It is well to oil the cut surfaces after the operation to prevent the irritation of fecal matter. The direction of incision is well illustrated in Fig. 389.

Fig. 389.



After the wound has healed, a folded napkin secured by a roller can be worn, or an ivory ball made to fit the artificial anus and secured by a spring answers the purpose admirably.

Some surgeons advise an india-rubber ball with a portion of its surface cut away, to be placed over the wound; being cup-shaped it can receive any little accumulation which may pass through the artificial anus. Sometimes a contraction of the artificial opening takes place; in such instances a sponge tent is the remedy.

Perityphlitic Abscess.—The connective tissue which attaches the cæcum

and the colon together, is often attacked with inflammation. The symptoms are intense pain in the cœcal region, tenderness on pressure, generally debility, high fever, worse at night, and varying in intensity during the day; tympanites is often present, the bowels are constipated, and all the symptoms of severe acute inflammation present themselves. We also have a secondary perityphlitis, which begins with a chill, and presents many symptoms of pyæmia. The acute disease is caused by cold or traumatic agencies; the *secondary* is found during the course of typhus fever, in puerperal fever, or from absorption of septic material; very often the inflammation terminates in suppuration: we then have the *perityphlitic abscess*, the especial surgical treatment of which must be here considered. The operations are varied, but in my own cases, four in number, I have invariably used the aspirator, and enlarged the opening if necessary, and then washed out the abdominal cavity with carbolic acid solution, 1 to 90, in the same manner as we adopt after ovariotomy. I have here given a brief history of this operation, because at the present writing, it is somewhat novel.

Perityphlitic Abscess.—In regard to the history of this operation, Prof. Erskine Mason and Dr. Gurdon Buck have observed* that the first published account of it is contained in the *London Medical Gazette*, for 1848. This refers to a case related by Mr. Hancock to the Medical Society of London, the operation having been performed, April 17th, 1848. Little notice was taken of the announcement, either in England or in this country; and it was not until 1867, when Dr. Willard Parker published his paper in the *Medical Record*, March 1st, 1867, giving the history of four successful cases, that the operation became fully established in the favor of the profession. Dr. Parker's first operation was in 1843, thus, apparently, antedating the operations of all others.

In December, 1875, three cases were described by Dr. L. Weber before the New York Academy of Medicine.† The operations were performed on the 7th, 8th, and 9th days, respectively. In all, he followed Dr. Willard Parker's method, by making a long incision over the region of the suspected abscess until the fascia transversalis was reached. At this point, the operation was suspended, and the abscess ruptured, spontaneously, after a short time, in one case, and in the remaining two cases, under the pressure of the finger, while searching for fluctuation. Perfect recoveries ensued.

Dr. Gurdon Buck reports a case in detail,‡ which affords a good example of the method of operation preferred by him. The patient was a gentleman, aged 26, of good constitution and regular habits. On the eleventh day of the disease, the precise seat of greatest sensitiveness having been determined by careful and repeated examinations, a puncture was made through the skin at the point chosen upon the surface of the tumor, and a sharp-pointed canula was advanced cautiously through the parietes of the abdomen to the depth of over one inch, when pus escaped. The canula serving as a guide, a sharp-pointed bistoury was then conducted into the cavity of the abscess, and its opening enlarged. At the same time, the external wound was also enlarged to the extent of nearly two inches, and the entrance of the abscess further dilated by the introduction of a dressing-forceps. A free discharge of fetid pus followed, together with an abundant escape of gas. On the twenty-eighth day after the operation, the wound had healed, and the patient was out of doors.

A case which terminated fatally seventy-four days after the abscess had been freely opened, has been related by Prof. Erskine Mason.§ It was that

* N. Y. Med. Record, Jan. 1st and June 10th, 1876.
† Ibid., Jan. 1st, 1876. ‡ Ibid., Jan. 15th, 1876. § Ibid., June 10th, 1876.

of a gentleman, 32 years of age, of very delicate constitution, and the operation was not performed until the seventeenth day from the date of the attack. A No. 3 trocar attached to the aspirator was introduced into the tumor at a point, half an inch to the left, and two inches above the anterior superior spinous process of the ilium. A curved bistoury was then passed along the side of the trocar as a guide, and the opening enlarged for an inch and a half. The amount of fluid at once discharged was exceedingly large; and the discharge, profuse at times, continued for seventy-four days, or until death. Up to the seventieth day, the case appeared to do well, the discharge becoming very slight and thin in character. Prof. Mason's theory as to the cause of the fatal result is, that some foreign body passing from the intestine had become lodged in some recess in the walls of the abscess, and, failing to be removed by the daily injections, had excited irritation and ulcerative action, which resulted in a perforation into the peritoneal cavity.

A case is reported by Edgar Holden, M.D., of Newark, N. J.,* of a stout, robust man, in which, on the twelfth day of the disease, no satisfactory evidence of actual suppuration had presented. The hypodermic needle, however, when introduced for the second time, just before the operation, drew off about twenty drops of exceedingly fetid pus. A curvilinear incision was now made, two and a half inches in length, its centre just below the point of puncture of the needle, and one finger's breadth in front of the anterior superior spinous process. When the fascia transversalis was being punctured, there was a sudden gush of disagreeable pus, amounting to a little more than a pint. The finger being introduced, the appendix vermiformis could be felt at the lower extremity of the cavity, the ascending colon pressing towards the outlet, and only separated from it by an exceedingly thin wall, probably the peritoneum. No opening could be detected into the bowel or appendix. The upper part of the incision was closed with a wire suture; and on the following day a glass drainage-tube, just large enough to enter the opening in the transversalis fascia, was introduced and secured. The wound and cavity were cleansed daily with warm salt-water. Twenty-three days after the operation, the wound had entirely closed, and the patient appeared well, though very weak.

Dr. J. C. Adams, of Lake City, Minn., performed the operation in the case of an Irishwoman, 40 years of age, and the mother of eleven children.† On the eleventh day after the setting in of the symptoms, the patient had a severe chill, and complained of a "burning in the right side." Temp. 104°; pulse 100, and very feeble. Repeated and careful examination by pressure, palpation, and percussion, detected a small, deepseated, ill-defined induration, and a point of greatest tenderness and dulness, half an inch above, and one inch to the inside of the anterior superior spinous process of the ilium. The integuments, fat, external and internal oblique muscles, and the fibres of the transversalis attached to the outer third of Poupart's ligament, having been divided, an incision was made one inch above the anterior superior spinous process of the ilium, and parallel with Poupart's ligament, three inches. The induration could now be distinctly felt and partly defined, but no fluctuation could be perceived. A No. 1 aspirator needle attached to a small syringe was introduced, three inches, into the tumor—first and second times toward its borders, each time obtaining a few drops of pus; third time into the point of greatest tenderness and dulness, withdrawing a teaspoonful of fetid pus. From this latter point, a half inch incision was made, into which the end of the finger was inserted, and

* N. Y. Med. Record, Dec. 23d, 1876. † Ibid., March 24th, 1877.

bored through into the cavity of the abscess. *Extremely* fetid pus gushed out in a continuous stream. The pubic third of the wound having been closed by suture, and antiseptic dressing applied, a female catheter was daily inserted for five days in the hole through the transversalis. All dangerous symptoms subsided speedily after the operation. Two weeks later, the wound was almost closed, and the patient fast regaining her usual health.

Leonard Weber, M.D., in a paper read before the New York Academy of Medicine,* gives the history of three cases operated on by him since 1874. In all, the operation was done in the same way, viz., by a four and a half inch incision above and parallel to Poupart's ligament, narrowing down to an inch and a half at the fascia transversalis. The incision was made as follows: Putting the thumb of the left hand in the inguinal fold close to Poupart's ligament, the four fingers were laid well upon the upper circumference of the abscess, making gentle but firm pressure downward. Midway between thumb and fingers thus placed in position, skin, fascia, and the fibres of the external and internal oblique muscles were divided, the exploring needle entered at a point where there was a certainty, from previous repeated examinations, that pus would be obtained, and when obtained, the knife was carried through the remaining tissues by a single cut. Immediately after the operation, the cavity of the abscess was washed out with carbolized water, and twice daily thereafter until the discharge had lost all its fetid character, and the wound had become too small for the further introduction of a drainage-tube. All the cases recovered perfectly; although, in the first case, traumatic erysipelas set in on the fifth day after operation, and lasted five days, and in the second case, in the third week after the operation, another abscess formed in the neighborhood of the first one, with eventual perforation of the bowel, and discharge of pus per rectum, and was followed, in the sixth week, by still another, which perforated the bladder, with free discharge of pus per urethram. In every case, the centre of the cicatrix required the support of a truss for a longer or shorter time after recovery.

The following case was noted in the service of Dr. H. B. Sands, attending surgeon, New York Hospital.† Five days after admission, and fifteen days after the onset of the disease, suppuration was detected low down in the abdomen, near the median line. Thereupon an incision, about two inches in length, was made, parallel with Poupart's ligament. The discharge of pus was very great; and the finger being introduced into the cavity of the abscess, it was found to extend upward and outward in the direction of the caput coli. The pus was extremely offensive, but contained apparently no fecal matter. The temperature at once fell to the normal standard, and the patient made a perfect recovery, the only drawback being a difficulty in passing urine, which continued for a few days.

Gastrotomy and Gastrostomy.—An article by Dr. J. H. Pooley, of Columbus, O.,‡ contains a table of 11 cases of gastrotomy performed for removal of foreign bodies, dating from 1613 up to 1856. All but one of these cases recovered. He also gives a similarly arranged table of 18 cases of gastrostomy, performed for stricture of the œsophagus, from 1849 to 1872. The result in all these cases was death.

The *Gaz. Méd. de Paris*, for October 28th, 1876, contains an account of the first really successful case of gastrostomy on record. The operation was performed by M. Verneuil, on a boy of 17, in whom the stricture was caused by swallowing a solution of caustic potash. An oblique incision

* N. Y. Med. Record, Jan. 19th, 1878.
† Ibid., Feb. 18th, 1878.
‡ Ibid., November 26th, 1876.

about two inches in length was made parallel to the cartilaginous border of the false ribs. When the stomach presented itself, it was immediately transfixed and held in the wound by two long acupuncture-needles. Fourteen metallic sutures were then passed through the skin, parietal peritoneum and wall of the stomach ; the acupuncture-needles were withdrawn, and an incision was made through the wall of the stomach, just large enough to admit a large gum catheter, which was secured in position by tapes and collodion applied over the abdomen. The slight hæmorrhage was controlled by hæmostatic forceps, a dozen or more pairs of which were also used to secure the parietal layer of the peritoneum while applying the sutures. The antiseptic method was strictly followed. There was no fever. The sutures fell out spontaneously, and a small portion of the gastric wall included between them sloughed, so that the opening became larger than at first. The patient was fed through the catheter with soup, milk, eggs, wine, etc. In two months he had completely regained his strength and energy. He experienced hunger, and fed himself with all sorts of food.

The operation, however, is always a doubtful one, and is thus well described by Mr. Bryant (ether or chloroform may be administered) : " The patient should be placed upon his back, and an incision made below the ribs on the left side, the object of the surgeon being to find the cardiac end of the stomach in preference to the pyloric. The line of the linea semilunaris is the ordinary one that has been used for the incision, a cut three or four inches long being made carefully through the tissues seriatim down to the fascia lining the muscles, every vessel being twisted or tied as it bleeds. In my own operation I made an oblique incision along the lower borders of the ribs, commencing at the linea semilunaris, with the view of catching the cardiac end of the stomach, and I may say that I picked the stomach up with my fingers very readily ; the fascia and peritoneum are then to be divided. With the thumb and finger the stomach is now to be sought, and when caught, held. This is best effected by the passage of a needle armed with a double silk through its coats, the silk being left with long ends ; a second should also be passed about three-quarters of an inch lower down. The surgeon has then to fasten the stomach to the margins of the wound, and the quill suture seems to be the best means to use. To do this he may first pass the needles that have already traversed the stomach, and are still armed, through one side of the wound, and with a second needle draw the free ends of the ligature, when threaded, through the other. The stomach should then be opened over the ligatures that have been passed through it, the incision being made in the line of the wound ; the centre of the double ligatures will then be exposed, and these should be drawn well out and divided. There will then be two double ligatures through each side of the opening in the stomach and the margin of the wound. On tying the two ends over two pieces of bougie, one introduced against the inner surface of the stomach, and the other upon the integument, the parts are secured, the bougies admirably compressing the thin walls of the stomach against the integuments, and retaining them there. One or two other sutures will probably be required to close the wound, and an additional one at either end of the opening in the stomach to keep it in its place; the operation is then completed. When the quill suture is not used, the stomach must be stitched to the margins of the wound in the ordinary way, but a more accurate adaptation of the parts and greater security is acquired by the quill suture than any other, and what is more, the pieces of bougie are capital guides to the orifice into the stomach, the slightest traction upon them rendering it patent for purposes of feeding ;

for this purpose one of the sutures should be left long on either lip of the wound. After the operation it is well to desist from giving food for a few hours, to give the stomach rest. Where enemata can be tolerated they should be used. After a day or so, according to circumstances, liquid nourishment should be administered in small quantities through a tube; milk and eggs being probably the best, or milk alone. Care should be observed that too much food is not given, as it retards progress, a quart or three pints of milk in twenty-four hours being ample. The edges of the wound should be carefully protected by oiled lint. The sutures may probably be removed wholly or in part on the fifth or sixth day."

Extirpation of the Spleen.—This operation has been performed about thirty-eight times, and curiously enough when traumatism was the factor, the results have been much more favorable than when the organ was removed for disease. In eighteen of the cases mentioned above, in which the operation was performed for disease, *all* died. There appears to be a very peculiar liability to what might be termed secondary shock and secondary hæmorrhage, after the removal of the spleen. A transverse or a curved incision is made over the body of the organ, and the parts divided layer after layer on a director until the spleen is reached. The adhesions must be then sought for, and broken away, and the organ turned out, the splenic arteries and veins are then to be secured by a double strong carbolized catgut ligature, and the spleen cut off above them. The patient must be very carefully watched for several days, and especially the first few hours. The operation as yet has hardly taken its place in the regular domain of surgery.

Prof. Billroth reports a case of removal of a greatly enlarged spleen (attended with great leuchæmia, the red globules being five to one of the white). The operation was performed on a woman of forty-five. The patient rallied from the anæsthesia, but died four and a half hours after the operation, from hæmorrhage due to the giving way of one of the ligatures on account of a strain. Another case is reported in which the greatly hypertrophied spleen was removed from a man of twenty years; this patient also rallied, spoke, and seemed not unduly collapsed, but in making an effort to sit up, he fell back and died.*

CHAPTER XXXVIII.

HERNIA—RUPTURE.

In surgical literature there is scarcely a subject that covers so wide, so important, and so interesting a field as that of hernia. There are so many varieties of the affection and so many individuals who suffer from it, so numerous are the operations and apparatus recommended for its relief, and its symptoms are so important and yet of such variable character—at the one time indicating rapid dissolution, and at another endured for years with apparently slight inconvenience—that we cannot but regard it as every way worthy of careful thought, reading, and experiments of both the physician and surgeon.

* American Journal of Medical Sciences, July, 1877, p. 261.

By the term hernia, may be understood a protrusion of the contents of any cavity of the body: thus by encephalocele we mean a hernia of the brain, and by pneumocele a hernia of the thorax; but the term, however, by common consent is now restricted to those protrusions that occur from within the abdominal cavity through natural openings or such parts as are but comparatively slightly covered by the tissues.

It is interesting to glance for a moment at the many forms of the protrusion that are embraced by the term *herniæ abdominalis.* We have the following:

ABDOMINAL HERNIA.

I. *In Relation to the Anatomical Site.*

1. *Direct inguinal.*
2. *Oblique inguinal.*

The difference between these two varieties is indicated by the terms designating them. In the first, the gut protrudes through the external ring, having pushed with it the conjoined tendon of the internal oblique and transversalis muscles; while in the second the intestine, entering the inguinal canal at the internal ring, passes through the entire length of the inguinal canal, taking as one of its coverings a few of the lower fibres of the internal oblique muscle (cremasteric fascia), and protruding through the external ring. In certain cases of direct hernia the gut passes out of the abdomen through Hesselbach's triangle.

3. *Femoral* or *crural*—escaping through the crural canal.
4. *Infra-pubian*—escaping through the opening giving passage to the infra-pubic vessels.
5. *Ischiatic*—escaping through the sacro-sciatic notch.
6. *Umbilical*—escaping through the umbilicus.
7. *Epigastric*—escaping through the linea alba above the umbilicus.
8. *Hypogastric*—escaping through the linea alba below the umbilicus.
9. *Perinœal*—escaping through the levator ani muscle.
10. *Diaphragmatic*—escaping through the diaphragm.

II. *In Relation to the Parts Protruded.*

1. *Enterocele*—if the intestines alone be displaced.
2. *Epiplocele*—if the omentum alone be displaced.
3. *Entero-epiplocele*—if both the intestines and omentum protrude.

III. *In Relation to Therapeutical Indication.*

1. *Reducible.*
2. *Irreducible.*
3. *Incarcerated.*
4. *Strangulated.*

} The terms explaining themselves.

The first variety may partake of the nature of the last two: thus we may have an inguinal hernia (direct) which may be an entero-epiplocele and may be irreducible.

Labial or pudendal, perinæal, and vaginal herniæ are of comparatively rare occurrence; their names indicating the parts through which the intestine protrudes.

Ovarian hernia is that variety wherein the ovary enters the ring, cov-

* Bellevue Hospital Reports for 1870, p. 159.

ered by the peritoneum, presenting all the symptoms of an inguinal hernia. Dr. Hamilton and Dr. Terry* have reported twelve cases of ovarian hernia.

Congenital hernia occurs soon after birth. At this time the intestine or omentum passes out of the abdomen, accompanies the testicle in its descent and becomes lodged in the pouch of peritoneum which forms the tunica vaginalis testis, *tubular vaginal process*, before its communication with the general peritoneal cavity has become obliterated. The sac of this hernia is, therefore, formed by the tunica vaginalis testis, having all the other coverings of the oblique variety. The "*congenital form*" of hernia according to Birkett, is that form of the congenital which may appear in after life, from the tubular vaginal process not having been entirely closed; from some effort on the part of the patient the adhesions give way, and the gut descends.

Encysted hernia infantilis is an *acquired* hernia, is more complicated than the latter, because it has, as it were, two sacs. The communication between the cavity of the tunica vaginalis and that of the abdomen is closed at its upper part, but the former is unusually large and continues high up the cord, and contains more or less serous fluid. Behind this is found a hernia invested by the ordinary peritoneal sac.

The following diagrams with their explanations I have taken from Bryant. They are, to my mind, the best descriptions of the different varieties of hernia that I have ever seen, and convey to the eye of the student an explanation of many important points in the nomenclature of hernia.

FIG. 390. FIG. 391. FIG. 392. FIG. 393. FIG. 394.

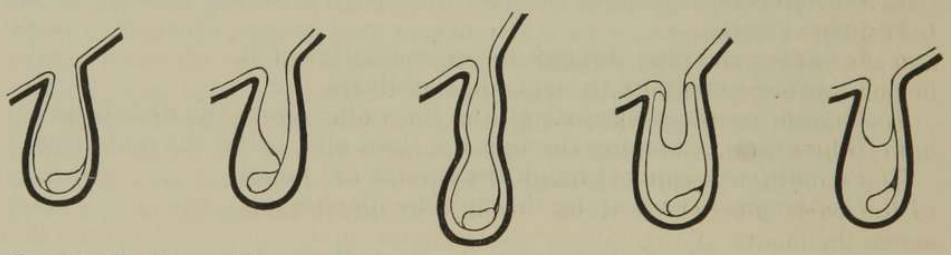


FIG. 390.—The diagram illustrates the tubular vaginal process of peritoneum open down to the testicle, into which a hernia may descend; when the descent occurs at birth it is called "congenital;" when at a later period of life the "congenital form" of hernia, Birkett's "hernia into the vaginal process of peritoneum," or Malgaigne's "hernia of infancy."

FIG. 391.—The same process of peritoneum open half way down the cord, into which a hernia may descend at birth or at a later period. Birkett's "hernia into the funicular portion of the vaginal process of the peritoneum."

FIG. 392.—The same process undergoing natural contraction above the testicle, explaining the hour-glass contraction met with in the congenital form of scrotal hernia as well as in hydrocele.

FIG. 393.—Diagram showing the formation of the "acquired congenital form of hernia," the "encysted of Sir A. Cooper," "the infantile of Hey," the acquired hernial sac being pushed into the open tunica vaginalis which incloses it.

FIG. 394.—Diagram illustrating the formation of the "acquired" hernial sac distinct from the testicle or vaginal process of peritoneum, which has closed.

Reducible Hernia.—In this variety of hernia the tumor increases in size or descends when the patient is erect, and diminishes or disappears during the recumbent position.

Sufficient inflammation has not taken place to cause adhesions of the sac or rings, and no stricture exists to prevent the return of the bowel.

The symptoms are well marked: when the gut returns to the abdomen, either spontaneously or by taxis, a peculiar gurgling sound is heard by the

* Bellevue Hospital Reports, 1870, p. 159.

surgeon and patient. The tumor is larger after a meal, and an impulse is communicated to it when the patient coughs. If the tumor contain omentum, a peculiar doughy sensation is communicated to the hand of the ex-

FIG. 395. FIG. 396. FIG. 397. FIG. 398.

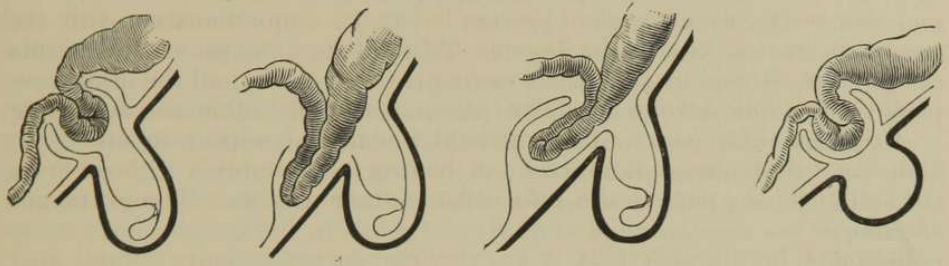


FIG. 395.—Illustrates the neck of the hernial sac pushed back beneath the abdominal parietes with the strangulated bowel.

FIG. 396.—Shows the space in the subperitoneal connective tissue into which intestine may be pushed through a rupture in the neck of the hernial sac; the intestine being still strangulated by the neck.

FIG. 397.—Diagram showing how the neck of the vaginal process may be so stretched into a sac placed between the tissues of the abdominal walls either upwards or downwards, between the skin and muscles, muscles themselves, or between the muscles and the internal abdominal fascia—forming the intraparietal, intermuscular, or interstitial sac; hernia *en bissac* of the French; "additional sac" of Birkett.

FIG. 398.—Diagram illustrating the reduction of the sac of a femoral hernia *en masse* with the strangulated intestine.

aminer. The hernia may, however, consist of both intestine and omentum (entero-epiplocele).

If suffered to increase, a reducible hernia may become enormously large, and the patient not only experience great disorder of the digestive organs, but be constantly liable to a strangulation of the gut.

Irreducible hernia is that form in which there exists a protrusion of the bowel which cannot be returned to the abdomen.

This condition is caused either by adhesion of the sac to its contents, or to the parts into which it has passed, by membranous bands extending across the mouth of the sac, by enlargement of the gut, or by contraction of the opening through which the tumor has passed. From the greater or less obstruction to the passage of fecal matter, and the fact of its being a foreign body, an irreducible hernia gives rise to certain symptoms, such as dragging in the abdomen, sickness at the stomach, vomiting of an obstinate character, colic, and constipation.

If the patient be corpulent, the above symptoms are generally more troublesome; and if it be a woman, and she become pregnant, these conditions will be much aggravated. These tumors are, of course, exposed to all the consequences of violence and injury, hence several cases are recorded in which the protruded bowel has been ruptured by falls or blows.

A strangulated hernia is one in which the contents of the intestines are prevented from passing to the anus and the venous circulation is impeded.

A hernial tumor may become strangulated when the contents of the sac increase its size, or it becomes enlarged from inflammation. The symptoms of strangulated hernia are in the majority of instances so well expressed as to allow of easy recognition. Yet it occasionally happens that the abnormal condition is confounded with *ileus* and other intestinal affections. The tumor resists the impression of the fingers, is painful to the touch, and the pain is increased by coughing, sneezing, or standing upright.

If not relieved, these symptoms are soon followed by sickness of the

stomach, frequent retching, stoppage of alvine discharges, hard, frequent pulse, high fever, and great pain all over the abdomen. Convulsive hiccough sets in, and all these painful conditions continue to increase in severity. Vomiting, first of ingesta, then of bile, and finally of fæces, results.

If relief is not afforded, the patient in a short time becomes perfectly easy, and all the previous symptoms subside. But the skin becomes cold and moist; the eyes glassy; the tumor has an emphysematous feel and communicates crepitus to the fingers. This indicates gangrene. Even now the gut may return spontaneously or by gentle pressure, and the patient express himself relieved, but death will almost inevitably follow in a short time.

An incarcerated hernia is one in which the protruded portions of the abdominal contents are retained in their abnormal situation without being strangulated or giving rise to the inflammatory process. The generation of gases or the accumulation of fluids and solids in the sac may prevent its reduction.

Medical Treatment of Hernia.—In the medical treatment of hernia there is no doubt of the efficacy of homœopathic medication, not only in the early stages of strangulated hernia, but in advanced states of this disorder, even after fecal vomiting has commenced. I am positive in this assertion, and speak from experience in many cases, and so much so indeed that I rarely am obliged to operate for strangulated inguinal hernia.

With the femoral, though I have not been so successful, yet the medicines have given most satisfactory results, the principal being nux vom., opium, and veratrum. Others that are efficacious are aconite, sulph. ac., lycopodium, and in some cases ars., rhus tox and sulph.

Aconite should be employed when there is inflammation of the affected part with excessive sensibility to the touch, accompanied with considerable fever, and quick, hard, and full pulse. It is also indicated when there is bilious vomiting, cold and clammy sweat, with violent burning pain in the abdomen. The dose should be repeated every half hour until symptoms of alleviation present themselves, after which the intervals of repetition should be considerably lengthened.

In the *North American Journal of Homœopathy* for November, 1861, Dr. H. G. Dunnell, of New York, reports the cure of a strangulated inguinal hernia, after stercoraceous vomiting had set in, and after the celebrated surgeon, Prof. Willard Parker, had pronounced the case incurable without an operation. Opium 1, three grains every two hours, appears to have produced the most decided effect in this case; although *acon.*, *arsen.*, *nux*, *sulph.*, and *verat.* were employed.

Nux vomica for its specific action is, however, the most important medicine in the treatment of this morbid condition, and is to be preferred when respiration is laborious and oppressed, when the tumor is sensitive to pressure, but not in so great a degree as when *aconite* is called for. When there is bitter vomiting, and when the strangulation has been occasioned from errors in diet or exposure to cold, *nux* is strongly demanded.

Perhaps a surer method of treatment in the generality of instances, unless the particular indications of a single medicine are very prominent, would be to exhibit nux and aconite in alternation.

According to Hartmann, *sulph. ac.* is a specific not only for certain cases of hernia, but also for the chronic diathesis which leads to intestinal protrusion.

If the above medicines do not produce the desired effect, and there be cold moist skin, coldness of the extremities, and profuse vomiting, *veratrum* should be administered; but if after a few doses of this medicine relief be

not obtained, and there be vomiting of fecal matter, with hard distended abdomen and a somewhat comatose condition, *opium* should be exhibited.

Dr. Laurie, in his *Homœopathic Practice of Physic*,* inserts some very practical remarks of Mr. Traub on the homœopathic treatment of strangulated hernia. The latter gentleman, from his own experience, recommends most highly *nux vom.*, *sulph. ac.*, *lyc.*, *bell.*, and, moreover, remarks concerning *aconite*, that although it does not often, in the series of symptoms that it is capable of producing, exhibit those which accompany the formation and incarceration of a hernia, yet it cannot be dispensed with as an intermediate auxiliary remedy in certain forms of incarcerated displacement, on account of the unlimited influence which it exercises upon the vascular, and especially upon the capillary system; and accordingly not only comprises among its symptoms the type of inflammatory fever, but also the state of acute local inflammation. Further, on account of its effects upon the mind, which manifest themselves particularly in the form of inconsolable anguish, forebodings of death and great disposition to be frightened, it is well adapted to persons affected with incarcerated hernia. M. Traub also mentions three varieties of strangulation. In the first the rupture is one of recent occurrence, or one that had formerly existed suddenly becomes incarcerated, in which case the rupture is small, and the symptoms are of great intensity. They consist in a pinching or squeezing and pressing sensation in the region of the rupture, violent dragging pain with periodical tearing, and spasmodic constriction in the abdomen, nausea, or actual vomiting of an acrid mucus, obstruction with frequent inclination for stool. Most of these symptoms are increased by the slightest pressure on the rupture, and also by movement. *Nux vom.* corresponds with the symptoms of this form of strangulation, and, according to the above authority, a dose consisting of ten or fifteen globules of the higher potencies frequently ameliorates the symptoms. If at the same time the relief is afforded, a sensation of movement takes place in the rupture, or if a gurgling noise be heard, a remission of the constricting muscular fibres ensues, and a speedy replacement without external treatment may be expected. Should this not be the case, but, on the contrary, the sufferings return with severity, and a violent burning prevails in the region of the rupture, and the superincumbent integuments become very sensitive to the slightest touch, or if the heat in the affected parts increase, and thus indicates an unnatural determination of blood to the parts; or should the strangulation have been preceded by a fright or other mental affection, and the patient be in a state of general irritation or excitement, *aconite* should be administered, and an hour afterward *nux vom.* (in a lower dilution than in the first instance) should be prescribed. The second variety of strangulation generally appears somewhat suddenly, and the rupture is small; there is a tearing, dragging pain, which is often the most prominent symptom, and is experienced both in the rupture and the whole abdomen. There are also fugitive stitches in the region of the hernia, and the symptoms return periodically, disappearing almost entirely for a time. The patient is much exhausted during the remissions, complaining of a general sensation of cold, the abdomen is much distended by flatus, and, after continued nausea, there is thrown off an acrid-tasting fluid. There is likewise a very urgent inclination for stool, but no evacuation takes place.

In this form of incarceration likewise, *nux vom.* is an excellent medicine, but *lyc.* vies with it in efficacy. According to Traub these may be administered in alternation. If, however, the symptoms appear in a crural rupture,

* Page 503.

if the patient be a female, and if, moreover, the individual be of a mild yielding disposition, *lyc.* is to be preferred. If throbbing, burning, and other symptoms indicating *acon.* become predominant, of course that medicine should be administered. The third form of strangulation occurs chiefly in aged persons, and in ruptures of long standing, and generally approaches insidiously. It betrays itself at first by a distressing, pinching, and constrictive sensation in the region of the rupture, by uneasiness and fulness of the abdomen, and by periodical sickness and constipation. The hernia is not very painful to the touch, and the incarcerated part is not so tense and hard as in the two preceding forms, but feels more doughy. This strangulation may exist for days without any perceptible increase in the concomitant symptoms. Gradually, however, twistings and pinchings, combined with periodic transitory tearing pains supervene in the abdomen and groin. The sickness then becomes more lasting, a sweetish, saline, or bitter fluid is sometimes eructated, not unfrequently followed by vomiting of a watery fluid, and subsequently of ingesta.

With this form also two medicines concur; one is again *nux vom.*, which competes with *acid. sulph.* for prominence. If the patient is of a sanguine, choleric temperament, which is, however, but seldom the case, *nux vom.* in a low dilution may be given, and should the removal of the incarceration not be effected in twelve hours, *sulph. ac.* must be administered.

The operations for the different varieties of hernia will be explained in the following pages. Among the means, however, to remedy strangulated or incarcerated hernia which present themselves, the *taxis* stands prominently forward as so natural a mechanical means for overcoming a mechanical difficulty that it should be always attempted before resorting to the knife.

Taxis.—By taxis is understood the endeavor to reduce herniæ by certain manipulations, for the purpose of restoring the protruded intestine to its normal position within the abdomen.

The *position* of the patient during taxis is of great importance, and careful attention to it will often facilitate the success of the operation. Generally, the pelvis should be placed higher than the shoulders, and the patient should avoid as much as possible every exertion of the abdominal muscles. There are several postures, each or all of which may be tried in performing taxis.

1. Place the patient upon the back, flex the leg upon the thigh, the thigh upon the abdomen, and by rotating the limb inward relax the columns of the ring. With the patient in this position I have been able to reduce hernia where others have failed.

2. Much advantage may often be derived by elevating the hips and depressing the trunk of the patient, together with the flexion and rotation as above.

3. By *inversion of the patient* I have known a most severe case of strangulated hernia reduced. I had been called to perform herniotomy in the case, but was unable, from a previous engagement, to proceed at once to the house of the patient. In the meantime my friend, Dr. Youlin, was sent for. Arriving, he turned the sufferer "topsy turvy," and suddenly with a gurgling sound the gut returned into the abdomen after having been strangulated nearly two days.

4. The patient placed upon the side on which the hernia exists, in the semi-prone position, with the thigh flexed upon the body.

5. *The upright position* may be a novel one, yet it is urged by those who have had practical experience in the reduction of herniæ, that it succeeds after other means have entirely failed.

Dr. F. H. Nichols, of Cumming, Ga.,* in giving his opinion of taxis in hernia, says: "I hold that every case of strangulated hernia can be reduced and can be cured by the hands alone. And I also believe that active cathartics or powerful anodynes are seldom useful or necessary in such cases." Dr. Nichols follows a plan of local treatment very similar to that which I have adopted, viz., very warm or hot cloths saturated with chloroform. Of the more intractable strangulations, the doctor says: "In such cases I do not despair. I carefully readjust the pressure, reduce or lessen the tumor as much as possible, holding the part, and making the pressure close to the point of stricture with one hand, and with the other, after holding it in cold water a few minutes, I suddenly seize the abdomen below the navel, and carry it upwards, at the same time using a little more force or pressure with my other hand at the stricture.

"The shock of the cold wet hand and the continued gentle pressure at the stricture, never fail to unlock the bowel, while the patient cries out, 'Oh!' only to find himself completely relieved, and the hernia gone: gone into the abdomen, and the cure is accomplished.

"I thus excite the retractive power of the bowels as well as of the whole abdomen. This power is adequate for the reduction of many cases of strangulated hernia alone.

"It becomes potential and all-sufficient when conjoined with the proper pressure at the point of stricture; amply so, for every case of strangulated hernia that I have ever seen.

"*I know this by experience, and I fully believe that it is the remedy 'par excellence' in every obstinate case of strangulated hernia.* This retractive power can be excited at our will, can be united with external pressure, is without risk to the patient, and in my hands has always proved successful."

The various manipulations employed in the ordinary operation of taxis are substantially as follows:

It will generally be found desirable that the bladder and rectum be thoroughly evacuated.

The patient having assumed that position, among those already described, which seems best calculated to relax the constricted parts, chloroform should be administered, to the extent of complete obliviousness, in all severe cases.

Having obtained a thorough relaxation of the whole system, the surgeon grasps the tumor in his right hand and draws it gently downward, in order to disengage the protrusion from the neck of the sac, and at the same time give it the proper direction in relation to the opening through which he desires to return the protruding bowel.

This being done, a gentle, steady, uniform pressure is applied to the tumor with the right hand to force out its contents, while the left thumb and index-finger are applied to the upper part of the tumor to fix it at that point and thus facilitate its reduction. The direction of the pressure must correspond inversely to the course and situation of the hernial protrusion. In *oblique inguinal hernia* the force should be directed *obliquely upward* and *outward*, in the course of the inguinal canal; whereas in the *direct* variety the parts should be pushed directly upward, or upward with a slight inclination outward. Acting upon the same principle in *femoral hernia*, the tumor is first pushed directly backward until fairly beyond the reach of the ligament of Hey, then the pressure being made in an upward direction, the reduction is accomplished. If in any case, the hernial tumor be of large size, the manipulations should be performed with both hands, but always with much caution, lest the parts should sustain still further injury.

* Medical and Surgical Reporter, Phila., Jan. 4th, 1873.

Soon after the continuous application of this pressure, the operator will generally be aware of some diminution in the size of the tumor, from the escape of gas or fecal matter, and by steadily continuing the treatment, will find one portion after another of the protruded parts going back, until, finally, with a distinct gurgling sound, the sac is emptied of its contents.

Sometimes only a trifling pressure is sufficient for its complete replacement, while at other times considerable force is required.

The length of time that may be devoted to these efforts will vary according to circumstances.

In general an old hernia will bear pressure better and longer than one of recent date, and one of large size will be found more tolerant than a smaller one.

Puncturing the Intestine.—I am very much of the belief that puncturing the intestine, in those difficult cases in which reduction is impracticable, will in many cases supersede other operative measures. The common-sense of the proceeding is very evident. There can be no doubt, from the cases that have already been relieved in this manner, that ultimately the operation will be attempted before resorting to the graver one of herniotomy. Mr. Thomas Bryant, of Guy's Hospital, is very much in favor of this method and has adopted it with success, and in several instances I have resorted to it. Dr. Mandeville, of Newark, has also performed the operation successfully. A fine aspirating needle should be carefully introduced into the tumor, and the fluid cautiously and slowly withdrawn. The puncture may also be made, as I practised in three of my cases, with a good-sized hypodermic syringe.

In a very severe case of intestinal occlusion, in which the entire abdominal wall was incised, it was utterly impossible for either Dr. Talbot or myself to return the intestines into the abdominal cavity, so enormously were they distended, until several punctures were made, whereupon an immense amount of gas escaped, and the intestines were easily returned.

Trusses.—At the present day there are a very great variety of trusses, which have been devised for retaining the bowel within the abdomen after the reduction of hernia. Some of these present advantages over others, and some are worse than useless. I am also very well assured of one fact, that a truss that will be of perfect service in one case, may fail entirely in another, and indeed a truss may suit a case of hernia at one time and not at another. A truss is nothing more than a pad which fits upon or near the rings, and a spring or a bandage to keep this pad in place. In many instances, besides the spring, a perineal band is also necessary. An inguinal hernia is much more readily kept in position than a femoral, and there are but one or two trusses that I have found that are of any service in the latter variety. There are some trusses that have no circular spring, but are supported by elastic bands; of these the Mocmain lever and the Rainbow elastic are the best; they are peculiarly suited to the cases of elderly people, where the inguinal rings require but little support, but in younger persons, especially those of the laboring classes, the pressure upon the rings is not sufficient to prevent the escape of the intestine.

It would be impossible for me to enter into the description of many trusses. I can simply say that different cases require different trusses, and that those instruments which combine lightness, elasticity, steady pressure, and are not likely to shift position from the varied movements of the body, are the best.

Figs. 399 and 400 represent the ordinary single and double hernia truss with the pad fixed. Fig. 401 shows a femoral hernia truss. The in-

guinal hernia truss of Dr. Chase, is seen in Fig. 402, and a lock-pad truss in Fig. 403. A very good truss is that of Dr. Shelden. It is so arranged that the compress, or ball, is precisely fitted over the inguinal canal longitudinally; it fits either side by sliding the spring to one or the

Fig. 399.

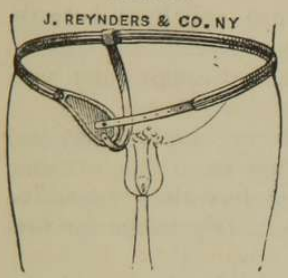


Fig. 400.

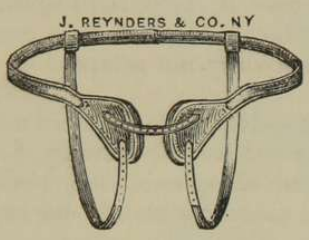
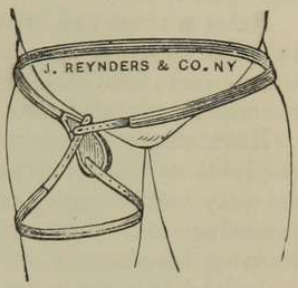


Fig. 401.



other extremity of the semicircular aperture; the pressure can be increased or decreased precisely as required, upon either end, or upon the whole length of the canal, by turning one or both screws entering the

Fig. 402.

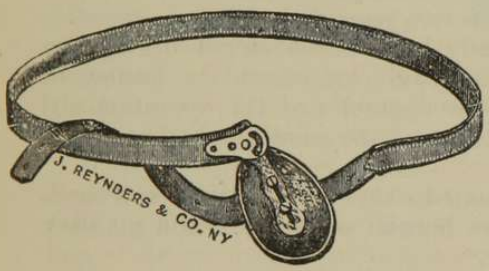
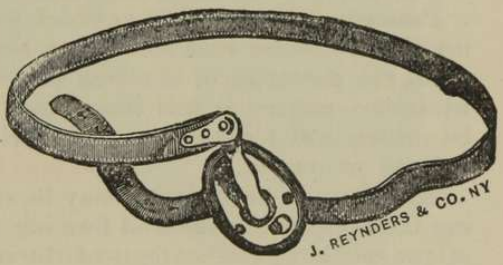


Fig. 403.



compress; reverse action of the screws reverses the action of the compress. A self-adjusting truss is seen in Fig. 404, and Foster's, or the Ratchet, in

Fig. 404.

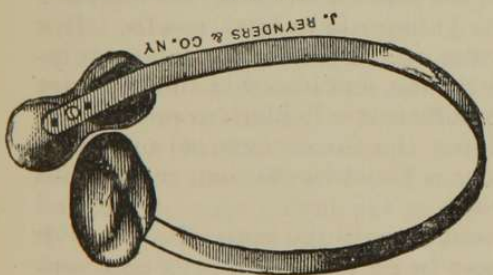


Fig. 405.

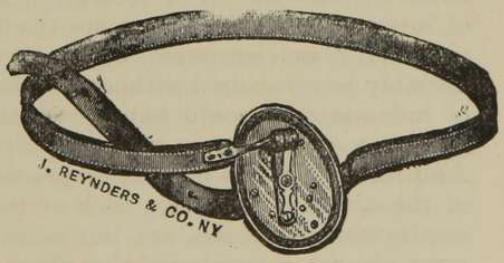


Fig. 405. This can also be fitted to either side; the arm which guides the compress below Poupart's ligament, directly over the femoral aperture, can be slid upon the pad to increase or decrease its length, and change the

angle precisely as required. The pressure is increased and decreased in the same manner as the inguinal truss. These appliances have met with considerable favor among scientific gentlemen, and are constructed upon anatomical principles.

I may say here that I have used a truss manufactured by Pomeroy, known as the "*finger pad*," which held a hernia that had resisted many other instruments.

After a truss has been applied, the patient should run, cough, and strain, in order to see if any portion of the intestine escape beneath the pad, in which case, the truss is not only not adapted to the case, but may be a source of great danger.

Herniotomy—Kelotomy.—Having exhausted all the previously described methods of relief without success, or having decided from the extreme severity and urgency of the symptoms that nothing less than operative procedure can be of avail, measures should be immediately taken for performing herniotomy.

Indeed this operation should not be regarded as absolutely the *dernier ressort*, lest it be deferred to a time when all hope from any source would be unreasonable, for in many instances it may be regarded as the very first resource.

The *danger from the operation* is but slight compared with that which threatens the patient, if the strangulation is allowed to continue for any considerable length of time. The more severe the symptoms, the more urgent the demand for prompt and positive removal of the cause.

Premising that in all cases which are severe enough to demand operative interference, some anæsthetic has already been administered during the taxis, the operation of dividing the constricted part should be performed while the patient is still insensible. The character of the operation will be determined by the seat of the stricture and the condition of the strangulated protrusion.

The cause of constriction may be situated either in the tissues surrounding the neck of the sac and forming the hernial opening, within the neck of the sac, or in the contents of the sac.

Division of the Stricture External to the Sac.—Respecting this method of treatment, the opinions of surgeons are at variance. Of course all must agree that the less the hernial sac and its contents are subjected to manual interference, the more likely is the severe inflammation which is such a fruitful source of danger in this operation, to arise.

It may be urged that as the bowel is not exposed to inspection, there exists a great liability of returning into the abdominal cavity some portion of intestine already gangrenous, thereby giving rise to fatal results. This objection is well answered by the fact that such a condition can almost invariably be recognized without opening the sac, and also that such a degree of inflammation would have produced sufficient adhesions to prevent the reduction of the tumor by simply dividing the tissues external to the sac. And further, if this method of procedure is found insufficient, the division of the stricture inside the neck of the sac, or the laying open the sac and displaying its contents, are but additional steps in the same direction. It must also be remembered that there may be an omental as well as a peritoneal sac, as seen in Fig. 406.

In general, then, whenever there is reason to believe, from the character and duration of the symptoms, that the strangulation does not depend upon adhesive inflammation, in fact, whenever the taxis has been considered applicable but has failed, the operation external to the sac is certainly justi-

fiable, and when complete reduction follows, all that could be gained by any plan of treatment, has been accomplished, and all manual injury of the peritoneum has been avoided.

If, however, after dividing the edges of the hernial opening the reduction is still impossible, or if something remains in the sac which would raise a doubt as to the condition of its contents, or when from the severity or long continuance of the strangulation, there is fecal vomiting, a dark appearance and leathery feel of the sac, with prostration, indicating that gangrene has already taken place, then should the sac be freely laid open, and its contents carefully examined and judiciously dealt with. It is said that Langenbeck operated for strangulated hernia without opening the sac, and has lost but three cases in fifty-nine operations.

Fig. 406.

An "omental sac," from a case in which the stricture was relieved by operation, the omentum being divided in order to reach the bowel; *a*, points to a dense fibrous membrane, apparently a condensation of the different fasciæ and neighboring areolar tissue; *b*, to the peritoneal sac; *c*, the external surface of the omentum, which is spread out over the interior of the whole of the hernial sac; *d*, the wound made in the operation; *e*, the testicle. This preparation is from one of the cases referred to by Mr. Hewitt, in Med.-Chir. Trans., vol. xxvii, and is in the Museum of St. George's Hospital.—Holmes.

Theilhaber* says that empty hernial sacs, especially if exudation occur rapidly in them, give rise to symptoms closely resembling strangulation of the intestine, and gives two cases. *First.* A woman, presenting all the symptoms of strangulated hernia, the operation for herniotomy was performed; the sac opened and a large quantity of thin, flaky fluid evacuated; the cavity was divided by septa into five smaller ones intercommunicating; in one of these was a small cyst containing some bright-yellow fluid. The sac contained no gut, was contracted at its neck, but a sound could be passed into the abdominal cavity through the constricted portion.

Second. A man received a kick from a horse; a swelling made its appearance next day, and was diagnosed as a hernia, for which a truss was applied. Nine months later, symptoms of strangulated inguinal hernia came on, and herniotomy was performed. On the outer aspect of the spermatic cord was found a cyst, about the size of a bean, containing bright-yellow fluid; besides this, nothing abnormal was found. The post-mortem discovered an ulcer at the lesser curvature of the stomach, about the size of a shilling, and near by, the cicatrix of a similar one. The peritoneum was much injected,

* Abstract of Medical Science, vol. iv, No. viii (Aertzliches Intelligenz-Blatt, 7, 1877).

contained shreds of coagulated lymph, and about a pint of pus. The spermatic cord was thickened, and no sac was found.

Herniotomy.—The patient being under the influence of an anæsthetic, with the bladder emptied and the hair shaved from the parts, is placed, with shoulders slightly raised and knees flexed, in a position similar to that assumed during the taxis. An incision is then made directly over the neck of the sac, in inguinal hernia from the internal to below the external ring, in the course of the inguinal canal; while in femoral hernia, a vertical incision is made over and to the inner side of the crural ring. Divide the coverings consecutively until the sac is reached, making free use of the grooved director and scalpel handle when exposing the deeper structures, while any important hæmorrhage must be controlled by torsion, or the ligature.

It will not generally be possible to demonstrate the precise number of coverings of the intestine, for if there has been considerable inflammation, the coats may be almost indistinguishable, or additional layers may have been deposited. The seat of the stricture is now to be ascertained by passing the left index finger into the upper extremity of the wound, and if it be found *outside the sac*, a director is passed beneath the obstruction, and with a hernia knife, herniotome, or probe-pointed bistoury, the stricture is divided by a short *incision upward*, this being most likely to avoid the epigastric artery. Care should be taken to make the division as small as possible, just enough to allow the return of the intestine without force. This being done, reduction is carefully attempted, and if the bowel goes back readily, the whole object is accomplished.

But if this result does not follow the operation already described, and any of the hernial contents remain in the sac, then it must be opened freely, great care being observed not to wound the intestine. To avoid this make a small incision to admit the director, and then carrying it along close to the walls of the sac, divide them with a bistoury. Generally some fluid will escape, although in recent strangulation the quantity may be small. Now, the contents having been fully exposed, they should be examined with the utmost care and gentleness.

Upon examination, the intestine may be very much discolored, almost black from congestion, or covered by the products of exudative inflammation, yet if it be neither ruptured or gangrenous, it should be restored to the cavity of the abdomen.

Cases will be often met, in which much doubt exists as to the propriety of the above procedure, and good judgment and nice discrimination will be demanded to decide the question. If a large amount of intestine be found to be injured, it will be wiser to leave it, simply dividing the stricture.

Much care should be taken in cutting the neck of the sac, lest the already inflamed and weakened bowel sustain still further injury.

Having introduced the finger into the neck of the sac, a probe-pointed bistoury is passed flatwise along the finger till underneath the constriction, when by turning the edge of the knife upward, it is immediately divided. An incision of one or two lines in length is generally sufficient.

This will also be the best method of treatment if the vitality of the bowel seems destroyed beyond reasonable hope of recovery. In order to determine this point, some aid may be given to the practitioner by the history of the case, the size of the tumor, duration of constriction, and the condition of the patient.

Much greater danger of mortification exists when the hernia is *small*, *recent*, and the strangulation has been *protracted*, than when opposite conditions obtain.

If the ordinary phenomena of constricted hernia are succeeded by a Hippocratic countenance, feeble, wavering pulse, hiccough, and crackling state of the tumor, with sudden cessation of pain, and great prostration of the vital forces, it may be positively assumed that gangrene is present.

When, however, the symptoms are less marked, the prognosis will be assisted by recourse to the following measures: all constriction being relieved, warm fomentations should be applied to the parts for ten or fifteen minutes, in the hope of restoring the circulation; but if at the end of that time there is no change in the appearance of the tumor, if no blood issues on puncturing some of the vessels, and if superadded to these, the intestine is found soft and flaccid, its sensibility lost, and its temperature decreased, the presence of mortification becomes a certainty.

Under these circumstances, having relieved all constriction, in order that when by sloughing an "artificial anus" is formed, by which the bowel may discharge its contents through this external opening, nothing remains but to support the patient, giving all care to the wound, in the hope that nature may be able to effect a spontaneous cure. No apprehension need be felt that the intestine may be retracted into the abdomen, for such strong adhesions have been formed at the neck of the sac that such a result is for the time prevented. Later, this attempt at retraction of the bowel is nature's method of bringing about a cure.

If the bowel be ruptured or perforation has taken place, the stricture should be relieved at once, the healthy intestine replaced, while the diseased portion is left at the mouth of the sac. Should there be but a small perforation, a delicate ligature may be carried around it, cutting the ends close to the knot and then leaving it at the orifice of the sac.

In all cases of epiplocele or entero-epiplocele, in which strangulation has taken place, it must be remembered that the omentum cannot bear with safety as much injury as the intestine, and when there is much inflammation, hypertrophy, or that loss of consistence which follows these two conditions, the diseased portion should be removed with the knife, carefully ligating all the vessels separately, as this tissue is quite vascular. Before performing this part of the operation the tumor should be closely examined, lest it contain a knuckle of intestine concealed within its folds. There may exist an omental sac, in which case much care must be exercised; the intestine and omentum being returned separately, if reducible, with the precaution that there remain no adhesions or bands at the neck which will prolong the constriction.

The *after-treatment* of this operation is by no means unimportant. Of course, the patient is kept strictly quiet, and after the wound has been closed by sutures, a compress and bandage are to be applied. All action of the bowels is to be prevented by an opiate or suppository of morphia. Very little aliment should be taken by the mouth; but if the patient is very feeble he must be supported by a little brandy and water, or small lumps of ice may be freely administered if there be much thirst. Should there be high fever or symptoms of peritonitis appear, they must be met by the appropriate homœopathic remedies.

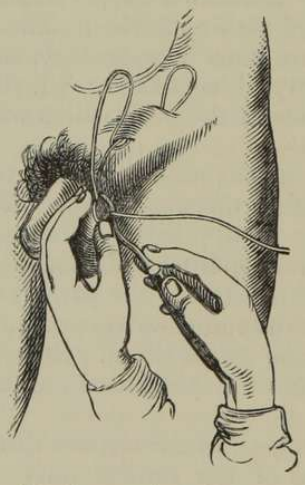
Radical Cure of Hernia.—We read a great deal, and hear a great deal, through the medium of various advertisements, of the radical cure of hernia by means of trusses; now although it cannot be denied that once in a while, a cure is effected by the persistent wearing of a well-fitting truss, yet in the majority of cases no such fortunate result is attained.

Many surgeons have, from time to time, exercised their ingenuity in finding a proper operation for the radical cure of herniæ, but all of them are more or less unsatisfactory. Wützer, of Bonn, invented an instrument

which has met with general favor (I have used it myself, but with only partial success). It consists of a hollow cylinder of wood rounded at its extremity and having an aperture near this rounded extremity. The scrotum is well pushed up into the canal, and is there retained by means of the cylinder; a large curved and flexible needle, fitted into a handle, is passed into the cylinder until its point emerges through the orifice; it is still pushed forward until its point passes out of the anterior wall of the abdomen; a concave piece of wood is now laid over the abdomen in such manner as will cover the cylinder within the canal, and by means of a screw fixed firmly in place, and allowed to remain until suppuration is established, which will take a week, or in some cases even two; it is then removed, and a truss worn for a considerable time.

The following is Wood's description of his radical cure operations, of which in 155 cases, there were but 2 deaths, 40 failures, and 113 cures: "The patient being laid upon his back, with the shoulders well raised and the knees bent, the pubes cleanly shaved, the rupture completely reduced and chloroform administered, an oblique incision, about an inch long, is made in the skin of the scrotum over the fundus of the hernial sac. A small tenotomy knife is then carried flatwise over the margin of the incision, so as to separate the skin from the deeper coverings of the sac to the extent of about an inch or rather more all round. The forefinger is then passed into the wound, and the detached fascia and fundus of the sac invaginated into the canal. The finger then feels for the lower border of the internal oblique muscle, lifting it forwards to the surface. By this means the outer edge of the conjoined tendon is felt to the inner side, of the finger. A stout semicircular needle, mounted in a strong handle, with a point flattened antero-posteriorly, and with an eye in its point, is then carried carefully up to the point of the finger along its inner side, and made to transfix the conjoined tendon and also the inner pillar of the external ring; when the point is seen to raise the skin, the latter is drawn over toward the mesian line, and the needle made to pierce it as far outward as possible. A piece of stout copper wire, silvered, about two feet long, is then hooked into the eye of the needle, drawn back with it into the scrotum, and then detached. The finger is next placed behind the outer pillar of the ring and made to raise that and Poupart's ligament as much as possible from the deeper structures. (Fig. 407.) The needle is then passed along the outer side of the finger and pushed through Poupart's ligament, a little below the deep hernial opening (the internal ring). The point is then directed through the same skin-puncture already made, the other end of the wire hooked on to it, drawn back into the scrotal puncture, as before, and then detached. Next, the sac, at the scrotal incision, is pinched up between the finger and thumb, and the cord slipped back from it, as in taking up varicose veins. The needle is then passed across behind the sac, entering and emerging at the opposite ends of the scrotal incision. The end of the wire is again hooked in and drawn back across the sac; both ends of the wire are then drawn down until the loop is near the surface of the groin above, and are twisted together down into the incision, and cut

Fig. 407.



Wood's operation.—Bryant.

off to a convenient length. Traction is then made upon the loop; this invaginates the sac and scrotal fascia well up into the hernial canal. The loop of wire is finally twisted down close into the upper puncture, and bent down to be joined to the two ends, in a bow or arch, under which is placed a stout pad of lint. The whole is held steady by a spica bandage. The wire is kept in from ten to fourteen days, and even longer if the amount of consolidation is not satisfactory. Very little suppuration usually follows, but after a few days the parts can be felt thickened by adhesive deposit. The wire becomes loosened by ulceration in its track until it can be untwisted and withdrawn *upwards*. In this operation the hernial canal is closed along its whole length, and an extended adherent surface is obtained to resist future protrusion."

After this operation, as in others, the truss must be worn for a long time, and always when lifting or straining.

For the radical cure of hernia, Langenbeck* succeeds by dissecting up as thick a flap of skin as possible, corresponding in width with the hernial opening. In inguinal hernia, he begins at the external ring, and dissects upwards and outwards for an inch and a half. He then makes room for the flap, by introducing his finger into the inguinal canal, and forces the flap into it without twisting, and finally closes the external wound *over* the flap. For a femoral hernia, the flap is made from the fossa ovalis, and is about one-half as long. The flap in umbilical hernia is made in any direction, except over the ligamentum teres.

There are many other operations which have been performed by Rothmund, Chisholm, Clark, Wells, Davies, Riggs, and others, but space forbids their insertion here.

Inguinal Hernia—Anatomy.—We will now turn our attention to the study of the coverings of this form of hernia, proceeding from *without inwards*, it being the most practical, as it is in this direction the surgeon is called upon to operate. In studying the anatomy of this region much assistance will be derived by adopting certain "*fixed points*."

Of these points the umbilicus may be regarded as one, the symphysis pubis another, and the anterior superior spinous process of the ilium a third. Draw a line from the symphysis to the umbilicus, carry another from the umbilicus to the superior spinous process of the ilium on each side, and again from these latter points to the symphysis pubis. We now have two triangles with a common base, while their apices correspond to the superior spines of the ilia. These are the inguinal triangles. In the dissection of these points, the incisions made will correspond to the common base of the triangles and to the line drawn from the umbilicus to the superior spinous process of each ilium.

The *first* covering is the integument, which is removed by reflecting it downward.

The *second* covering is the superficial and deep fascia; the superficial epigastric vessels and nerves being contained between the two layers of the superficial fascia.

The *third* is formed by the intercolumnar fascia, which is a series of curved tendinous fibres arching across the lower portion of the aponeurosis of the external oblique muscle, from the outer third of Poupart's ligament, closing the orifice of the external abdominal ring, and strengthening its pillars by stretching from one to the other, and from this deriving its name,—*intercolumnar fascia*.

* Monthly Abstract of Medical Science, October, 1876; American Practitioner, September, 1876.

The external abdominal ring is *not* round, but triangular in shape, and any expectation of finding a round aperture will certainly be disappointed. In the recent state there is no opening, it being closed, as before stated, by the intercolumnar fascia; otherwise hernial protrusions would be of much more frequent occurrence.

This ring is found in the aponeurosis of the external oblique, about an inch or an inch and a quarter upward and outward from the crest of the os pubis, lying just above Poupart's ligament, and transmitting the spermatic cord in the male, and the round ligament in the female. Poupart's ligament is a reflection of the aponeurosis of the external oblique, from the anterior superior spine of the ilium to the symphysis pubis. This is sometimes called the crural arch. The external pillar of the external abdominal ring is strengthened by a small triangular ligament, which extends from the under surface of Poupart's ligament to the ilio-pectineal line, into which it is inserted to the extent of one inch, and is called Gimbernat's ligament. This may be the seat of stricture.

Having removed this fascia, immediately beneath is discovered the internal oblique muscle, the lower border of which gives the *fourth* covering, the *cremasteric fascia*. The cremaster muscle consists of the lower fibres of the internal oblique, taken away by the descent of the testes in the fœtus. These fibres are continued in loops upon the spermatic cord, and being held together by dense areolar tissue, constitute the fascia of which we speak. It has also received the name of *tunica erythrodes*.

The internal oblique muscle arises by fleshy fibres from the outer half of Poupart's ligament, from the anterior two-thirds of the middle lip of the crest of the ilium, and from the neighboring fascia. From these several points of origin, the fibres of this muscle diverge; the posterior ones ascend and are inserted into the cartilages of the four lower ribs; those from Poupart's ligament pass downwards and inwards, join with the aponeurosis of the transversalis in forming the *conjoined tendon*, and are inserted into the crest of the os pubis and the pectineal line.

Those from the spine and crest of the ilium are directed forward, upward, and inward, terminating in a broad aponeurosis; the upper three-fourths divides and sends one portion in front, and the other behind the rectus muscle, but unites again at its inner border to be inserted in the linea alba; while the lower fourth is continued forward unseparated in front of the rectus to the linea alba, where it is also inserted.

When the muscle is removed, the transversalis is brought into view, but this gives no covering to hernia, as the viscus passes beneath its lower border.

Laying back the rectus, the transversalis fascia is reached. This is an aponeurosis lying between the under surface of the transversalis muscle and the peritoneum, and forming the *fifth* covering of the hernia by a funnel-shaped process called the infundibuliform process of the transversalis fascia. The internal abdominal ring is found in this fascia at a point about equidistant between the spine of the pubis and the anterior superior spine of the ilium, and about a half inch above Poupart's ligament.

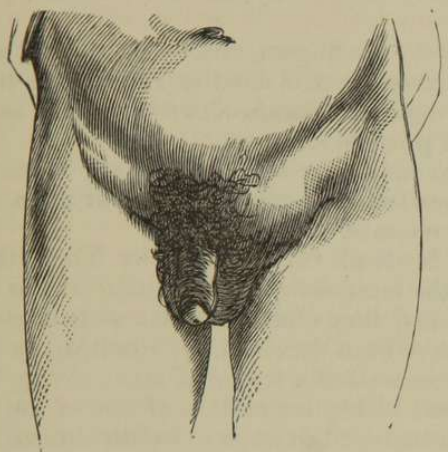
Its size differs in different individuals, being larger in the male than in the female; it is of oval shape, and its oval extremities are directed upward and downward. Above, it is bounded by the arched fibres of the transversalis, and internally by the epigastric artery.

The inguinal or spermatic canal is about an inch and a half in length, is directed upward and outward, placed parallel with and a little above Poupart's ligament, and extends from the internal to the external abdominal ring. It transmits the spermatic cord in the male, and the round ligament

in the female. Immediately underlying the transversalis fascia, and forming the *sixth* and last covering of hernia, is found the peritoneum, which may be recognized by its white glassy appearance—and this forms the sac of the hernia. Between this and the gut is the subserous areolar tissue, which by some is considered an additional investment of the intestine.

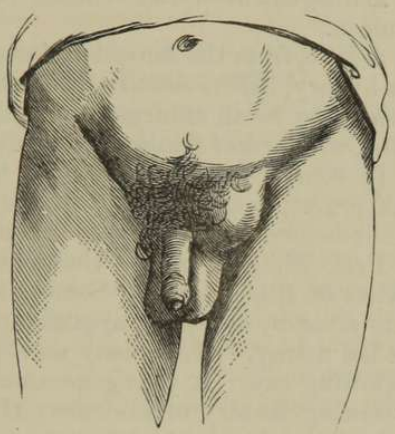
An *oblique* inguinal hernia passes through *both* rings, and through the inguinal canal (Fig. 408); a *direct* inguinal hernia escapes through the abdominal wall and the *external* ring. (Fig. 409.) The two varieties have

FIG. 408.



Guy's Hosp. Mus., 478[15]. Oblique Inguinal Hernia. Bubonocele on right side, but passing through external ring on left.—BRYANT.

FIG. 409.



Guy's Hosp. Mus., 480[20]. Direct Inguinal Hernia.—BRYANT.

the same coverings, except that in the latter the conjoined tendon is substituted for the cremasteric fascia.

The following is the *differential diagnosis* between inguinal hernia and other diseases.

HERNIA.	HYDROCELE.
1. *Hernia* is almost invariably opaque, the only exception being in case of a large fold of intestine distended with gas and covered by thin integument.	1. *Hydrocele* simulates hernia, but differs from it by being more or less translucent.
2. The tumor is always varying in size, and can generally be made to disappear by pressure.	2. The tumor is constant.
3. The cord can never be distinctly felt in any part.	3. A part of the cord can be felt distinct from the tumor at its apex.
4. The tumor is enlarged upon coughing or exertion.	4. Hydrocele, unless congenital, does not enlarge upon or feel the impulse of coughing or exertion of the muscles.
5. The testicle can be felt distinct and separate from the tumor at the lower part of the scrotum.	5. The testicle can scarcely be felt, if at all.
6. Hernia appears suddenly, is developed from above and descends.	6. Hydrocele forms gradually and is developed from below upwards.

In *hydrocele of the cord* the tumor is circumscribed, leaving a portion of the cord clearly to be felt above and below the tumor, and has most of the distinguishing signs of hydrocele. But when that portion of the cord within the inguinal canal is the site of such serous effusion, the difficulty of diagnosis is great, for then the tumor may be caused to disappear on pressure as in hernia.

Varicocele is diagnosed from hernia by the following signs: The swelling is not reducible and has the feeling as of a bunch of earthworms. It simulates hernia, because its size is reduced in the recumbent position as well as by pressure, and the tumor returns upon assuming the upright posture, notwithstanding the abdominal ring has been closed by pressure; the latter condition would not exist in hernia.

When the enlarged veins occupy the upper portion of the cord and the inguinal canal, accompanied by an accumulation of serum, the diagnosis is rendered extremely difficult.

Enlargement of the veins of the cord frequently facilitates hernial protrusion.

A *bubo*, from the sensation detected by the fingers, method of growth, and its history, differs essentially from hernia; but it must be recollected that there may be an enlargement of the inguinal glands occurring at the same time, with either femoral or inguinal protrusion.

In some cases a hernia or a bubo may coexist. It therefore behooves the practitioner to bring all his knowledge of diagnosis to bear upon the point before any attempt is made to operate.

Prof. Metcalf, of the University Medical College of New York, thus writes on this subject: "Sometimes the most skillful and careful will be led into error by deceptive appearances, and very often will the inexperienced be led astray. How many would have been deceived, for example, in the following case: A young gentleman consulted a friend of mine, giving the following history of his case: He had had inflammation of one of the inguinal glands, for which his physician had used tincture of iodine externally. Suppuration occurring in spite of this, an incision was made and the accumulated pus discharged, but the abscess had again filled very rapidly, and his physician having left the city, he wished my friend to relieve him. Upon an examination of the spot indicated by the patient, it was found reddened from the recent use of iodine, and a scarcely closed incision showed where the pus had been discharged. Upon palpation the abscess seemed to have again filled, but to the experienced touch of the examiner, into whose hands he had fortunately fallen, a peculiar elastic softness was noticed which caused him to pause, with his knife already in hand, and examine further. To his surprise he found that a hernial protrusion had occurred just under the seat of the abscess!

"Had he entered this with his knife, death or a miserable infirmity would have been the almost inevitable result. How many would have been deceived by such a case!"

The *testicle being late in its descent* may be arrested either in the inguinal canal or at the external abdominal ring, thus giving rise to a swelling which presents appearances in some degree similar to those of rupture. The diagnosis may be formed from the absence of the testis from that side of the scrotum, and by the peculiarly characteristic sickening sensation occasioned by pressure on that organ.

In non-descent of the testicle, that organ may be lodged either within the inguinal canal or at one of its apertures, and this forms one of the predisposing causes of hernia.

Sarcocele is known by the history of the case, absence of cough impulse, and the non-implication of the spermatic cord.

It will be seen from the above diagnostic marks that when the gut extends into the scrotum we have the so-called *scrotal hernia*, which is nothing more than an inguinal hernia, and that the differential diagnosis has been given with this understanding.

Operation for Strangulated Oblique Inguinal Hernia.—In *St. George's*

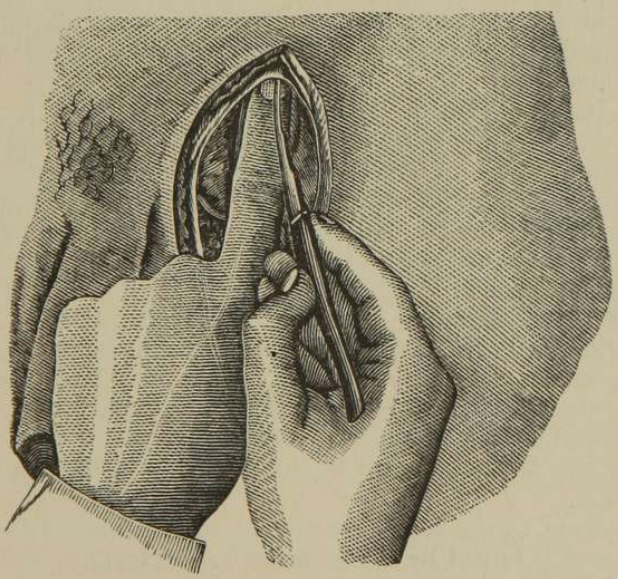
Hospital Reports,* we find the following interesting summary of the cases of strangulated hernia operated upon. The whole number of cases is fourteen, of these seven were males, and seven females. The sac was opened in every case. The total number of deaths, five. Of the eight cases of inguinal, six were males, and two were females, and two died. There were five cases of femoral, four of which occurred in females, and one in the male: three died, and all from peritonitis. There was one case of umbilical in the female, which recovered.

To the student who has carefully studied the various coverings of hernia, it may seem necessary that each covering be found and cut through before coming down to the sac or the gut itself. This, however, can rarely be done, as the previous inflammation and other causes may have obliterated some or all of the coats, or blended one or more of them together.

The patient having been brought thoroughly under anæsthetic influence and the parts shaven, an incision should be made from the external ring to the inferior extremity of the swelling. This incision should be made by the operator pinching up a fold of skin, lifting it away from the intestine, and with a small sharp-pointed curved bistoury, cutting from within outward. The director is introduced into the wound, and the incision completed with a probe-pointed bistoury. In this incision the superficial epigastric will, in the majority of instances, be cut and must be secured. Each successive layer of tissue must be raised with the forceps, nicked with the knife, and the director used constantly. There may be six coverings, or there may be a dozen. No matter how many, the same caution must be used, until the sac is reached.

This is known by its slightly transparent hue; its vessels, which may often be seen ramifying on its surface, which is of a bluish color. The finger should now be introduced into the wound, and the endeavor be made

Fig. 410.



to discover if the stricture be seated outside the sac; if this can be ascertained and the surgeon can assure himself that the intestine is in good condition, the hernia knife, or a curved probe-pointed bistoury, wrapped

* Vol. viii, 1874 to 1876, p. 449.

with cotton or silk to within a quarter of an inch of the point, should be introduced flatwise, on the finger, insinuated beneath the stricture, and then turned with its edge upon the stricture, and with a sawing motion upward, the point of strangulation divided. If, however, there be the slightest doubt in the mind of the surgeon, as to the condition of the intestine, the sac must be incised after the manner of other fasciæ, and the gut exposed. Upon the division of the peritoneal covering, there will generally a few drops of serum exude. The finger is again introduced as a guide for the knife and the stricture divided as above (see Fig. 410.) If the omentum is either gangrenous or ulcerated, parts of it may be removed. If the case be one of entero-epiplocele, the intestine should be replaced first, the omentum afterward.

It has happened to me, to find very often that adhesions may have taken place. These may be broken up carefully by the finger, and the parts restored to their natural position. The wound must be closed by silver sutures, and the patient given nux vom. 3d trit. every half hour, for a considerable length of time.

In the *direct* variety of inguinal hernia, the stricture may be either at the internal or external ring, or at the neck of the sac. The rules for the operation are the same as those already laid down.

Congenital Inguinal Hernia in the Male.—This variety of hernia generally occurs very early in life, but the student must remember that the "*congenital form*" of hernia may appear in the adult, and is generally occasioned by late descent of the testicle and imperfect closure of the inguinal rings. This hernia should be carefully returned at as early a day as possible, and nux vomica given for a time, a well-adjusted pad being also worn. Sometimes, however, in spite of the best-directed efforts at reduction, strangulation occurs. In these cases the internal administration of homœopathic medicines will often cure. (The student is referred to the early parts of this Chapter.) Sometimes, by raising the child by the feet, or placing it upon an inclined plane, the facilities for reduction are much increased. Indeed, in the majority of instances operations will not be found necessary in these cases.

Congenital Inguinal Hernia in the Female.—The round ligament in the female passes out from the external ring, and is accompanied by a process of the peritoneum, which in most cases is obliterated in adult life. Sometimes it remains open, and forms the canal through which a hernia may protrude. Sometimes the sac may contain an ovary or a fallopian tube. The treatment is the same as for other forms of inguinal hernia, viz., medicine, taxis, and operation.

Crural or Femoral Hernia—Anatomy.—We must observe that on the inner side of the thigh, between the sartorius and pectineus muscles, there is a slight depression, known as the fossa ovalis or saphenous opening; this depression has no well-defined inner border, but externally it is bounded by the well-developed edge of the fascia covering the sartorius muscle.

The floor of this fossa is formed by the pectineal fascia which invests the pectineal muscle.

This aponeurosis, at the lower margin of the opening, becomes thicker, turns inward, and is joined by the sartorial fascia, forming a lunated edge; over this edge, as is well known, the vena saphena major turns and joins the great femoral vein.

Superiorly the sartorial fascia is connected with Poupart's ligament, or with that reflection of it known as Gimbernat's ligament; thus forming a lunated border, which receives the name of Hey's ligament.

Now, the femoral vessels coming from the abdominal cavity, emerge

beneath Poupart's ligament, and consequently under Hey's ligament, being covered by their sheath, which is formed by the fascia of the iliacus internus *posteriorly* and the fascia transversalis *anteriorly*.

The sheath is loose, and by some writers is called the *crural canal*, and that part of the canal found at the junction of the thigh with the abdomen receives the name of the *femoral ring*. This so-called ring is filled up with loose tissue, which is called the *septum crurale*.

The whole anatomy of crural hernia is really very plain, but is oftentimes so clumsily described in the books that students are frequently at a loss to understand the precise relations of the parts concerned. Observe, that as the femoral vessels come from the cavity of the abdomen to pass out upon the thigh, beneath Poupart's ligament, a space is left between them and the pelvis, slightly guarded by loose tissue, the *septum crurale*, which, when the intestine protrudes, is necessarily pressed onward before it. Notice further, that an opening in the upper part of the thigh is formed where the superficial join the deeper seated veins, and this also is filled with a loose tissue —the cribriform fascia. Then it will be apparent that the bowel, coming from the cavity of the abdomen along the course of the femoral vessels, will protrude on the thigh at the opening where the femoral vein is joined by the saphena major, as this point is but slightly protected by fascia.

Proceeding from *within outwards*, the following would be the order of the coverings of hernia in this region: First, the *peritoneum;* secondly, the *septum crurale*, which covers the ring through which the intestine passes. The gut then follows the crural canal, or in other words the sheath of the femoral vessels, until it reaches the fossa ovalis, where it protrudes, pushing before it the *sheath of the femoral vessels*, which therefore constitutes the *third* covering. This last coat carries with it the fascia which lies in the fossa ovalis, hence we have for the *fourth* covering the *cribriform fascia*, which in turn forces outward the *fifth* coating or *superficial fascia*, and with it comes lastly the integument or *sixth* investment.

There is one other particular in the anatomy of crural hernia which deserves notice, and that is the relations of the gut with the femoral vein, the epigastric artery, the spermatic cord, and occasionally with the obturator artery.

In femoral hernia these parts stand in the following order: On the outside the femoral vein, on the inside the spermatic cord, in front and near the seat of stricture the epigastric, and in some instances the obturator artery, the latter, in about one case in four, being given off from the epigastric artery.

Diagnosis of Femoral Hernia.—A femoral hernia may sometimes be mistaken for an inguinal; the symptoms differential are as follows: In the former the finger can be introduced into the inguinal canal. Poupart's ligament can be made out even though the gut has ridden over it. An inguinal hernia lies inside of the spine of the pubis.

Sometimes a *varix of the femoral vein*, as it passes the saphenous opening, simulates femoral hernia.

In such cases a careful examination is necessary to insure a correct diagnosis of the case.

Place the patient on the back and reduce the protrusion. On assuming the erect position, if varix is present, the swelling immediately reappears; but if it be hernia, pressure will prevent its recurrence.

Psoas abscess may, in rare instances, be mistaken for femoral hernia.

But the many presenting symptoms of spinal disease, the slowness and variability of progress, the fluctuation, and the part at which the abscess

points, which, in the majority of cases, is outside of that at which hernia protrudes, serve to form the distinctions necessary for diagnosis.

An *enlarged gland* has been mistaken for hernia by most distinguished surgeons. Hamilton records a case in which several days elapsed before the diagnosis was made out, the delay causing the death of the patient. Sir Astley Cooper also mentions two fatal cases of the kind. The absence of cough impulse, the solidity of the tumor, the history of the case, and the constitution of the patient, must be our chief guides in these cases.

In *operating for femoral hernia*, an incision should be made in the long diameter of the swelling. The parts raised upon the director as before noted when treating of inguinal hernia. The seat of stricture is often at Hey's ligament, and sometimes at Gimbernat's. The finger-nail, or Little's director is passed beneath the stricture; the hernia knife, or the wrapped probe-pointed bistoury is insinuated underneath the seat of stricture, and the cutting edge turned upward, then with a slight sawing motion the stricture is divided. The gut is then carefully examined, and if there be any adhesions they should be cautiously broken up, and the intestine returned. For further information refer to the section on kelotomy.

The same after-treatment is necessary as that recommended in inguinal hernia.

Other Varieties of Hernia—*Umbilical hernia.*—In this variety of rupture the intestine makes its way through the umbilical ring in the fœtus, or through a separation of the fibres of the linea alba; in young persons we find it as congenital, or it may be found in adults, especially in fat women.

The various coverings of this form of hernia are very thin, and when the protrusion is large it may be of various shapes, pyriform, sessile, or pedunculated, and may contain omentum, portions of the large and small intestine, and indeed the stomach.

Treatment.—In young infants I have cured many of these cases of herniæ by a well-adjusted pad, in the centre of which a smaller or larger ball of ivory protrudes. Sometimes a piece of sheet lead, such as is found in tea-boxes, folded several times upon itself, and held *in situ* with adhesive plaster and a broad band of stout muslin, answers well the purpose.

Dr. Bowers, of New York, devised a pad for the cure of congenital umbilical hernia, which is so easily constructed and is productive of such good results, that he has used no other for a number of years.

The following are the directions for its construction:

Take a piece of sheet lead, thick enough to retain its shape under moderate pressure, about one and a half inches square, draw lines diagonally across from corner to corner, and from the centre describe a circle just within the square. Then raise a little knob in the centre, and near each corner where the circle cuts the diagonal lines, by placing these points directly over a suitable hole in a board, and forcing the lead down by a blow on a blunt rounded punch, taking care not to break through the lead. Round the corners, straighten the square so that it will lie level, and it is ready for use. The central knob may be a little the most prominent, and is to be placed directly on the umbilicus, and secured by a compress and bandage. The chief superiority of this pad consists in its permanently retaining its place without slipping.

For the radical cure of this hernia several operations have been from time to time proposed.

Mr. Barwell reported in the *London Lancet* several cases in which he has performed a radical cure operation, by pressing the gut back into its position, inserting needles into the sac and twisting either wire or silk over them.

In the only cutting operation which I have been called upon to perform for strangulated umbilical hernia in a very young infant, the patient died.

For the adult, an incision should be made over the bowel, the layers of tissue be raised upon a director and the stricture sought after and liberated by the smallest possible nick into it. The after-treatment is the same as in the other operations for hernia. It is now not a matter of dispute that if the intestine be gangrenous, several inches and indeed even feet thereof, may be cut away, and the patient recover, as in the famous case of my friend, Dr. Beebe.

Obturator Hernia.—This variety of rupture is rare. In it, the gut descends through the obturator canal, the thyroid or obturator foramen. It occurs more frequently in females than in males, and the protrusion is generally very small. The patients who suffer from this obstruction complain of severe pain along the course of the obturator nerve, and suffer from bowel affections in a greater or lesser degree; sometimes there is cramp in the muscles of the affected limb. In many cases there are complications which render the diagnosis very difficult.

Treatment.—Taxis may in some cases be sufficient, together with the internal administration of medicine, to relieve this serious affection; should it not, an operation will be necessary. The incision should be made parallel with the femoral artery and aside from the femoral vein, beginning at the centre of Poupart's ligament, and extending about three inches and a half downward. The fasciæ are then raised on the director and divided according to directions already given. After this the fibres of the pectineus should be divided in the line of the first incision, which will generally allow the tumor to be felt. If, however, it cannot yet be recognized, the fibres of the obturator muscle must be separated. This will expose the protrusion. The stricture must then be felt for and divided in the same manner as directed for other strangulations.

Ischiatic Hernia.—In an ischiatic hernia, the intestine forms a tumor beneath the large gluteal muscle. The neck of the sac is generally below the pyriformis. The tumor is frequently reducible. The symptoms are those of other herniæ. The operation consists of cutting down upon the sac and enlarging its mouth.

Pudendal Hernia.—By the term pudendal hernia is understood the escape of the gut into the labium pudendi. This hernia may occur at an early age. It forms a small and somewhat elastic tumor, at the side of the vagina, the neck of the sac lying between the vagina on the inside and the ramus of the ischium on the outside. It may be diagnosed from inguinal hernia by its location by the side of the ramus of the ischium, by its parallelism to the axis of the vagina, and by the ability to feel the inguinal canal.

Treatment.—An appropriate bandage and pad. These herniæ do not become strangulated.

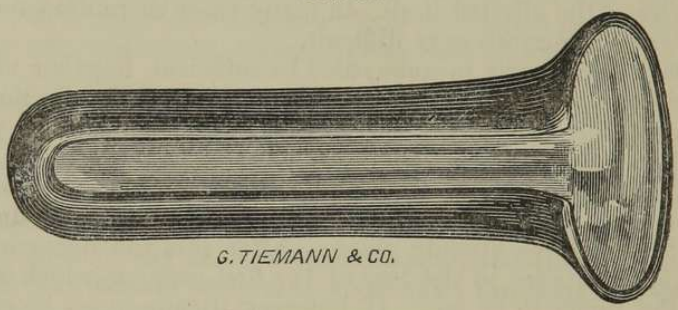
Diaphragmatic Hernia.—There are several varieties of diaphragmatic hernia, as when the muscular partition between the thorax and abdomen from being long on the stretch, loses its tone, and the fibres separate; or when the gut escapes through one of the natural apertures of the diaphragm; or again where a wound in the abdomen allows the passage of the intestine. In the latter case, death generally occurs in a few days and at best the diagnosis is so obscure, that we can only be guided in the selection of our medicines by the symptoms.

CHAPTER XXXIX.

DISEASES OF THE RECTUM AND ANUS.

Examination of Rectum—Foreign Bodies.—Examinations of the rectum are oftentimes very unsatisfactory; indeed, I have not been able to see half as much, as some record, even with the benefit of the best instruments. The mucous membrane of the lower bowel has so many rugæ, and in itself is capable of such great distension that the view is often obstructed. Some-

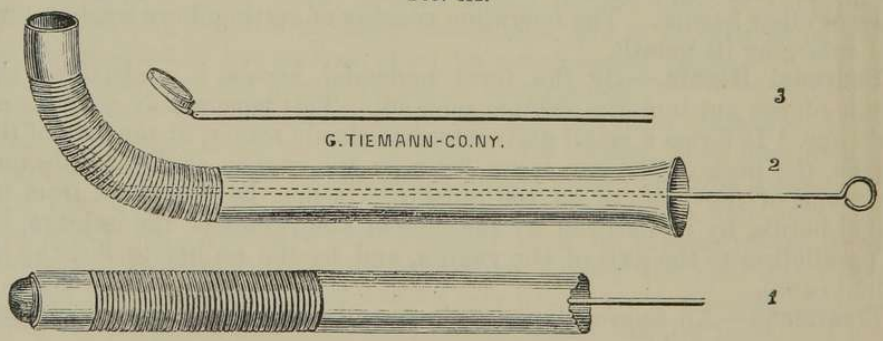
FIG. 411.



Ordinary Anal Speculum.

times, however, much may be learned by careful examination. Fig. 411 represents the ordinary glass fenestrated speculum ani.

FIG. 412.



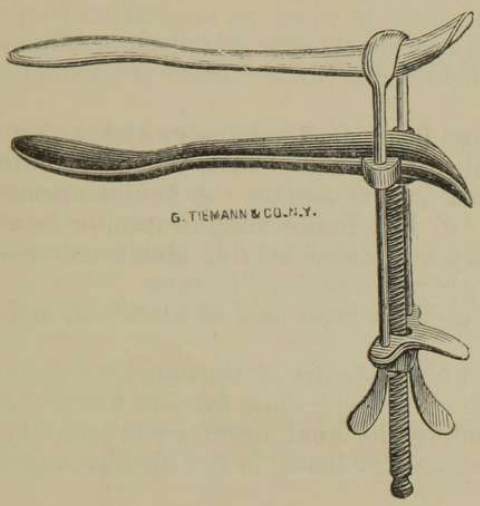
Bodenhamer's Recto-Colonic Endoscope.

Much has lately been said concerning the endoscope as applied to the rectum. I have never used the instrument (a representation of that devised by Bodenhamer is seen in the cut), and therefore, cannot say anything either *pro* or *con*.

Fig. 413 represents an admirable instrument invented by Dr. Thebaud, of New York, which is probably one of the best. There are also bivalve, Fig. 414, and trivalve specula, Fig. 415. The instrument which I have

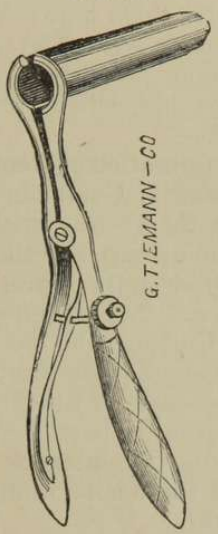
the best succeeded with, is that of a gorget shape, seen in Fig. 416, or indeed, with the smaller-sized Sims's speculum. In some cases the insertion

Fig. 413.



Thebaud's Sphincter Ani Dilator.

Fig. 414.



Bivalve Speculum Ani.

of the thumbs into the anus, as directed for paralyzing the sphincter in fistula, affords a good view of the lower part of the bowel.

Fig. 415.

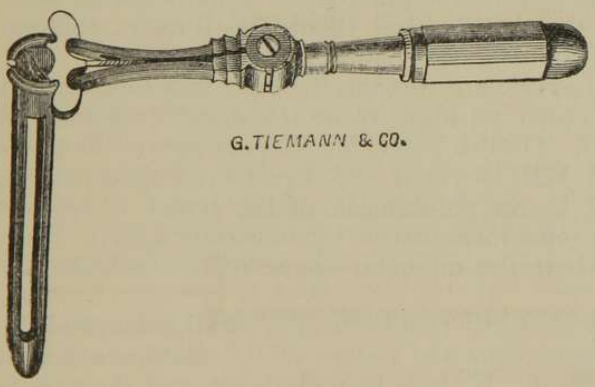


Fig. 416.

Gorget-formed Anal Speculum.

Imperforate Anus and Rectum.—There are several varieties of imperforate rectum, all of which are more or less serious in character, and which very often terminate fatally, even after the best-known means have been resorted to for preserving life.

There cannot be a doubt, that there are hundreds of children who die yearly from the malformation in question ; how many of whom might have been saved by appropriate treatment, it is impossible to say.

It is a question, however, whether (if life may only be saved by the formation of an artificial anus) it is not better to allow the little sufferer to

die rather than drag on a miserable existence, with such a loathsome and disgusting affliction, "an artificial anus."

There are several classifications of this malformation, and as the affection is rather rare, and attention is not very frequently called thereto, I shall give them here: Mr. Holmes divides the cases of imperforate rectum into two classes. The first embraces those in which no anus exists (imperforate anus properly so called); the second, those in which there exists an anal opening, which terminates in a short *cul-de-sac*. These are again subdivided—

The former class (imperforate anus) into: 1. Membranous obstruction of the anus. 2. Complete or partial absence of the rectum. 3. Communication of the rectum with the vagina in the female. 4. Communication with the urinary tract in the male. 5. External communication or fistula. The latter (imperforate rectum) may be subdivided: 1. Membranous obstruction. 2. Deficiency of the upper portion of the rectum.

Mr. Curling, who has given this subject a great deal of attention, makes a more simple classification thus:

Those cases in which there is complete closure of the anus, the rectum being either in part or entirely wanting. Second, those cases in which there is nothing but a *cul-de-sac*, surrounding the anal opening; in the third variety, there is no anus, but the rectum terminates in the bladder, vagina, or urethra.

An imperforate anus, properly so called, is much sooner recognized than an imperforate rectum, for the reason that the latter is not so easily discovered, and the patient continues to suffer, the causes of indisposition not being rightly understood, and indeed, death may ensue without either physician or attendants being aware of the true nature of the malady.

It is from a knowledge of these facts that every child should be examined carefully on the second day after birth, if there has been no movement of the bowels. In such an examination the practitioner should not be satisfied with the fact that the anus is open, but should institute an exploration with his finger, to ascertain as to the viability of the rectum.

In many of the cases of imperforate rectum, the intestines terminate in a blind pouch, which may either be high up or low down, or connected with the anal *cul-de-sac* itself. On this point, Mr. Bryant says: "It seems possible from Curling's and MM. Goyrand and Friedberg's observations, that such cases are caused by an obliteration of the bowel, which was originally well formed, from some intra-uterine inflammatory action. Some instances being recorded, where the muscular tissue of the intestine was clearly traced."

When the anus is entirely closed by membrane, the constipation, and the "*bulging*" at the anus, at once show the nature of the malformation; a simple incision generally suffices. If there be no bulging, and the anus is firmly closed, then it is proper to make an exploratory incision, beginning at a point about where the centre of the anus should be, and carrying the knife *backward* toward the sacrum. Forward incisions endanger the bladder, vagina, and other important organs.

In cases of imperforate rectum, the following method may be successful, if the gut can be reached; this latter is the chief point of difficulty in the operation.

On the 3d of March, I was called by Dr. Richardson, of Williamsburgh, to see a child, thirty-six hours old, who the doctor informed me, had an imperforate rectum. As there was no time to be lost, I went immediately to the house, and found an infant, healthy and plump-looking, born a day and a half previous, but with enormously distended abdomen, the convolutions

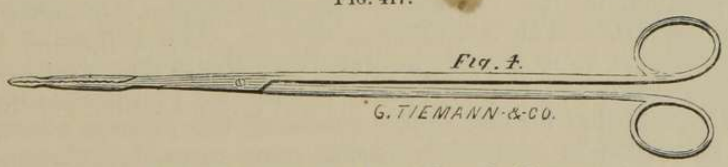
of the intestines being distinctly seen. The child had passed urine once since its birth. A peculiar feature in this case existed in that the parents had had another child born with a similar malformation, who had been operated upon, and had died. They had, two weeks previously, lost two children with measles, and necessarily were in an excited and despairing frame of mind.

Upon inserting my finger into the anus, I felt a *cul-de-sac*, which fitted over the end of the finger like a thimble. This I tore away, and then proceeded to search for the gut. It was entirely beyond my reach, and the finger moved about in vacancy. I then divided the sphincter toward the sacrum for about half an inch, to give more room; and upon again introducing my finger, I could just touch the intestine, but could not, by any means, "hook it" sufficiently to draw it down. By placing a very small hook flat-wise on the forefinger of my right hand, I pushed it through the anal orifice, and by using the left hand as a manipulator, and the right as a guide, succeeded in hooking the intestine, and drawing it down. The amount of traction required to do this was surprising; indeed, I was fearful that the instrument would tear out. So soon as I had drawn the gut outside the anus, I passed a needle, threaded with a double silk ligature, through it, and then let it retreat again into the cavity of the abdomen. With a few strokes of the scalpel, the margins of the anus were then scarified. By making traction on the ligature, the gut was again brought into sight, and held outside the anal aperture by Dr. Richardson, until I had stitched it to the margins of the anus. So soon as this was done, I cut off with a scissors the *blind end* of the intestine. The amount of fæces that were discharged seemed almost incredible; indeed, several times during the operation, we were obliged to stop proceedings, on account of fæces issuing from the punctures made by the hook and the needles.

This operation was a complete success. On the third day the anus had to be dilated with the finger, and since then there has been no further trouble. The father of the child called upon me a few days ago, stating that the child was thriving, nursed and slept well, and had natural and free evacuations from the bowels.

Foreign Bodies in the Rectum.—It is astonishing how many foreign substances, and of what enormous sizes, have been introduced within the rectum; bowls, cups, bottles, pots, pencils, etc., have all been removed from the lower bowel. In some cases, however, the foreign body may come from within, having been accidentally swallowed and thus passed into the alimentary canal. Pins, fish-bones, hair, bristles, etc., have been known to be found within anal abscesses, and have also been impacted in the rectum. The first thing to be done in such cases, is to carefully explore

FIG. 417.



Forceps for Extracting Bodies from the Rectum.

the rectum with the finger to ascertain not only the exact location of the foreign body, but if possible, its size and shape. The next step will be to place the patient thoroughly under anæsthetic influence, in order that the sphincters may be relaxed; the third step is to inject at least a pint of warm olive oil into the bowel; and then to use such forceps and scoops as may be required. Fig. 417 shows forceps for this purpose.

The best instrument, however, is a small pair of placenta forceps, those of Loomis being preferable; indeed it may be necessary, and in some cases is both practical and proper, to gradually introduce the hand into the rectum to remove what has become impacted therein.

Prolapsus Ani.—A protrusion of a portion of the rectum, or of its internal coat, from the anus, is denominated a prolapsus, or *procidentia ani.* In some cases a considerable portion of the rectum protrudes.

The causes of the complaint are such as tend to weaken the action of the muscles which support the intestine, and violent exertions of the rectum in consequence of certain irritations. The frequent use of cathartics, especially those which contain aloes, the presence of ascarides in the lower portion of the alimentary canal, habitual costiveness, and hæmorrhoids, all occasionally produce prolapsus ani. Cases are on record in which the affection was engendered by the tenesmus attending dysentery.

In some instances, the intestine remains a considerable length of time unreduced without any ill consequences, but more commonly it swells and inflames very speedily.

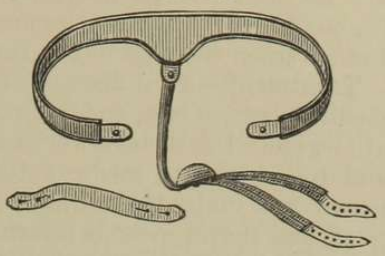
The protruded portion of the bowel is generally oblong in shape, of a bright-red color—especially in recent cases—and covered with mucus. In older cases, however, the color is purple, and it is rather difficult to ascertain where the skin is merged into the mucous membrane, and sometimes ulceration takes place. Often, especially in old cases, the bladder suffers, and complete retention with violent pain result. The constitution suffers materially after the disease has existed for a time; the patient is worn down with the prolonged suffering, and generally suffers from severe dyspeptic symptoms.

Treatment.—When called to a person suffering from a prolapsed rectum, the surgeon should immediately attempt reduction. This is readily accomplished by grasping the displaced gut, having first smeared the protruded part with fresh lard or simple cerate, and pressing upon it inwards and upwards. It will slowly, or in some instances quickly, return to its natural position. If a larger portion has escaped, as sometimes happens, especially in females rather advanced in life, a smooth towel folded cone-like, and well greased, must be placed against the central and most dependent part, and pressure then made firmly and steadily upwards; from time to time it may be necessary also to press inwards and upwards upon the circumference of the intestine. If, however, the surgeon be not called until the protruded intestine is swollen and painful, an immediate attempt at reduction may prove abortive; therefore a dose of ignatia or nux vomica should be administered, and the patient placed at perfect rest. These medicines, possessing a powerful influence over the intestinal canal, will probably relieve the patient in a short time, when the part may be returned to its normal position, in the manner above mentioned. The vapor of hot water retards rather than facilitates reduction. This complaint is, unfortunately, very apt to recur; to prevent which the proper means should be used, among which are, that the patient be strictly prohibited overloading his stomach, and that his diet should consist of the plainest aliment. Dr. Physick succeeded in completely curing some cases of prolapsus ani, by confining his patients exclusively to a diet of rye mush and sugar; and the same means have proved equally beneficial in the hands of other practitioners.

There have been many bandages and contrivances invented to prevent the recurrence of prolapsus ani, among the best of which is that contrived by Darrow & Co., of New York, and seen in Fig. 418; but they generally fail in

accomplishing the desired end, which latter is much more certainly attained by the administration of appropriate medicines and rigid dietetic observances.

Fig. 418.



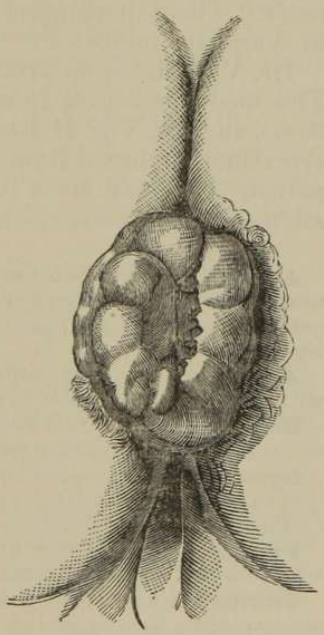
The principal medicaments are, ign., nux vom., merc., sulph., or ars., calc., lyc., rut., sepia.

For the particular symptoms indicating a choice of the above, the *Materia Medica* must be consulted.

Another method, which is sometimes successful, especially in old cases, is to draw down the rectum with a vulsellum forceps, include the prolapsed portion in Smith's clamp (a cut of which is found on page 778), and apply nitric acid.

Hæmorrhoids.—There is probably no disease which is more frequently met with by the surgeon than hæmorrhoids. The pain they sometimes engender is most excruciating, the constitutional symptoms belonging to them are various, and their cure is often difficult in the extreme. Piles consist, not only in an enlargement of the veins of the rectum, but of the arterial twigs also, together with more or less infiltration into the surrounding structures. They are divided into *internal* (those within the sphincter), and *external*, those situated outside and around the anus. The former are said to be of more frequent occurrence than the latter, and are more serious in every way. They generally begin with frequent and often profuse hæmorrhage from the rectum after stool, with pains in the back and loins, and more or less suffering during defecation. This condition may exist for a time without much inconvenience. Then tenesmus becomes noticeable, and increases, until with every action of the bowels the piles protrude; there is much hæmorrhage and great pain. The abnormal growths then have to be returned, which increases the sufferings. Sometimes during exercise, lifting, or straining, they pass beyond the sphincter, it contracts upon them, and most agonizing pain results. Fig. 419 represents old internal hæmorrhoids as they often appear after defecation. There are generally three, four, or five distinct tumors, as seen in this figure; sometimes they are all sessile, sometimes pedunculated, and bleed easily. Often after excesses these tumors inflame, and fever and severe constitutional symptoms result. The *external hæmorrhoid*, at first, merely consists of enlarged bloodvessels; gradually, however, the parts around become infiltrated, and the coats of the piles more or less thickened. When they become irritated, they rapidly inflame, become enlarged, the vessels composing them burst, their contents become extravasated, and thus a series of changes ensue, which render the hæmorrhoids quite hard tumors surrounding the anus. Sometimes there are very many of these tumors present, varying considerably in size. Sometimes they are enormously enlarged. The largest I have ever seen were the size of a coffee-cup, and which, with two others, each the

Fig. 419.



size of a walnut, I removed successfully with the écraseur. Dyspeptic persons suffering from liver disease, high livers, hard drinkers, sedentary men, are all liable to hæmorrhoids, indeed in many instances there exists a hæmorrhoidal diathesis, rendering the patient subject to these painful tumors upon the slightest indiscretion.

Treatment.—In a disease so very frequently encountered, the variety of medicaments, salves, and embrocations, etc., which have been recommended, are legion. I have been very successful in the management of hæmorrhoids, and the combined medical and surgical treatment adopted rarely fails if persevered in by the patient, to effect a cure. If a patient has internal piles, and they appear below the verge of the anus at stool, the *hot* sitz bath, immediately after the evacuation, will give relief, and enable the protruded parts to be returned. Many patients having for years suffered with hæmorrhoids, and taking *cold* baths after an evacuation from the bowels, are relieved by the *hot* water. If there is much hæmorrhage, apis mel. and hamamelis. H. Strisower* describes the case of a man, who had resisted all treatment for profuse hæmorrhoidal bleeding during six months, who was promptly cured by a clyster containing five grains of ergotin in two ounces of glycerin. If severe pain and dyspeptic symptoms are present, nux vom. and collinsonia canadensis are useful. To allay the severe itching and inconvenience resulting from an action of the bowels, a cerate of æsculus hippocastanum is the best application.

Hydrastis has proved the most efficient medicine in hæmorrhoids, accompanied with fissures and cracks about the anus. Three or four drops of the tincture, in half a glassful of water, a tablespoonful taken every six hours, is of great service.

Pond's extract of hamamelis I know has permanently cured a most aggravated case of hæmorrhoids; it was taken internally and applied externally. The following are the indications for medicines which may be used as symptoms indicate:

Dr. Von Holsbeck praises *chelidonium* as an excellent remedy for piles. This medicine is greatly in vogue with the inhabitants on the shores of the Seine, and Dr. Von Holsbeck has used it extensively as decoction, tincture or extract, prepared from the sun-dried root, gathered after the blossoming period. Fumigations of the root have also been followed by great amelioration of the excessive suffering which often accompanies the complaint.

Aconite, though not specific, is exceedingly useful when the hæmorrhoidal tumors are highly congested or inflamed, giving rise to symptoms of general vascular excitement; after which the most appropriate medicine should be administered.

Arsenicum should be employed when there is itching and burning in the tumors, with stinging pain in the daytime, particularly when walking.

Belladonna when there are sudden lancinations in the rectum, pain in the back, and difficulty in voiding urine.

Lycopodium when the hæmorrhoidal affection is chronic, attended with congestion to the head, constipation, painful protrusion, and acrid discharge; palpitation of the heart during digestion.

Pulsatilla when there are discharges of blood and mucus, accompanied with smarting and sense of excoriation.

Causticum when there are large and painful tumors, with stinging and burning and excessive itching of the anus day and night.

Platina when there is frequent inclination to go to stool, creeping, itching and piercing in the anus, succeeded by general shuddering, and a feeling of weakness in the abdomen.

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* London Medical Record, February 15th, 1877.

Antim. crud., discharge of blood and mucus at every stool, followed by severe colic, burning at the anus, and acrid discharge, particularly at night.

If the hæmorrhoids are attended with excessive colic, colocynth is an excellent medicine. Sulphur may follow the administration of nux; hepar and bella. symptoms may also be present. Other medicines are capsicum, calc. carb., china, merc., ipecac. and rhus tox. It is impossible in a work of this character to begin to notice the symptoms which call for the administration of these various medicines.

In *Hale's New Remedies*, we find the following clinical experience:

A case is recorded where æsculus glabra effected a cure (page 19); Dr. R. Hughes (page 44) reports several cases in which æsculus hip. was entirely successful; Drs. C. H. Lee, George Logan, E. M. Hale, A. A. Bancroft, T. C. Duncan, Cuthbert and L. B. Wells, also verify the action of the medicine. At page 159, Dr. Lippe mentions cactus grand.; at page 191, Dr. King mentions chelone glabra; at page 250, Drs. Hale, Carroll, Coe, E. P. Fowler, Holcomb, Stewart, G. W. Barnes and Jones recommend collinsonia canadensis; at page 311, Dr. Burt speaks of dioscorea vil.; at page 319, Dr. Hale mentions erigeron can.; at page 488, the virtues of hamamelis virg., are attested by Hering, Okie, Preston, Burritt, Burt, Hughes and Hale, who at page 500 cites several cases; at page 583, hydrastis is praised by Dr. Brown; at page 791, Dr. Paine proves the homœopathicity of phytolacca decandra; Talmage, of Brooklyn, at page 826, records cases showing the virtues of podophyllum. There are a great many other medicines which are too numerous to mention here.

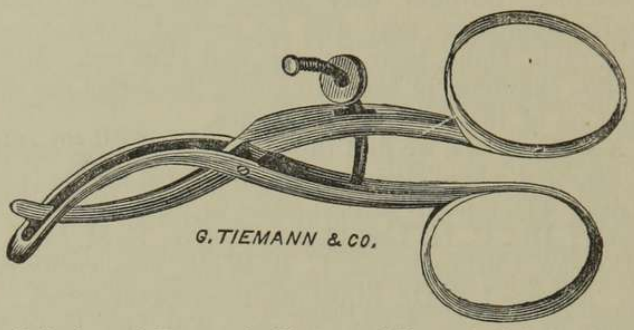
Injection.—In most cases of internal hæmorrhoids, when surgical treatment is necessary (which I hold often relieves the patient, and allows the medicines a better opportunity for displaying their power), the best is the injection into the hæmorrhoid of a mixture composed of equal parts of olive oil and carbolic acid. The pile must be brought down as low as possible, and then about eight to ten drops of the solution gradually thrown into it. If the connective tissue is dense, it may be broken up with the end of the needle before the piston is thrust home. An indication that the work is successful, is the change of color of the hæmorrhoid; it becomes whitish. Only one pile should be treated at a time, and the parts, well smeared with æsculus cerate, should be returned into the rectum. I have cured the most obstinate cases by this method.

Écraseur.—I have removed piles often with the écraseur, and without any disastrous result, excepting on one occasion, in which a profuse hæmorrhage followed, which was arrested by pieces of ice inserted within the rectum; in this case also (the patient being a lady of great nervous sensibility) tetanus resulted, from which she made a most tedious recovery. I am aware that there are cases upon record where the use of the écraseur has not been so free from after-results as in my own cases.

Ligature.—In applying the ligature, the patient should sit for a time over hot water, and use every effort to force without the verge of the anus, the offending masses. They then may be seized with a rectum polypus forceps, as seen in the section on that subject, or with the forceps invented by Bodenhamer, Fig. 420, for that purpose. Then having a good stout round needle, with a sharp point and no cutting edge (threaded with a double-waxed thread), pass it through the centre of the base of one of the tumors, cut the thread off at the eye of the needle, and tie one side around one portion of the hæmorrhoid, and the other ends on the other side. Having treated all the tumors in this manner, and allowing the ends to remain, the parts are well smeared with hippocastanum or simple cerate, and returned within the rectum.

Nitric Acid Treatment.—In one or two cases in which there has been profuse hæmorrhages from internal hæmorrhoids, I have used the nitric

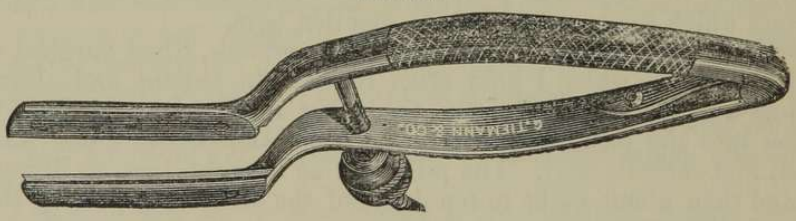
Fig. 420.



Bodenhamer's Forceps for Ligature of Hæmorrhoidal Tumors.

acid treatment with very good results. Having drawn the hæmorrhoids well down, apply to them a Smith's clamp, or the modification thereof by Mr. Stohlmann, which has ivory plates fixed to the blades to prevent the action of the acid on the steel (Fig. 421); this done, turn the screw tightly,

Fig. 421.



Smith's Hæmorrhoidal Clamp (ivory plates).

and apply the acid thoroughly with a glass rod or a brush composed of glass threads, or a piece of wood, and allow it to act for a considerable time. The clamp is then removed, and cold water applied. This must be repeated every few days until the growth is removed.

Écraseur.—This is my favorite method of removing all internal hæmorrhoids. The piles are brought well out, by a needle and thread, which is passed through the tumor. By traction on the thread the hæmorrhoid is drawn out and *kept out* until the chain of the instrument *bites*. The thread may then be removed, and the screw at the handle turned slowly. After the hæmorrhoid is cut through, a portion of the mucous membrane generally is impacted between the chain and side of the instrument; this may be divided with scissors. Dr. Nott's rectilinear écraseur is also most efficient in removing hæmorrhoids. The *galvano-cautery* is another means of removal. It is safe, and the results are successful. Those physicians who possess a battery can always have recourse to this method with confidence.

Fistula in Ano.—When an abscess forms in the cellular membrane surrounding the rectum, or about the verge of the anus, and leaves, after its contents are discharged, one or more small openings communicating with its cavity, the disease is denominated fistula in ano. Other appellations have also been employed, expressive of the particular situation of the fistulous orifice and the extent of the disease.

If the fistula open upon the surface of the integument, it is called an

external fistula; if it communicate with the rectum, and not with the integument, an *internal* fistula; and if the sinus open internally through the rectum, and externally through the skin, a *complete* fistula.

The formation of a fistula in ano is often denoted by rigors, painful swelling about the ischium or perinæum, difficulty of passing urine, and by irritation in the rectum and neck of the bladder. During the progress of the disease, the patient in many instances suffers extremely; at other times, however, the abscess forms and breaks almost without his being aware of its existence. Generally the abscess communicates with the integument by a single opening, but occasionally there are three or four.

In healthy constitutions the abscess does not differ from that met with in other parts of the cellular tissue, but in consumptive and scrofulous subjects the disease often assumes a different character. The surface of the integument is covered with an erysipelatous inflammation, the constitutional symptoms are well marked, the matter is discharged in small quantity, and from a sloughy, ill-conditioned opening, or from a ragged, unhealthy surface.

The causes of fistula in ano cannot be always satisfactorily ascertained. Sometimes it arises from irritation about the rectum; from local injury; from the lodgment of undigested articles of food taken into the stomach, and passed through the intestine as far as the rectum (for example, small bones of fish or fowls); severe and long-continued exercise, particularly on horseback; hæmorrhoids, etc.

Medical Treatment.—When the inflammation is erysipelatous, and spreads rapidly, bell. or rhus may be prescribed. Silic. is a very important medicine, not only in the commencement of the affection, but also when the fistula is fully established. In the former case, if the abscess has not discharged, and the cellular membrane be found in a sloughy state, a free incision should be made to permit the escape of the purulent secretion. If healthy action does not display itself, ars. and china must be prescribed.

Merc., sulph., silic., hepar, or calc. carb. must be exhibited, if incarnation proceed imperfectly. If the constitution of the patient is impaired before operation is thought of, appropriate medicines must be administered, to eradicate any disease that may be present. In cases where the fistula has not been subjected to homœopathic treatment from the commencement, merc. or silic. may be given. Hepar may be required after merc., when the fistula is extensive; and phosph. after silic., where there is complication with disease of the lungs. When the digestive apparatus is impaired, calc., nux, merc., and silic., will prove valuable medicines.

Caust. is very important in cases of long standing, and in alternation with silic. I have known a fistula in ano to be healed for a time.

Dr. Eggert, of Indianapolis, and Dr. Grasmuck, of Kansas, both report cases of fistula cured by internal medication, the latter gentleman using æsculus cerate in connection with nux vomica and sulphur. My friend Dr. Scriven, of Dublin, also related to me a successfully treated case. As a general rule, however, surgical means must be resorted to, although previous medication may do very much toward rendering the operation successful.

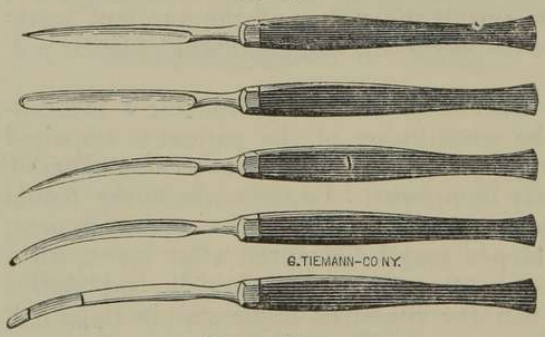
Dr. Hute employs an ethereal solution of iodine as injection for the cure of fistula. He states that patients are not obliged to keep their beds, and has known several cures after one injection.

Surgical Treatment.—If, however, after a patient trial of the means above mentioned, the disease remain unchanged, recourse must be had to surgical measures. I prefer over all other methods the elastic ligature of

Dittel. I have operated with it many times with better results than with the knife. Having passed a director through the fistula, I introduce the finger of the left hand into the rectum and draw the point of the instrument out at the anus. It is then pushed over across to the opposite buttock. Having then a blunt probe threaded with the elastic, it is passed along the groove in the director and the ligature drawn through. The director is then withdrawn. This leaves one end of the ligature hanging from the anus, the other from the fistula. A round circlet of lead, made for the purpose, or a perforated leaden ball, is then slipped over the ends of the ligature, which are firmly taken hold of with the thumb and finger of the left hand, and drawn out until the thread is about half its ordinary thickness. A good-sized pair of forceps with strong jaws is then taken in the right hand and the clamp taken hold of, but not squeezed, with the instrument. Holding then the extended elastic in the left hand and keeping it tense, the clamp is slid close up to the fistula, and with a sudden and firm compression of the handles, the jaws of the forceps are closed, thus pressing firmly together the malleable lead and securely fastening the ligature, the ends of which are cut off. The patient is not confined to bed; the elasticity of the ligature cuts itself out in from four to ten days, with the wound generally granulating behind it.

When the knife is preferred, the operation may be performed in the following manner: The patient being placed upon his face and knees, the pelvis elevated, with the thighs separated—or upon his back, with the thighs separated and flexed upon the abdomen—the surgeon, oiling the forefinger of the left hand, passes it up the rectum; a narrow probe-pointed scalpel or bistoury (Fig. 422) is passed up the fistula, until it comes in contact with the finger. If the intestine be not perforated by the disease, the surgeon must make an opening into it with the point of the knife, and pass it into the cavity of the intestine; the end of the finger is then firmly fixed upon the probe point of the knife, and by drawing both outwards, the sphincter muscle and all the intervening tissues are divided.

Fig. 422.



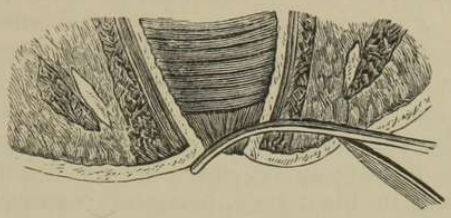
Cooper's Knife.

Another mode of performing the operation, is by passing a grooved director through the fistula, against or into the intestine. Then pass into the bowel a smooth, round stick, resembling a rectum bougie, the size of the thumb; the stick having a groove on one side as wide as the finger. This being passed up and held firmly by an assistant, the surgeon takes the director, already introduced, and impinges its extremity firmly against the groove in the stick. He now takes a sharp-pointed knife, and runs it forcibly down the groove in the director, and when it comes in contact with the rectum stick, cuts outwardly against this, and thus divides the fistula at one sweep. This operation is performed in a shorter time than the one previously mentioned, with much less pain to the patient, and greater convenience to the surgeon.

The operation, however, which I have always performed, is that I believe devised by Gross. Pass a grooved director (a strong one which will not easily bend), and with a somewhat pointed extremity into the fistula;

if the canal is blind internally, make the internal opening by pressure with the director. Then having oiled the finger, pass it into the rectum until it reaches the point of the director, hook the finger over the latter, and draw the instrument outside the anus. So soon as the point of the director emerges from the anus, push it with the right hand, which has not left the handle of the instrument, across on the opposite buttock. Then with a bistoury divide all the structures upon the director (Fig. 423). The bowel then returns into the cavity, and is dressed as described below.

Fig. 423.



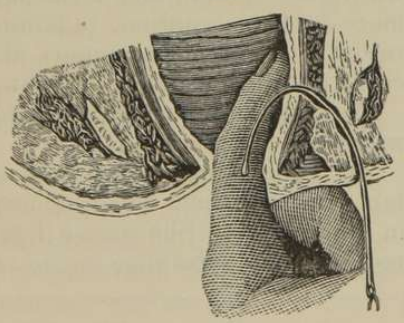
Many of the French surgeons, after dividing the fistula, dissect out its walls—thus cutting out a tube of the indurated soft parts.

In whatever way the operation is performed, after the fistula is divided, lint is to be pushed into the wound, to insure its closing from the bottom by granulations, which, as the healing process progresses, force the lint before them. The patient must be kept at rest; and, if there be any constitutional excitement, it may be allayed by aconite and bella. in alternation, after which silicea and sulphur may be exhibited, to hasten granulation.

There is one point that should not be overlooked, in this operation. When passing a probe into the fistula, the instrument should be carefully used, lest it perforate the walls of the sinus, and pass into the cellular texture of the perinæum. Deep cutting in this region may be productive of the most serious results; and, as the cure of the disease does not call for any such risk, it should never be encountered. The service required of the knife, is the division of the sphincter muscle; and, to accomplish this object, an incision an inch, or an inch and a half, in depth, is all-sufficient, and should never be exceeded.

Ligature.—When the internal orifice of the fistula is situated above the internal sphincter, it is safer treatment to use the ligature. Indeed, some surgeons prefer this method in all cases. Its objection is the length of time required in gradually cutting out the fistula, which always gives rise to more or less constitutional symptoms. A good method is to divide the upper portion of the fistula with the ligature and then to employ the knife. In passing the ligature a flexible probe may be used. It should be insinuated gradually into the sinuosities of the canal, until it impinges upon the finger within the rectum. It may then be brought out at the anus, as seen in Fig. 424, and the ligature, a good strong cord, fastened to its end. The probe is then carefully withdrawn, guided by the forefinger of the left hand, within the rectum. The ligature ends are then tied (with sufficient tightness to somewhat constrict the mass) over a small piece of flat cork. After two or three days the ligature must be again tightened.

Fig. 424.



Dr. Sawyer reports the case of a German man thirty years of age, who from disease seemed very prostrate, therefore he used a ligature drawn through a piece of cork, which was to be tightened every day, at the same time injecting

dilute phosphoric acid into the fistulous passage night and morning. He also gave arsenicum three times daily. In three weeks the fistula was cured. The patient was soon at work, which is the more satisfactory, as he, at the time Dr. Sawyer saw him first, had seemingly diseased lungs, and had been treated for such by other physicians.*

Forcible Dilatation of the Sphincter.—In the treatment of fistula in ano, John Pattison, M.D., of London, has offered, as a substitute either for ligature or the knife, a method of dilatation of the sphincter ani. This expansion of the muscle is effected by placing both thumbs within the anus, and drawing them forcibly outwards towards the tuberosities of the ischia; and so paralyzing the sphincter by overstretching the muscle. This treatment has, in his hands, been very successful—all his cases, saving one, having recovered. He treats the sinuses by injections of hydrastis canadensis, to cleanse them; and afterwards fills them with the anhydrous sulphate of zinc.

Some of the cures reported by Dr. Pattison are most remarkable, and the operations are so simple that they are certainly worthy of a trial.

Dr. Brownell relates the case of an Irish laborer, aged 39, admitted into Bellevue Hospital, April 13th, 1864, in which, after referring to Dr. Pattison's mode of treating these cases by suddenly paralyzing the sphincter ani, he gives his mode of accomplishing this desired end by inserting a sponge compress into the anus, which by subsequent expansion exerts an equable, steady pressure outwards, paralyzing the sphincters; the case, with two or three causes for retarding progress, recovered after some little trouble. The doctor says a second case was cured in a few days, and a third in seven days.

In the *Medical Investigator*, for March, 1867, and in the *Western Homœopathic Observer*, for January, 1870, George W. Bowen, M.D., of Fort Wayne, Indiana, reports five cases in which he employed this treatment successfully. He states that the bowels must be relaxed; after which the sinuses must be injected with a solution of nitrate of silver; the compressed sponge or a fine sponge tent is then introduced into the fistula. Dr. Bowen has generally found a week sufficient for this treatment. Thebaud's dilator, as seen in Fig. 413 of this chapter, is probably the best instrument, however, for forcible dilatation.

Dr. Brownell also refers to a case cured by introducing a bivalve speculum at the time of defecation, and then washing the rectum before the withdrawal of the speculum to avoid the necessity of confining the bowels in any case, and says his friend Dr. Sterling speaks highly of this method.†

Tumors within the Rectum.—Various abnormal growths have been found within the rectum, and according to their bulk, or specific character, excite more or less irritation, inflammation, diarrhœa, etc. There are cases on record‡ of enormous tumors of the lower intestine, involving the whole circle of the anus, and extending beyond it many inches.

Of these, polypus of the rectum is most frequent. The following case will show the symptoms:

A young woman of twenty years of age, admitted into the Good Samaritan Hospital, had never menstruated, was short of stature, and dwarfish in appearance. She stated that eight years ago she had suffered from a red, bleeding substance in the rectum, which had been removed by a phy-

* Am. Homœop. Obs., Detroit, September, 1868, p 436–7.
† United States Medical and Surgical Journal, January, 1867, p. 219.
‡ *Vide* Mr. John Bell's Principles of Surgery, vol. iii, page 188.

sician, but that similar growths had apparently returned. She was pale and sickly-looking, though not much emaciated, but was troubled with a constant diarrhœa, and more or less tenesmus, and the passage of a good deal of blood. Upon a mere external examination of the parts, nothing particular could be noted; but upon desiring her to attempt to expel the contents of the rectum, there would protrude several elongated bodies, resembling earthworms in shape, but of a much more brilliant red color. They presented a soft, vascular, shreddy appearance, bearing some resemblance to sarcomatous growths. With this expulsion there was always a yellow, very fetid discharge. Upon examination of the fæces they were flattened, and there was flatulent distension of the bowels. Knowing the value of bromide of potassium in the removal of several varieties of morbid growths, I determined to try the medicine upon this patient. I gave the following prescription:

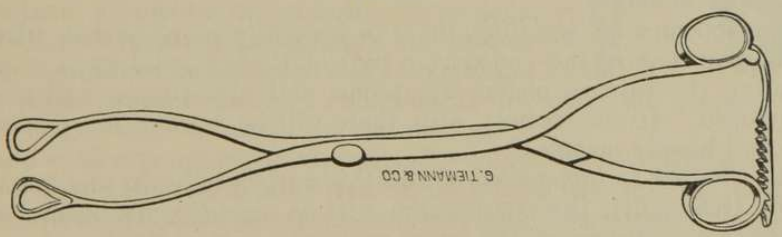
℞.—Potassii Bromid., ... ℥j.
Aquæ font., ... ℥vj.
M. ft. sol. S. A teaspoonful three times a day.

She continued the treatment from early in February until the middle of May. She began to improve in health shortly after taking the medicine; the diarrhœa ceased; she performed household duties in the hospital, and on the 13th of May, though the fetid fluid was expelled, she was unable to protrude any polypi. The remains of the growths could be felt, but otherwise the patient was in good health. I had endeavored to draw down the polypi and ligate them, but they were too friable, and broke away so easily that I gave up the attempt.

Treatment.—The best medicines for such tumors are caust., conium, calc. carb., lyc., phos., sepia, sulph., and thuja; others, however, may be employed according to the presenting symptoms; when these fail, resort may be had to an operation.

If the tumor originate by a narrow pedicle, and admits of motion, it may be pulled down by the forceps (Fig. 425), and a ligature applied to the

Fig. 425.



Rectum Polypoid Torsion Forceps.

neck. If, however, the abnormal formation be large, it should be drawn down as low as possible with the forceps, and several needles armed with ligatures must be passed through its base, and their ends firmly tied; circulation thus being arrested, sloughing will result. It is especially to these tumors that electrolysis is applicable. (See chapter on that subject.)

Stricture of the Rectum.—The rectum is sometimes the seat of stricture, which may be either spasmodic or permanent; the former is caused, in many instances, by improper or unwholesome articles of food taken into the stomach, which passing undigested through the alimentary canal, excite

irritation, which gives rise to the spasm. I must say, however, that in the cases that have come under my observation there has always been an actual deposit and permanent stricture of the tube; indeed it is not until the calibre of the rectum has been materially circumscribed by the deposit that patients apply for relief. *Permanent stricture* generally originates from chronic inflammation of the lining membrane of the intestine, causing thickening and contraction of the part or deposit in the submucous cellular tissue. In these diseases there is great pain and difficulty in voiding the fæces, which are passed in narrow flattened fragments, or if fluid, are ejected with considerable force. The stricture may be felt in some instances *per anum*, by the finger; in others, however, when the stricture is higher up, an instrument must be used. In examining a patient for stricture a great deal of care should be exercised, especially if the disease be high up in the rectum. Instances are on record where *fatal* results, from perforation of the bowels, have ensued. The digestive organs become impaired, dilatation takes place above the seat of stricture, which may result in ulceration of the intestine. In such cases the prognosis is exceedingly unfavorable.

This disease also is frequently accompanied with *carcinoma* of the rectum, which in the majority of instances, is of the epithelial variety, and complicated with hæmorrhoids. There can be no doubt that many physicians have treated cases as simply those of constipation of the bowels, when in reality a stricture existed within the rectum. Such cases have come under my own notice; one in particular, in which the stricture existed to such an extent that a small-sized bougie could be introduced with great difficulty. In this case the patient vomited fæces from time to time. I dilated the stricture at intervals with graduated metallic bougies, and this, with arsenicum given by the attending physician, was productive of the most happy results. On one occasion I believe life to have been saved by the timely application of this medicine.

The following points will be useful in diagnosing between *syphilitic contraction, carcinomatous* and *inflammatory* stricture.

If the stricture be *cancerous*, we generally can detect, in and around it, hard nodular masses, with here and there a softened and fluctuating spot. In this variety, also, there is generally an uneven deposit *around* the canal, and this deposit is sessile. Together with these manifestations there is often discharge of blood.

If the *stricture be syphilitic*, there is generally more or less ulceration *from* the anus *toward* the constricted part of the gut, and upon closely investigating the case, suspicious symptoms and appearances will generally be developed. In this variety, also, there will be more or less discharge of mucus and bloody matter.

If the *stricture be inflammatory* (and this variety is by far the most favorable for treatment), the constriction will be *annular*, and some previous inflammation or disease of the bowel will have been noticed.

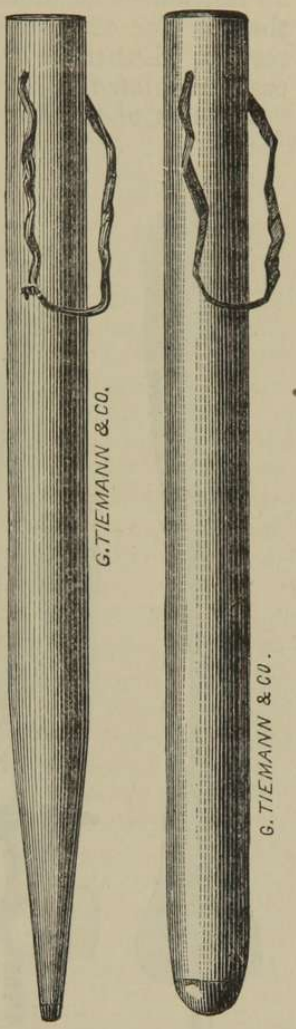
Treatment.—In spasmodic stricture nux. vom. is the principal remedy, and will often relieve the affection if the patient observe the strictest dietetic rules. Arsenicum, bell., hyos., sulph. ac., and verat. may also be called for.

To ascertain the position of the stricture it is often necessary to explore the rectum, which, when the seat of the disease is high up, is sometimes very difficult. In such cases the rectum exploring sound of Bodenhamer is a good instrument (Fig. 426).

In permanent stricture, ars., bell., canth., colch., ignatia, nux vom., lyc., merc., sulph., may be indicated, and together with the administration of the

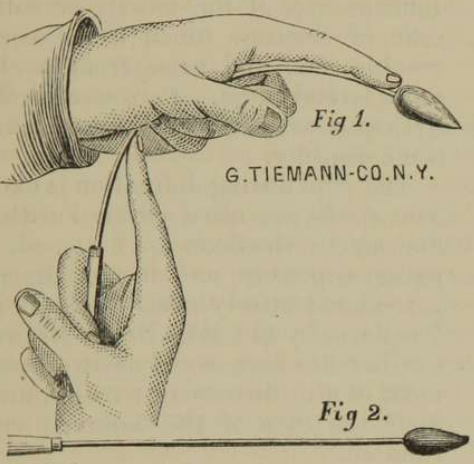
most appropriate, the bougie (Fig. 426) must be employed. The instrument should be soft, and at first introduced once in three or four days, and allowed to remain as long as the patient is able to bear it. After a time, a larger-sized bougie should be used, and introduced more frequently; in some instances, where

Fig. 426.



Rectum Bougies.

Fig. 427.



Bodenhamer's Rectum Exploring Sound.

there is great constriction, and the smaller-sized bougies cannot be introduced with facility, it is necessary to divide the stricture with a probe-pointed bistoury, passed into the intestine upon the forefinger.

Linear Rectotomy, anterior and posterior, may be practiced when the stricture is within reach. The patient being thoroughly etherized, a small Sims's speculum is introduced anteriorly. This, with traction, will bring the stricture into view; the forefinger of the left hand should be used as a guide, and passed into the rectum. On this, a probe-pointed bistoury should be introduced beyond the finger, and the stricture, mucous membrane, and even a few fibres of the muscular tissue, divided in a perpendicular line. The speculum is then introduced to bring the anterior portion of the stricture to view, and the same method of incision practiced. The hæmorrhage will be profuse, and the operation must not be performed if there are internal hæmorrhoids, otherwise most disastrous bleeding might be the consequence. Pieces of ice, or, as I practiced in a recent case, injections of *hot* water will arrest the bleeding, when a fair-sized bougie (one that will enter without much force) must be introduced and allowed to remain for half an hour.

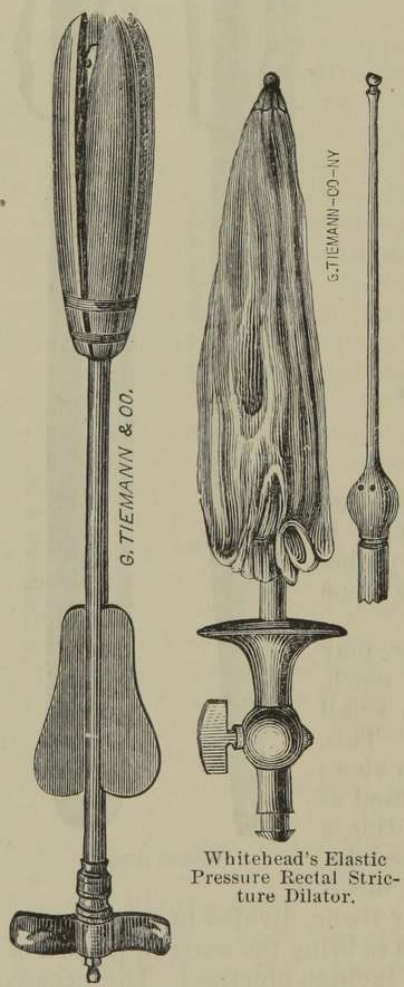
I cannot place too much stress upon the absolute necessity of great caution in all these operations. After a day or two a bougie, somewhat larger, may be entered, and by patience and gentleness the obstruction overcome. This method of operation was devised by Dr. Beane, of New York.*

* American Journal of Medical Sciences, April, 1878.

Other instruments have been employed for dilating the rectum, as in Fig. 428. In the *American Journal of the Medical Sciences* for January, 1871, Dr. Whitehead has an article on stricture of the rectum, and has devised an instrument for dilatation of stricture. It consists of a bag, as seen in the cut, Fig. 429, which, when collapsed, is easily introduced within the rectum. Either air or water may then be injected, the pressure being thus easily regulated.

Fissures of the Anus—Pruritus Ani.—The verge of the anus and the mucous coat of the bowels are often the seat of fissures, which are exceedingly troublesome, and arise from a chap or other trivial cause. Persons afflicted with dyspepsia are often subject to this troublesome disorder.

Fig. 428. Fig. 429.



Whitehead's Elastic Pressure Rectal Stricture Dilator.

Rectum Dilator.

The pain during defecation is excessive. The stools are often covered with blood and mucus, the fæces are flattened, constipation is present, and in fact the patient is rendered utterly miserable. It is said, I believe, by the late Baker Brown, that sterility has been noted as an accompaniment of this disease in females, and that upon the cure of the fissure, pregnancy resulted.

Treatment.—The medicines that relieve the patient most speedily, are graphites and nitric acid; indeed, I have known fissures that have resisted other treatment for a considerable time, yield readily to the action of these remedial agents, especially the latter.

Dr. Perry* has written a valuable article on this subject, and the following are the results of his experience: The chief medicines for this painful affection are nit. ac. and ignatia; next in order are plumb., sulph., ars., nat. mur., phos., and sepia; lastly, caust., sil., nux vom., thuja, tabac., gratio., and mez.; petrol. is also an important medicine.

I have used also, with great success, to relieve the pain after defecation a cerate of æsculus hippocastanum. Of late years, however, I have found surgical management the safest and most speedy. The patient should be placed under the full influence of anæsthesia, as the pain of this apparently trivial operation is often excessive. Then opening each fissure, divide thoroughly the mucous membrane at its deepest point. To make sure of the thorough division, pass the finger forcibly into the fissure, and break up any slight adhesions that may remain. Gurdon Buck cured rhagades by dilatation either with the fingers, as directed in the treatment of fistula in ano, or with Thebaud's instrument, as seen in the first portion of this chapter. I have successfully treated fissures in this manner.

* Journal de la Société Gallicane, quoted by British Journal of Homœopathy, vol. viii, p. 541.

Dr. Créguy* inserts charpie, soaked in a solution of chloral (1 to 50), just within the anus daily, and reports complete cure of two cases within a fortnight.

Itching of the anus is a very troublesome and inconvenient affection. Frequently it is an attendant upon verminous diseases, or in other cases it may be purely idiopathic. In most instances it is attended with other symptoms, as burning and stinging, and is worse at night.

Treatment.—All stimulating ointments, plasters, etc., should positively be prohibited, as in the generality of cases they aggravate rather than ameliorate the pruritus, or convert a simple into a troublesome and sometimes painful affection.

When there is excessive itching of the anus, a few doses of causticum may entirely subdue this unpleasant symptom. If there be burning pain, *alumina* and *capsicum* frequently relieve it. When it occurs during the night, *iod.;* during stool, *terebinth.;* after evacuation, *antim. tart.* or *strontia.* Burning, itching, and smarting in the anus, is cured by *antim. crud.;* burning, itching, and tingling, by *colchicum;* and itching, smarting, soreness, and burning, with sensation as if tumors would form, by *nit. ac. Platina* is homœopathic when there is frequent creeping, with tenesmus, as if diarrhœa would set in, particularly in the evening before going to sleep. *Kali carb.* relieves a stinging, tearing, and cutting, also an itching and burning in the anus. When there is itching, with sensation of contraction of the anus, *plumb.* The best local application is that mentioned at the top of this page.

Cancer of the Rectum.—Some of the symptoms of cancer of the rectum have been detailed already, when speaking of malignant forms of stricture; indeed, in all malignant diseases of this tube, there is more or less obstruction of the canal. In the earlier stages, the affection is known by the peculiar, hard, uneven (nodular) masses that are felt by the finger, or sometimes seen with the speculum, situated from an inch to four inches beyond the sphincter ani. The symptoms are pain during the efforts at defecation, with occasionally loss of blood, which becomes more frequent and profuse as the disease advances. The suffering lasts for some hours after stool, which is accompanied with tenesmus. The fæces are altered in shape, being thin and tapelike, and the patients become gradually emaciated. After a time, a fetid and acrid discharge escapes from the anus; there is absolute constipation, and an examination reveals a soft and pulpy degenerate tissue, which is reddish or purplish, friable, and readily bleeding. The constitutional symptoms are, by this time, well marked, and the cancer cachexia is very apparent. A portion or the entire walls of the rectum may be involved, but as the disease advances, all the surrounding tissues may be infiltrated and destroyed. I have seen cases where the entire sphincter and perinæum had been eaten away, presenting a hideous and disgusting deformity. The cases that have come under my care have generally been those of epithelioma.

Treatment.—In the early stages of the disease, the medicines best adapted to its treatment are arsenicum, conium, hydrastis, both internally and externally, lachesis, and nitric acid or thuja.

The best local application is by far *electrolysis.* I have known cases so far advanced that the patients were apparently beyond all hope, to be arrested and apparently cured, or certainly the disease held *in statu quo*, by this method. If the surgeon, however, prefer it, the rectum may be excised.

Excision of the Rectum.—Lisfranc made this operation popular in 1826,

* Monthly Abstract of Medical Sciences, Jan. 1876; London Medical Record, Nov 15th, 1875.

and Prof. Schuh,* in 1868, operated successfully. Of late years, however, the performance has been revived, and with sufficient success to warrant a further trial. Volkmann has given a new impetus to the operation, and it has already been performed several times with success, in this country, by Dr. R. J. Levis,† of Philadelphia, Drs. Van Buren and Keys, of New York,‡ Dr. L. A. Stimson,§ Dr. Briddon,‖ and others. The method of removal is thus practiced, as recommended by Volkmann, whose paper, March 13th, 1878, has been accurately studied by Dr. L. A. Stimson, of New York, and Dr. I. C. Warren, of Boston. The operation may be briefly described as follows: After the usual precaution of emptying the bowel, and preparing all the details for the antiseptic plan, a circular incision is carried around the anus, about three-quarters of an inch from its margin; a second cut is then made in the median line from the circular, one back to the coccyx, and, if necessary, a forward one, in the perinæum; the rectum is drawn gradually down and dissected carefully out, or, as was practiced by Dr. Levis, the hand of the operator may be gradually insinuated into the hollow of the sacrum, and the attachments of the gut torn loose. The front portion of the bowel must be removed with more care, as the peritoneal fold on the anterior face of the rectum is much lower than on the posterior portion of the gut. Threads are now passed through the healthy portion of the intestine, which is stitched carefully to the sides of the aperture, and the cancerous portion removed with the knife or scissors. As a necessary precaution, and also as a guide, a good-sized bougie should be introduced into the bladder, and held there during the operation. Volkmann, in one instance, to allow himself room, resected portions of the sacrum as high up as its promontory, and in another removed a portion of the posterior wall of the vagina. If the peritoneum is incised, the rent is immediately to be plugged with sponges saturated with a solution of thymol or carbolic acid, and afterwards carefully brought together with catgut sutures. If the entire circumference be not involved, a portion may be taken away, and the lips of the wound united by suture.

CHAPTER XL.

INJURIES AND DISEASES OF THE MALE URINARY ORGANS.

Malformations.—A complete defect or absence of the urinary bladder is very rarely met with, and if such were the case, the ureters would be found opening somewhere on the surface of the body, perhaps around the umbilicus, or into the rectum or vulva.

Cases have been recorded of what is termed double bladder, in which a septum, more or less perfect, has been found stretching between the walls of the viscus, and dividing it into two cavities.

The variety of malformation which is most frequently seen, and which is also of rare occurrence, is what is termed by authors, extrophia, or inversion of the bladder. It appears to me that the term "inversion of the bladder" does not convey to the mind a proper idea of the arrest of devel-

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* Medical Record, N. Y., July 13th, 1878.
† Archives of Clinical Surgery, vol. i, p. 311, 1877.
‡ Medical Record, N. Y., July 13th, 1878.
§ Loc. cit., Oct. 19th, 1878.
‖ Archives of Clinical Surgery, vol. i, p. 313.

opment now under consideration. When we say inversion of any hollow body, we do not necessarily understand that its *structure is deficient*, but merely that it has been turned inside out; whereas, in the cases that I have seen, and a description of those I have read, there has been always a *deficiency in the anterior* wall of the organ.

In the majority of cases, the arrest of development appears to be first in the abdominal walls, then in the symphysis pubis, and finally in the structures immediately beneath.

In the female it is accompanied by an absence of the clitoris, and in the male by a fissure of the urethra, or linear epispadias. In the hypogastric region, we find protruding the posterior wall of the bladder, fiery red, with here and there a slight mucous coat of a bluish color. The circumference of the organ is lost in the surrounding integument, which has the appearance of a cicatrix, and is bluish. The orifices of the ureters are found in the lower half of the organ.

In my own case, which is rather rare, as will be seen by further perusal, the rudimentary penis was pushed close to the lower portion of the bladder, and the ureter opened by an orifice close to the pubic bones. The caput gallinaginis with the openings (in the shape of slits) of the vesiculæ were visible. The semen passed from time to time through these orifices, and I found it on the mucous surface of the open urethra.

The pubic bones were separated about three inches and a half, and the posterior exposed wall of the viscus was two and a half inches in diameter; the length of the penis was an inch and a half, and had a large fold of prepuce hanging downward. It was singular, also, to notice the arrangement of the hair, and the superabundant skin, which appeared as though it had been pushed aside by the protruding bladder. The testicles were very well formed, and the man was apparently healthy. The ureter was large, and I could pass a gum bougie upward several inches toward the kidney.

The malformation is said to occur much more frequently in males than in females, and the late Mr. Earle, of London, states that after the most careful examination he has found sixty-eight cases on record, of which sixty were males. Others have given the ratio as four to one. This is the third case which I have seen, one being exhibited to the class of the Jefferson College, while I was a student, and which is represented in *Gross on the Urinary Organs*, and in his able work on *Surgery*.

Dr. Gross also mentions that he had seen another case in a child from Missouri.

In the *Medical Record* there is the description of a case, which is singular in the fact that the writer states that the urine passed outward from slits in the surface. There must be some mistake in this. The case I present has some important differences from any heretofore recorded:

First. In the *single opening* of the ureter, there being but one.

Second. In the split nature of the urethra, the surface being flattened and mucous.

Third. In the wide and slit-like openings of the seminal ducts; and

Fourth. In the manner in which the penis could be separated from the protruded wall of the bladder.

Dr. Gross states the disease is utterly irremediable, and there can be no doubt whatever that, all things considered, there is but a poor prospect of ultimate recovery. There has been a successful operation reported by Mr. Simon, of London, who caused the ureters to open into the rectum, which was accomplished by introducing threads from the ureters and carrying them to the rectum, and there allowing them to remain until the passage was completed. The patient, however, most narrowly escaped with his life.

Mr. Lloyd's case, in which the communication was effected by a suture, died on the third day.

The operation of autoplasty, or of taking integument from the surrounding structures, has been performed several times in this country, once by Dr. Pancoast, in the Jefferson College, in 1858, and once by Dr. Ayres, of Brooklyn, New York. The latter was more successful than the former; also by Dr. Ashurst, of Philadelphia, and many other surgeons.

In my case I had many ideas, and abandoned them one after another.

The following plan of procedure which I adopted, and a description of the autopsy, were prepared for me by Dr. J. S. Read.

Taking a piece of wet parchment, it was applied accurately to the protruding viscus; it was then divided in halves, one being laid in each groin; the flaps were then traced with ink, an allowance being made for shrinkage; the flaps being dissected up, and the nodular edges of the vesical tumor being refreshed, they were laid down over it, and held by silver pins and wire sutures; a semilunar flap was then dissected up, on that portion of the abdomen immediately above the vesical wall; it was then turned down, being held by wire sutures. The catheter was inserted, the wound dressed with a solution of carbolic acid and glycerin. During the operation the external epigastric arteries were both cut. The operation lasted one hour and fifteen minutes.

The patient recovered at six P.M.; had considerable nausea and tickling cough, for which ignatia was administered. Compresses, saturated with calendula, were placed in the cavities in the groins. He was kept in a sitting posture, in order that the urine would pass more readily.

August 21st. Restless night, on account of posture; the urine trickles alongside the catheter; about one pint has been passed. Can retain nothing on the stomach; bilious vomiting every twenty minutes, attributed to chloroform; for this condition ipecac[3], once every two hours, was given. Removed some large clots in groin; hæmorrhage from left groin quite profuse, which was checked with Monsel's styptic. The retching has put the flaps on the stretch, and forced the canula out; parts washed with calendula solution.

August 22d. Was called to him early in the morning; catheter had come out, urine trickling through the wound; Dr. Goodman replaced it. At 2 P.M. much improved; adhesion seemed to be taking place, and the raw surface to be granulating. Had to allow him to get into bed; very stiff, from long sitting. Some cough, with immense amount of expectoration, easily ejected.

August 23d. Catheter clogged with blood, forced out; urine passing on both sides of flap; took out one pin; wound had not healed underneath sufficiently. Wound beginning to gape; two new sutures were put in; complains of erections at night, which press catheter into the surface of the wound; there appears to be no healing process going on below; tendency to slough in the flaps; at superior parts, healthy granulation is taking place.

August 24th. Catheter out again at night; wound looks badly below, healthy above. Most severe cough, raising large quantities of thick pus. Stannum[3]. Great deal of swelling around the opening of ureter, but finally succeeded in introducing a No. 4 flexible catheter about five inches, fixing it to penis by narrow, adhesive strips, thus carrying off the urine.

August 25th. Pulse one hundred and ten; slept better last night; has had some diarrhœa; great rumbling in bowels, very thin passages. Phos. acid[3], a tablespoonful of a watery solution after each operation. Opened catheter by means of a wire; half a pint of urine was discharged, which must have been contained in the ureter and pelvis of the kidney.

From this date for several days he gradually improved. His diarrhœa

lessened and his pulse came up, but he still withal appeared to be losing flesh.

September 1st. Complained of great weakness; diarrhœa of a cadaverous odor came on; pulse one hundred and twenty; great pain along the track of the ureter, and some bloody discharge; no appetite and great discouragement; cough worse in the evening; the wound has united at the uppermost extremity, and the raw surfaces are gradually filling up, but the parts below are all open, and the ureter so sensitive that he cannot bear the introduction of the catheter. Carbo veg. 30—one powder every four hours.

From this period he gradually sank—his cough and diarrhœa increasing steadily, with great prostration, indicating no doubt a tuberculous condition of the entire system.

Autopsy.—The autopsy was made about fifteen hours after death, by Dr. Read, who says:

"The expression of countenance did not indicate that great suffering had been endured, but I should not have recognized the face, so greatly had he emaciated. The skin was sallow, the veins showing distinctly; the odor from the suppurating surface was scarcely perceptible, owing to the judicious use of carbolic acid. The flaps taken from the inguinal regions right and left, had united at the tips, in the median line of the body, immediately over the mucous surface of the vesical portion of the abdominal wall; union had also taken place between the flaps and the surface external to the mucous membrane. No union had taken place between the flaps and the mucous surface; the orifice of the ureter was filled with calcareous matter, about the consistency of thin mortar, some particles being so large as to prevent the entrance of the bougie.

"The incisions being made, one in the median line, running from an inch above the opening of the ureter to the sternum, meeting the lateral incision, the flaps were carefully turned outward.

"Above, the abdominal walls were of the usual thickness, gradually getting thinner toward the inguinal region, where they were quite thin. The round ligament of the liver attached to the upper and inner surface of the vesical portion of the wall, was now cut. Lying in the left hypochondriac region, and extending down into the left lumbar region, in immediate contact with the abdominal walls, was the kidney—filling the left lumbar region so completely as to leave no space for the descending colon and small intestines. The peritoneum was greatly thickened, not only in the renal region, but throughout the whole extent. The renal capsule was quite small, about one-half the normal size, and of very loose texture.

"Tearing the kidney away from its attachments it was measured. In the great circumference it measured *nineteen and three-fourths inches;* around the lower part, *twelve and three-fourths inches;* near the upper end, *nine and three-fourths inches.* The ureter was twelve inches long, slightly sacculated; toward the lower end, just as it was about to enter the vesical substance, it was greatly reduced in size; the walls of the ureter varied in thickness from one line to three lines, the thickest portion being above; this thickening extended to the pelvis of the kidney, which appeared as if it had been enlarged, the appearance being wholly due to the increase in the thickness of its walls.

"The pelvis of the kidney and the ureter were both filled with a calcareous matter, about the consistency of thin mortar, the mucous membrane being finely dotted with minute calcareous particles that were with difficulty rubbed off.

"The kidney of the right side was entirely absent, not a vestige was there, nothing even rudimentary.

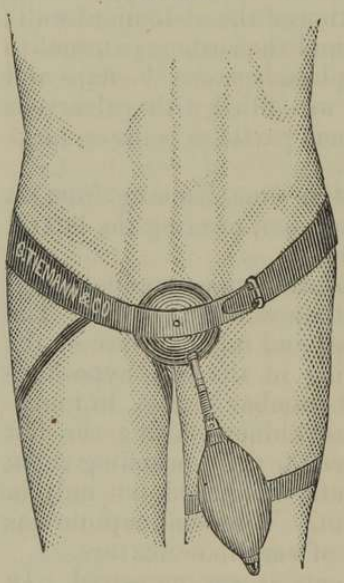
"The ascending colon was in its proper position, but did not extend high

enough; the descending colon commenced on the right side of the spine, crossed it, dipping down underneath the small intestines to join with the rectum; the ascending and descending portions were united by the transverse colon, about three inches in length, these three parts forming a small arch toward the right side of the body.

"The mesenteric glands were enlarged; many of the small glands presented a grayish appearance. The vas deferens was the usual size; the spermatic cord was normal in every respect. When, however, the vas deferens reached the internal abdominal ring, it turned abruptly, forming a very acute angle, then proceeded in a straight line to the seminal vesicle, which was rudimentary. The vesical portion of the abdominal wall was three-fourths of an inch thick, composed principally of fibrous tissue. The interval between the bones at the pubic symphysis was filled in with a dense fibro-cartilaginous growth, interspersed with cellular spaces or cavities, lined with fine vascular membrane.

"The cremaster muscle was more fully developed than I have ever seen it, its fibres being continuous with those of the internal oblique, forming a thin, flat, muscular covering for the cord, before it began to break into loops, which were also fully developed and very distinct."

FIG. 430.



It is really a matter of much thought whether surgical interference in such cases is justifiable. Each surgeon, however, must determine in his own mind the course to be pursued in each case, as no two cases are probably alike.

An apparatus such as is seen in Fig. 430 will render life somewhat comfortable, and can be worn with little inconvenience.

Epispadias—Hypospadias.—In some cases the urethra terminates on the upper portion of the penis, and sometimes from an arrest of development an opening exists in the course of the canal on the lower side of the organ. To the former condition the term epispadias is applied, to the latter hypospadias. In the case of extrophy of the bladder which I have just recorded, there was complete hypospadias; indeed, a simple groove covered with mucous membrane existed on the upper part of the penis. As far as my knowledge extends the affection is beyond the reach of medical or surgical treatment. In epispadias, *urethroplasty* may be attempted. The first proceeding in this operation is to open that portion of the urethra beyond the fissure, as from want of use, in the majority of cases, it has become obliterated. This portion of the operation must be conducted with great care, and be performed with a round blunt instrument not much larger than a common probe. From considerable experience in the separation of occluded mucous surfaces, I am quite confident that much greater success follows carefully introduced blunt instruments than when the knife is employed.

So soon as the canal is opened, a catheter (silver) should be introduced into the bladder, the edges of the fistula pared and approximated with metallic sutures. Nelaton's method consisted of the above operation, together with a dissection of the skin to relieve tension of flaps, underneath which a slip of india-rubber is placed to prevent the surfaces being injured by the urine.

Hermaphrodites.—Of all the varied anomalies of form which the anatomist encounters, there is none so curious as the hermaphrodite. These complicated deformities have been variously considered by different authors, and are found, in the majority of cases, to be formed by an arrest of development of the female organs of generation and the formation of the male sexual system, or a part of it, in one individual, and *vice versa*.

Such monstrosities have from time to time been described in medical literature; but, according to Bischoff, Paget, and Müller, many of the cases mentioned cannot be considered as reliable.

The former of these authors has pointed out the reasons for rejecting the majority of the examples that have been described. He states that there are numerous sources of error by which the judgment may be warped; as, for example, the great resemblance between the generative organs of the two sexes at an early period, the uniform type in the development of both, the coalition of the corpora Wolffiana, and the errors formerly prevalent as to the primitive identity of both sexes.

The existence of testicles and of ovaries *on the same side, in their normal position*, the development of the uterus, of the seminal vesicles, of the prostate and Cowper's glands, have, strictly speaking, neither in man nor in the higher order of animals, ever occurred. However, from everything I can learn (although, in truth, my researches have been limited on the subject), the case that I am about to describe approximates nearer to true hermaphroditism than any yet on record, there being both testicles (although concealed and abnormally placed), ovaries, more than rudimentary fallopian tubes, uterus, vagina, penis, with glans and prepuce, scrotum, etc.

Hermaphrodites have been thus classified:

I. Those which, being, as to the essential organs of generation (testicles and ovaries), distinctly male or female, exhibit nevertheless some anomaly of development—be it arrest, overgrowth (up to the masculine type), or disproportion of some other kind—more or less typical of the opposite sex.

a. "*Hypospadias*," in its highest grades, viz., on the one side a cleft scrotum and the formation of a vagina-like sinus; on the other side, as its analogue, diminutive vagina, closure thereof into a raphé or suture, partial or entire absence of this organ, with a clitoris developed into the semblance of a penis hypospadiæus, or one completed, and channelled with a urethra.

b. "*Cryptorchism.*" Concealed testicles, in the one case; in the other, its parallel condition, descent of the ovaries into the greater labia pudendi, now and then associated with the foregoing form. High grades of these anomalies constitute the so-called transverse hermaphroditism, implying external organs of the one, and internal of the other sex. The case of externally female and internally male organs, is by far the more common, because due to an arrest in the development of the male organs, whilst the opposite case depends upon the ulterior development of the female organs into the male type.

c. The occurrence in the male sex of a womblike organ.

These cases collectively constitute what is termed spurious hermaphroditism.

II. "*Lateral hermaphroditism.*" The presence of testicles and vas deferens, with or without seminal vesicles on one side, and of ovarium and tube on the other.

III. "*True hermaphroditism*" (*hermaphrodite per excessum, androgynus*, coexistence of male and female organs on the same side).

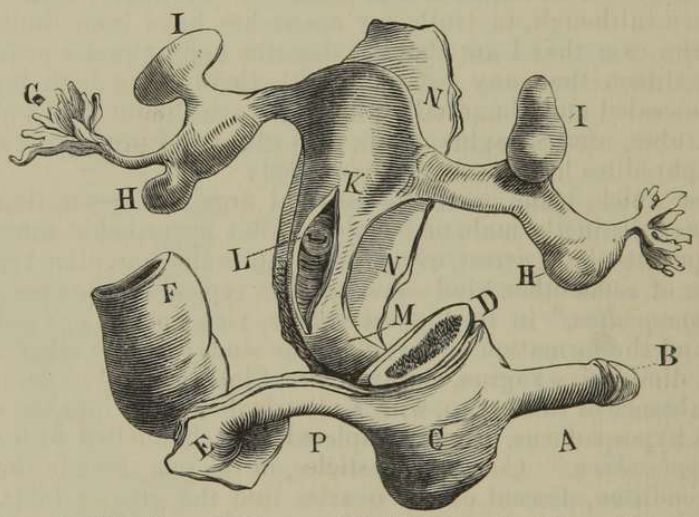
From these remarks, it would appear that the case represented in the woodcut is very remarkable, in possessing the characteristics of all the different forms of hermaphroditism (with the exception of the lowest grade, hypospadias) embraced in the above classification. By referring to the

drawing, it will be seen that it embraces a high grade of cryptorchism, *b*, or transverse hermaphroditism, viz., external organs of the one and internal of the other sex. Also, *c*, the occurrence in the male sex not only of a *womblike* organ, as mentioned in the classification, but of a well-developed uterus and vagina. It comes, to a certain extent, under II, *lateral hermaphroditism*, and we find it nearly allied to III, *hermaphroditism per excessum*, or the coexistence of the male and female organs on the same side, the last being a condition of things which is positively denied by some authorities. Gurlt and Meckel have recorded such cases; but Bischoff remarks in reference to them, "that not a single one offers conclusive evidence of the union of the two *main* organs of generation, the testicle and the ovary, and that the seeming dualism of the rest of the organs is explicable according to the principles of arrest of development."

From these facts, the anomalies of form, size, and relation of the organs represented in the cut, are certainly very wonderful, and worthy attentive examination.

The accompanying sketch (Fig. 431) I have taken from a cast. The model was made from the organs themselves, taken from the subject shortly

FIG. 431.



Hermaphrodite. From the Museum of the Homœopathic College of Missouri.

after death, and the arrangement of the parts is such as will best exhibit them in their connection. Professor Brainerd, of Cleveland, Ohio, was acquainted with the individual during life, and assured me that a regular menstrual discharge took place, the fluid passing through the vagina into the urethra, and thus making its exit through the penis. By referring to the cut, it will be seen that the empty bladder, N N, with the uterus, K, have been, for their better exposure, twisted upon their pedicle, which is the commencement of the urethra, and that the rectum, F, has been flattened out. It was only by such an arrangement that the cast could be taken to show the entire parts in their appropriate connection. The penis, A, is well developed, and has a prepuce and glans, B. The scrotum and dartos, fully formed, are represented by C. The pubic symphysis, D, has been sawn through; the integument has been allowed to remain from the scrotum, C, to the anus, E, showing the perinæum, P. F is the rectum, empty and collapsed; G, the partial fimbriation of the fallopian tubes; H, H, the ovaries; I, I, testicles on each side, covered by deflections of the

peritoneum; K, the uterus, well developed; L, the os tincæ; M, the vagina, its wall divided to show its internal surface, with rugæ, etc., and the position of the cervix uteri; N, the bladder (empty), upon which is lying the uterus.

Through the kindness of my friend Dr. John McE. Wetmore, I have been enabled to carefully examine a most remarkable case that came under his observation. In this, the breasts were developed, there was beard on the face, and there was a well-developed penis with prepuce; a vagina of considerable capacity, and apparently testicles in each enlarged labium, which looked like a cleft scrotum.

The case of the German hermaphrodite who was exhibited throughout the country is familar to most medical men.

A very interesting case of hermaphroditism in the male, the patient believing *itself* to be a woman, and being married to a man, is recorded by W. E. Wheelock, M.D.*

NEPHRITIS.

Nephritis or Inflammation of the Kidney.—(*Inflammatio Renum.*)—The substance of the gland itself, its capsule, tubes and pelvis may be affected; when the mucous membrane of the latter is involved the term *pyelitis* is used.

Generally on one side only of the lumbar region a dull weight or pain is perceived, which becomes deepseated and sharp, producing a feeling of tightness and downward pressure, occasionally lancinating or pulsatile, increased by pressure, by lying on the belly, or *un*affected side; the urine is scanty or suppressed, is passed with difficulty, and is red or tinged with blood. The pain sometimes extends from the loins to the bladder, groin or penis (in females down the round ligaments), accompanied with a tremulous motion and numbness of the thigh and retraction of the testicle; there is also vomiting and fever. The pain may cease and return with redoubled severity, which latter symptom would indicate calculi in the kidneys, especially if calculous matter were found in the urine. When the complaint is chronic the pains are less severe, a heaviness in the loins is complained of, and the urine becomes turbid, having a fiery red appearance and containing a purulent fluid.

Upon dissection we seldom find more than one kidney affected, and that is red, hard, and filled with pus (infiltrated); if the ureters participate they are found to be red, their mucous coats thickened and covered with pus. Adults are most liable to be attacked.

The causes are, shocks of the body, external injuries, falls, strains, excessive use of stimulants, overdoses of cantharides, too long lying on the back, suppressed hæmorrhoids or menses.

Belladonna is an excellent remedy when the lancinations and burning pains in the region of the lumbar vertebræ extend along the ureter into the bladder, and return periodically with increased severity, sometimes affecting the abdomen below the umbilicus, and increasing by contact; heat and bloatedness in the region of the kidneys; urine fiery and passed in small quantities.

Cannabis for a drawing, dragging, with feeling as of *excoriation* reaching from the renal region towards the groin.

Cantharides is a very prominent medicine, and it is especially called for if the urine be tinged with blood, and passes off in drops, with violent burning pain in the urethra, and when the pains are cutting, tearing and shooting in the loins and region of the kidneys; also if there be complete strangury. The pains are increased by motion and disturb respiration; loss of appetite in consequence of the

* Medical Record, June 8th, 1878.

desire to urinate (which is greater at night), together with the pains. The patient cannot sleep, the thirst is great, the cheeks hot and red.

Nux vomica, if there be tension, burning, pressure and heat in the region of the kidneys, faintness, nausea, bilious vomiting, drawing up of the testes and spermatic cord; if the disease can be traced to abdominal congestion, suppressed hæmorrhoids, excess in wine or stimulants, calculi, or sedentary habits.

Plumbum, thuja, colocynth, mercurius, cocculus, hepar, are other remedies. The latter if suppuration be apprehended, and when this is about to take place the sufferings of the patient are much alleviated; these cases, therefore, must be carefully watched. The signs of such a termination are, increased heaviness in the renal region, chills, heat and perspiration, also a sensation of pulsation. **Mercurius** and **aurum** are useful in the chronic stage, the doses given at long intervals.

Nephritic patients must avoid taking such fluids as are of a stimulating character.

Calculous Nephralgia.—In this disease there is the passage of a calculus down the ureter. Many of the symptoms are exactly similar to those already described, with the exception of the fever. The diagnosis is made out by the suddenness of the attack, the previous comparatively healthy condition of the urine, the absence of fever already noted, and the instantaneous relief afforded as the stone passes into the bladder. The pain is of the most excruciating character, and shoots down the loins into the scrotum; there is also vomiting and retraction of the testicle.

Treatment.—I have never known myself, though I have heard of cases relieved by homœopathic medication. The hot bath, hot fomentations to the part, and the inhalation of chloroform have been most serviceable in my hands. Morphia must be used in most cases, and has to be given in full doses until the agony subsides. The suffering is occasioned by a *mechanical* cause, and until it is removed the pain will continue.

Dr. Henry W. Roby, of Chicago,* reports a very interesting case of renal calculus, which he removed from the ureter of a lady by "suction." The patient was suffering the usual intense pain from the passage of the calculus, and had received the usual treatment, including a grain of morphia, with but temporary relief; so soon as narcotism passed away her sufferings were most intense. The doctor attached to a large double-acting Molesworth syringe, twelve inches of india-rubber tubing, to the free end of which he fixed a female catheter; this was inserted into the bladder, and pushed toward the locality of the ureter. Around the meatus a collar of linen was firmly pressed to prevent the entrance of air. The piston was then worked, which evacuated the contents of the bladder, after which, while the suction was being continued, the patient was suddenly and completely relieved. No untoward symptom followed, the parts being sore partly from the pain, but this was not of long duration. This most ingenious, and in this case most successful method, should be remembered. I should think that the catheter should be held free as possible in the bladder, to prevent the mucous surface from being drawn into the eye of the catheter, and that the exhaustion should proceed most carefully and slowly. It is to be hoped that further experience will prove this method to be successful in relieving the severe pain accompanying the passage of calculi.

Cystitis.—The urinary bladder may take on inflammation, for which morbid state we have the names, *cystitis, inflammatio vesicæ, cystitis urica*, etc. The inflammation may attack any of the coats, but most generally affects the mucous one, and the secretion of mucus, which in an acute form of the disease is diminished, in the chronic stage becomes increased and altered, constituting the disease known as *catarrhus vesicæ, dysuria*

* Homœopathic Times, July, 1878.

mucosa, catarrhal inflammation of the bladder. The general symptoms of this inflammation are, acute pain, tension, and tumor in the region of the bladder, with fever; pressure above the pubes causes pain and soreness; pressure on the perinæum also produces soreness and micturition, the urine being discharged in small quantities and with soreness, or else there is complete inability to pass it; it is of a dark-red color and is frequently discolored with blood; there are also tenesmus and vomiting. The pains are of a burning, lancinating, or throbbing kind, and extend to the perinæum, sometimes to the testicles and upper part of the thighs. In some cases there is a confirmed suppression, with skin hot and dry, pulse frequent, hard, and full; tongue whitish, thin, red, and dry. Should the disease not be arrested, swelling in the hypogastric region takes place, with increase of sensibility in the perinæum and hypogastrium. If the neck of the bladder especially be affected, most pain is felt in the perinæum, and there is entire retention of urine, or the patient has dysury (difficulty in passing urine), or strangury (extreme difficulty, issuing drop by drop). In this event the introduction of a bougie is horribly painful. Tenesmus takes place if the posterior part of the bladder be chiefly affected, in consequence of its proximity to the rectum. If the inflammation be about the mouths of the ureters, and extend along their course, a complete retention takes place, when there is more or less tenderness on pressing upon the hypogastrium. The disease may terminate in resolution, suppuration, gangrene, or induration and thickening of the coats of the bladder. Resolution is known by the gradual abatement of symptoms; suppuration if chills or rigors accompany the abatement of the pain and fever, with an appearance of a white matter in the urine. If suppuration take place in the mucous membrane, or an abscess form between the coats of the bladder, and the pus break into that viscus, it will be discharged with the urine; or it may open into the vagina or rectum, and infiltrate into the cellular tissue of the pelvis, or it may burst into the peritoneum, labia pudendi, or scrotum.

In the majority of cases of cystitis which have an unfavorable result within seven days from the commencement of the attack, gangrene has taken place, which is known by the sudden subsidence of pain, cold, clammy perspiration, cold extremities, prostration, confusion of intellect, weak, frequent pulse, deathlike countenance, and hiccough.

The causes of cystitis are, acrid substances irritating the bladder; injections of *cantharides* or turpentine thrown into the bladder; metastasis of other diseases, as rheumatism and gout; gonorrhœa; the introduction of a catheter or bougie; suppressed sweat and hæmorrhoids; injury in parturition, or by the use of obstetrical instruments; the application of cold to the feet or lower portion of the abdomen; retained urine; external injuries in the hypogastric region; retroverted womb; frequent use of stimulating drinks.

When complete suppression of urine exists and the inflammation runs high, the danger is imminent.

Aconite should be given if the desire to urinate be excessive and fruitless, or with the emission of a few drops only of red, deep-colored, or sanguinolent urine, with violent fever and thirst; and if the pains are increased when passing water, and much tenderness is exhibited when the region of the bladder is pressed upon.

Cantharides for shooting and burning pains in the vesical region, especially before and after the emission, sometimes only a few drops being passed, sometimes none; or if the pains are cutting and extend from the loins to the bladder, the region of the bladder being painful when touched. In a case which was induced by suppressed gonorrhœa, when the urine was bloody and discharged drop by drop with intense burning, *cantharides* in two days afforded relief and restored the gon-

orrhœal discharge from the urethra; the remaining pains in the urethra when urinating, together with drawing in the spermatic cords and testes, and fulness of the abdomen, were cured with *nux vomica.*

Nux vomica also relieves cases where there is a contractive pain in the urethra after urinating, especially when hæmorrhoids are present, also if the disease have been produced by a retroversion of the uterus, in which case the womb must first be replaced. If the inflammation is caused by *cantharides*, *camphor* should be given, *camphor* symptoms being, complete retention or slow emission in a slender stream, with burning in the bladder and urethra.

Digitalis, when the neck of the bladder is principally affected, when with the retention of urine there is constrictive pain in the *bladder*, the urine being turbid or deep-colored and passed in drops only, the desire to pass water being urgent and frequent; also if the disease be rather of a spasmodic character

Cannabis, for complete retention; also if the desire be great, especially at night, with discharge of bloody urine by drops, with burning pain.

Squilla, when there is great desire to urinate, with scanty emission; strong inclination to urinate and to evacuate the bowels, showing inflammation of the fundus; urine red, hot, or sanguinolent, with sticking in the region of the orifice of the urethra.

Kali carb.: great desire to urinate; pressure on the bladder for some time before the urine passes: fiery, diminished urine; patient is often obliged to urinate, with the emission of but a small quantity, but experiencing a renewed and almost painful desire after every emission.

Lycopodium, sepia, graphites, causticum, pulsatilla, and **dulcamara,** are other remedies. The latter in the chronic cases, where there is a continued desire to urinate, with an unpleasant feeling of a flow towards the vesical region and urethra; emission drop by drop of urine, with a slimy sediment or sediment mixed with sanguinolent corpuscles.

Phosphorus: inability to retain the urine long, from the desire for its evacuation; desire to evacuate the bowels at the same time; profuse micturition; emission of urine prevented by a dull pain in the hypogastrium in the morning This medicine is suited to chronic cases, and where paralysis of the bladder has taken place.

Sulphur if other means have failed, and if the urine be mixed with mucus or blood, with *burning in the urethra when urinating* If the complaint be caused by the suppression of hæmorrhoids, *calc. carb* after *sulphur*, is recommended, or *arsenic* and *carbo veg.* also for the burning *pains.*

Other medicines are also adapted to this disease, and especially to the more chronic forms; each case which presents itself for treatment having its own peculiar symptoms, for which the materia medica must be consulted.

Retention of Urine (Ischuria Vesicalis).—This affection differs materially from suppression of urine. In the latter the kidneys do not perform their usual function, while in ischuria, the urine is secreted and passes into the bladder, but cannot be ejected from that viscus. There is always more or less pain in the bladder, which, from distension, is perceptible above the pubes; there is urgent desire to void the urine, with pain and sickness, and but few drops are emitted. The disease is generally easily amenable to treatment, but in some cases it is of a very intractable character.

Treatment.—The chief medicines for this complaint are, acon., cann., canth., dulc., merc., nux vom., op., puls., stram. Others than the above may be required in particular cases. An empirically applied medicine, but one which relieves *spasmodic* retention of urine frequently in a short time, is *buchu.* The powerful action that this plant is known to exercise upon the urinary apparatus, should lead to its proving upon the healthy individual, and there can be but little doubt that it would be a valuable acquisition to the materia medica.

The method of preparing it for administration is as follows: Place in a large-sized tumbler, or other vessel, a small handful of the leaves of the plant, and pour thereon scalding water; allow this to remain until it becomes cold; of this infusion administer a dessertspoonful every quarter or half hour, until the patient is relieved. The above is an empirical use of

the medicine; but a knowledge of the fact may be useful to the practitioner in urgent and peculiar cases, when other means have failed. When the surgeon is called to a case in which the patient is suffering intense pain from distension of the bladder, the catheter should be immediately used.

Catheterism in the Male.—Every physician and every surgeon is called upon more or less frequently to pass the catheter into the bladder of man.

Those who have often essayed the operation are fully aware of the difficulties that attend its performance, and those who are seldom called upon are often, after repeated and unsuccessful trial, obliged to abandon the task, or hand the case over to more experienced manipulators.

There is scarcely an operation which requires more dexterity and knowledge, more gentleness and steadiness, than the simple procedure of the introduction of the catheter, or as it is technically termed, catheterism.

A bungler may, it is true, often pass an instrument through a healthy urethra and reach the bladder, while on the other hand experienced and renowned surgeons are frequently foiled in the attempt. I very well recollect, while I was student, waiting in the amphitheatre of the old Pennsylvania Hospital for over an hour while two gentlemen of acknowledged surgical ability were endeavoring to relieve a patient of a bladder full of urine. I have heard the illustrious Mütter state to his ever attentive class that the most important operation which the general practitioner was called upon to perform was undoubtedly catheterism.

Now, wherein lie the difficulties? Firstly, in the want of proper anatomical knowledge of the triangular ligament of the perinæum and the suspensory ligament of the penis, and in the curve of the catheter. I am very much disposed to believe that though the bulb of the urethra does sometimes impede the passage of the instrument to the bladder, yet that it does not offer so great opposition as is generally supposed.

If we draw a line across the perinæum from one tuber ischii to the other, we can form the base of two triangles, the upper one having an apex at the pubic arch, and being termed the urethro-perineal, the other having its point at the coccyx, and being designated the perineo-anal triangle. It is the upper of these spaces that we propose briefly to consider, as bearing especially upon the point we have in view. The line aforesaid passing from the tuberosities of the ischia would pass, as we are aware, above the verge of the anus, and must therefore be some distance below the transverse perineal muscles. The sides are very nearly equal, and measure from three inches to three inches and a quarter. In the centre of this triangle, and dividing it into two halves, passes the raphé of the perinæum, which is of considerable importance in a surgical point of view, but of little consequence anatomically.

Underneath the skin, which is counted as the first covering of the parts, and which is thin, elastic and very movable,—indeed to such a degree as to render it not easily divisible without being put upon the stretch and firmly held by the finger and thumb,—we have the second layer, which is a cellulo-adipose structure, varying very considerably in thickness; this fascia I have had occasion to observe does not lie in contact with the pelvic bones, but is continuous with a similar structure upon the thighs and scrotum. After we remove this layer we come down upon the true superficial fascia of the perinæum, which is attached in a peculiar manner, an appreciation of which serves to explain without difficulty the course taken by the urine in extravasation, either from rupture of the urethra or after surgical operations in the perinæum. To the outer border of the

pubic and ischiatic bones it is firmly attached, and also to the triangular ligament, of which I desire to speak more particularly hereafter, whereas in front it is continuous with the dartos of the scrotum. Therefore in cases of urinary infiltration, unless this fascia is ruptured, the renal secretion cannot gravitate either downward or backward, as would be supposed, but passes forward into the scrotum and upward into the groin. Besides this, Dr. Buck, of the New York Hospital, has shown by recent and careful dissections that this fascia also envelops the perineal muscles, the spongy structure of the urethra, and the corpora cavernosa penis.

Underneath the superficial fascia we come upon the fourth layer of the perinæum, which is composed of *five* muscles, two in pairs and one single muscle, which, together with the anterior portion of the sphincter ani, are connected at a point called the *central* tendon. The transverse muscles are situate in front of the anus, are irregular and somewhat triangular in shape, arise from the inner side of the tuber ischii, and are inserted into the already mentioned central tendon.

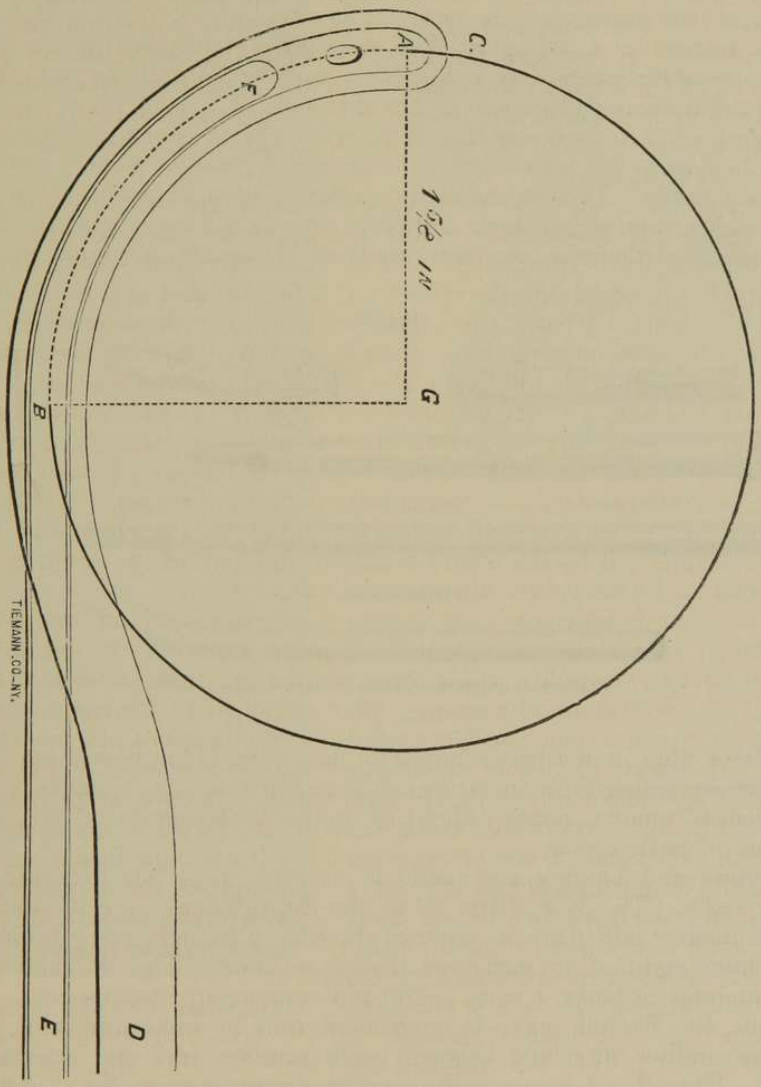
The *erectors* also arise from the tuberosities of the ischium, and are inserted into the cavernous body of the penis; while the *accelerator muscle*, with a bipenniform arrangement of the fibres, surrounds the bulb of the urethra and is inserted into the triangular ligament and into the cavernous body of the penis. I have passed very hastily over these muscles, which are really possessed of great interest, that we may come to the important structure which we wish to consider, viz., the *triangular ligament*. Before proceeding to describe it, let me premise that it is called by many names, each anatomist and surgeon giving it what he deems its most appropriate signification, which often leads to considerable confusion. Thus it is called, perhaps, most frequently, the deep perineal fascia, Cowper's ligament, the recto-urethral aponeurosis, and the ischio-pubic fascia. It would be far better to designate it by the term triangular ligament of the urethra, which would abundantly suffice for all practical purposes.

This triangular ligament then closes up a greater part of the space between the pubic and ischiatic bones, excepting superiorly or immediately under the arch of the pubis, which space is filled by an expansion of fibrous tissue called the subpubic ligament. It is attached to the inner border of the pubic and ischial bones, and extends from the ligament above—the subpubic—to the rectum and anal aponeurosis. It is composed of two layers, an anterior and a posterior; the former, which is comparatively dense, is prolonged forward around the urethra, while the latter is connected with the fibrous investment of the prostate gland. It contains foramina, which are specially important, superiorly for the passage of the dorsal veins of the penis, and about an inch below the pubic symphysis and directly opposite the raphé of the perinæum, an opening of considerable size for the passage of the membranous portion of the urethra.

It is not necessary in this connection to state what peculiar structures, either muscular or glandular, lie between the layers; the idea to be especially arrived at is this, that the urethra being movable along the most of its extent, *becomes fixed* and stationary after it passes the triangular ligament, making therefore a fixed curve, which varies but little, excepting in disease of the prostate gland. Besides this triangular ligament, the suspensory ligament of the penis and the anterior true ligaments of the urinary bladder assist to keep the urethra *in situ*, and necessarily *fix* the curve at this point of the canal. It is at this point that, from the wrong direction of the curve of the catheters, which are often constructed merely as the fancy of the cutler may dictate, or some ill-defined conception on the part

of the surgeon, that often great difficulty in the introduction of the catheter is experienced. Now having in our minds the ligaments already mentioned, by finding the distance from the pubic symphysis to the opening in the triangular ligament, we can discover the lowest portion of the curve which the urethra makes as it passes beneath the subpubic arch. This point Sir Henry Thompson has found, by very careful and oft-repeated measurements, to be distant from the pubic symphysis from seven-eighths of an inch to one inch and one-eighth, the variations not exceeding one-quarter

FIG. 432.



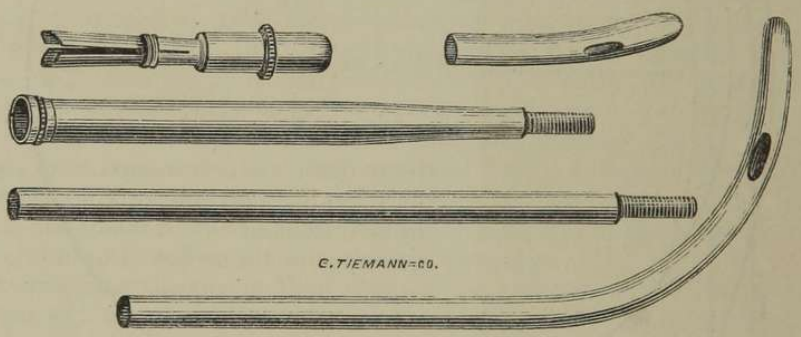
of an inch, thus explaining why the urethral curve varies so little. Dr. Van Buren thus writes, speaking of the attachments of which we have already spoken: "By these firm attachments the curve of the urethra is maintained in a fixed relation to the symphysis pubis, a relation which is unchangeable except by disease or injury to the parts. By taking its centre from the surface of a vertical section through the symphysis, the mathematical elements of the curve can be readily determined. It constitutes three-tenths of a circle, three inches and a quarter in diameter."

Or, as Sir Henry Thompson says, the subpubic curve may be considered as an arc of a circle, three and three-quarters inches in diameter, thus making a circle described by a radius of one and five-eighths of an inch in length, the chord of whose arc is two and three-quarters inches.

Fig. 432 shows a catheter and sound bent according to measurement. A B, the arc of a circle, three and three-fourths inches in diameter, having a radius of one and five-eighths inches; A B E, a catheter, corresponding to this curve; F B E, a sound, with same curve, though shorter; C B D, Benique's sound, following same curve, though with a larger arc of circle.

I would have it distinctly understood that these remarks apply to simple stricture, or the passage of the catheter in retention of urine. It is a very different matter in treating cases of *enlarged prostate*, because in this disease the *prostatic portion of the urethra* may be double its natural size, because the increased thickness in the diameter of it may be so much as to form a projection into the canal, and therefore the entrance into the bladder may be pushed so far backward, as to occupy a position almost behind the symphysis pubis. In such cases the catheter must be at least four to six inches longer than usual, have a greater curve, and be somewhat elevated at the point, or otherwise represent more of the arc of a complete circle.

FIG. 433.



Parker's Compound Catheter and Caustic-holder.

I believe that it is always better to have a good-sized catheter, with a curve corresponding to the measurements to which attention has been called, if we wish to remove many difficulties in the performance of the delicate operation of catheterism.

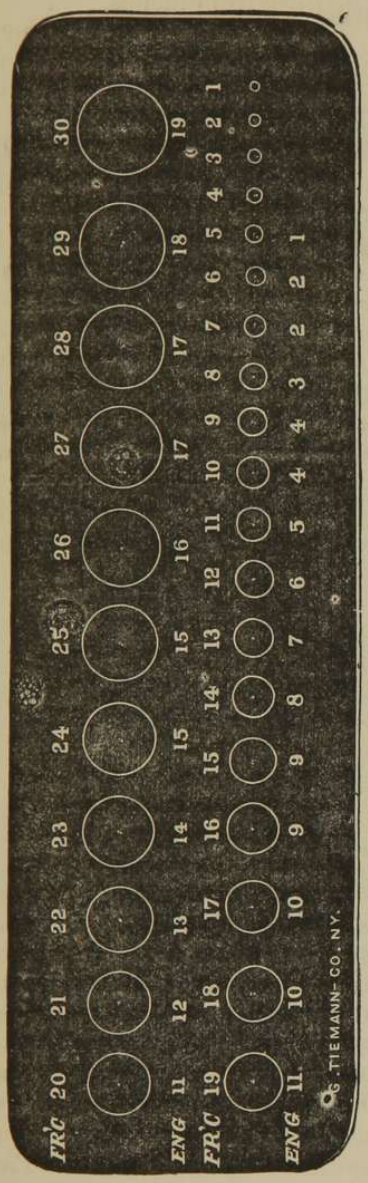
Catheters and bougies are made of various sizes, but according to a regular scale. The Nos. 10 to 16 of the English scale are those that are most frequently called for in general practice, although every practitioner should have eight or ten catheters always on hand. Fig. 433 shows Parker's compound catheter, a very useful and convenient instrument.

Of late the French scale is much used, and by some preferred, because there are smaller intervals between each number, and the interval more regular. Thus No. 1 is one millimeter in circumference, No. 2 is two millimeters, and so on to 30. The diagram shows the comparison between the sizes of the instruments (Fig. 434).

In introducing the catheter, the patient may be placed in the horizontal, or in the upright position, the former being that generally preferred. The head should rest upon a pillow, and the thighs be slightly bent upon the abdomen. The catheter (of the proper size and curve) well oiled, should be held with the thumb and forefinger of the right hand, while the surgeon, taking his position on the left side of the patient, takes the glans penis be-

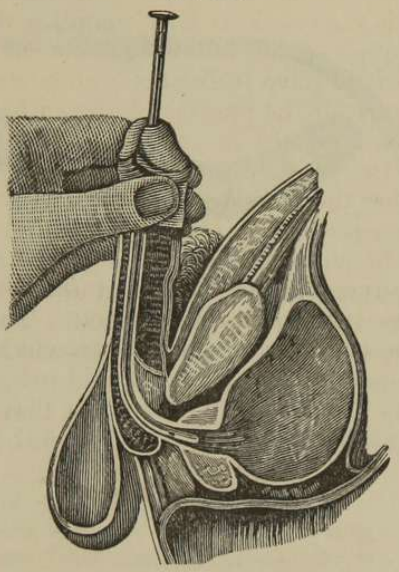
tween his thumb and finger, retracting the prepuce and allowing the orifice to gape. The instrument is entered then with gentle pressure of the right hand, and the penis drawn up almost on a line with the abdomen with the left,

Fig. 434.



French and English Catheter Gauge compared.

Fig. 435.



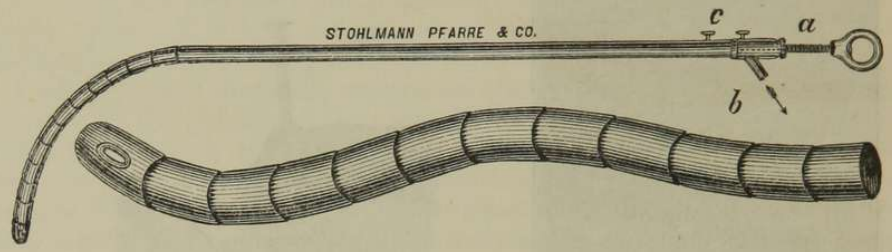
the object of which manœuvre is to put the movable portions of the urethra on the stretch, and to draw out the folds of the mucous lining (see Fig. 435). The catheter is then carried along the canal until it reaches the arch of the pubis, at which point, as has already been shown, the urethra perforates the triangular ligament. When the instrument reaches this point, it should be brought parallel with the linea alba. Then, still drawing the penis well up on the catheter, compressing it there with finger and thumb of left hand, the handle of the instrument should be depressed, or, in other words, made to describe a part of a circle, of which the straight portion of the catheter is the radius, and it will, with a little additional pressure, glide into the bladder.

Dr. Squire, of Elmira, New York, has devised what is termed a "vertebrated catheter," designed especially for prostatic enlargement. Its curve is formed of sections, as seen in the figure, and it is designed for passing tortuous canals. So soon as it enters the viscus, by turning the screw at the handle the sections are tightened. This improvement has again been somewhat modified by Dr. Caro, of New York (Fig. 436).

a, Is a regulating screw, by which the links can be made firm or slack to any degree.

b, Is a stopcock, with nozzle for the escape of urine, as indicated by the dart. Whenever the two buttons (*c*) stand parallel, the stopcock is then open for the evacuation of urine; but when the nozzle of the stopcock is turned up, or to either side, the escape of urine is entirely prevented.

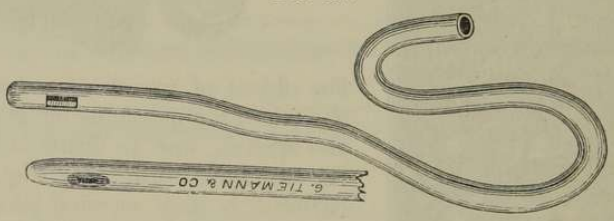
FIG. 436.



By removing the ring and the screw button (*a*), the instrument can be easily taken apart and cleaned. The whole instrument should be of good silver, and all the links of the chain of hard silver soldered to withstand the corrosive action of the acid urine.

The best ordinary instrument that can be used for entering the bladder is the soft rubber catheter, Fig. 437; it is now manufactured in this coun-

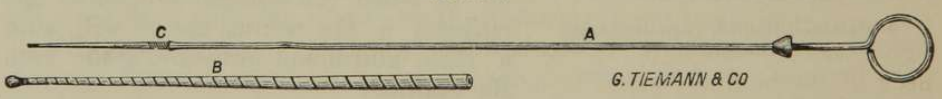
FIG. 437.



try by Mr. Tiemann, and has the advantage of having the edges of the eye sunken. With this catheter a patient may readily be taught to relieve himself, as no danger can come from its application.

In some cases, however, especially of enlarged prostate, the difficulties of entering the bladder seem almost insurmountable; no one but those who have had experience in these matters can appreciate the patience, gentleness, tact, delicacy, and perseverance that are often required in such cases. Dr. F. N. Otis* has invented an ingenious instrument, Fig. 438, for the

FIG. 438.



purpose of aiding the introduction of the soft rubber catheter in cases of enlarged prostate. It is named the "*Prostatic Guide.*" It consists of a small rod, A; can be readily introduced into Tiemann's soft rubber catheter, while the spiral riband, five inches in length, B, accommodates itself to any irregularity of the urethral line.

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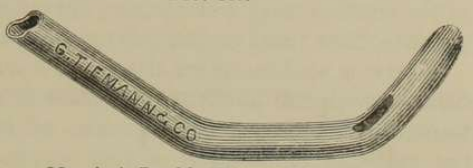
* Medical Record.

Figs. 439 and 440 represent the elbowed catheter of Mercier, which is said to be very useful (I have never tried it, however) in prostatic retention.

Fig. 439.

Mercier's Elbowed Catheter.

Fig. 440.



Mercier's Double-Elbowed Catheter.

If all these means fail, or indeed if there be much difficulty in the introduction of instruments, the aspirator may be used without fear. The capillary punctures heal readily, and the operation may be repeated often without danger. In fact, it is a question in my mind whether, after a careful trial of the catheter, the surgeon should not resort immediately to aspiration, rather than continue his efforts with other instruments, thereby necessarily bruising or injuring the parts, and running the risk of making false passages.

Catheterism in the Female.—The following is the method of passing the female catheter:

The forefinger of the left hand should be introduced between the nymphæ, and passed down to the urethral orifice, which is known by a depression, with an elevation on its vaginal aspect. The catheter should be taken in the right hand, and introduced along the finger which is at the urethral orifice, into which it should be inserted, and thence it easily passes within the bladder.

Abscess and Fistula in Perineo.—Urinary fistulæ, or perineal fistulæ, may arise from a variety of causes, one of the most frequent of which is *abscess in the perinæum.* Wounds, bruises, tight strictures, etc., also give rise to this distressing complaint. We must remember the manner in which the perinæum is bound down; that the deep layer of the superficial fascia is firmly attached on each side to the rami of the pubes and ischia, and that it curves behind the transverse muscles of the perinæum to join the lower margin of the triangular ligament, or deep perineal fascia. It will then be readily understood why we should endeavor to assist nature in making an outlet for discharges at as early a moment as possible after we have detected the symptoms leading to the supposition that a urinary abscess may exist. In this affection—strange as it may appear—the constitutional symptoms are often more troublesome than the local. The shivering, the nausea, the febrile paroxysms, the furred tongue, are all well marked; and, in connection with these symptoms—especially if the patient has been afflicted with tight stricture—there is heaviness in the loins, an uneasy sensation in the neck of the bladder, with the stream of urine rapidly diminishing in size, and a slight puffiness about the parts. In proportion as a stricture increases, the urethra at the diseased part is diminished, while that portion of the canal immediately behind the obstruction is enlarged by the continued propulsion of the urine against it. The irritation thereby induced, engenders the inflammatory process, which terminates in ulceration; an opening is formed through the urethra, and communicates with the cellular membrane surrounding it; the presence of the urine excites additional irritation; suppuration results, the pus is discharged, and there remains a fistulous opening, through which the urine constantly dribbles.

Fistula in the perinæum may also sometimes proceed from *rupture of the urethra;* then the urine is instantly diffused into the loose cellular membrane of the perinæum and scrotum, where it occasions much distension, and excites inflammation so intense, that in a few hours gangrene and *sloughing of the scrotum* may take place, leaving, in many instances, the testicles and urethra bare, and endangering the patient's life.

There is seldom more than one fistulous opening communicating immediately with the urethra, but from it numerous sinuses generally extend in various directions; and in cases of long standing it is not unusual to find the cellular membrane of the scrotum, and all the other parts through which the urine meanders, greatly condensed and converted into indurated tumors, upon the surface of which may be found innumerable small holes, that discharge offensive urine and pus, rendering the patient disagreeable to himself and pitiable to his neighbors.

Treatment.—When a fistula in perineo depends upon a stricture of the urethra, the first care of the surgeon must be to get rid of the obstruction, by means to be mentioned farther on; after which the most appropriate medicines should be administered. Among these are, ars., calc., carb. an., silic., and sulph. By such means it will generally be found, that as soon as a natural outlet is established the sinuses heal. The safe practice in perineal abscess is to incise the perinæum in the raphé and down through the triangular ligament. This cut may be from an inch to an inch and a half in depth. Even if pus does not escape, the incision relieves the tension of the parts, and establishes an opening through tissues which, from their unyielding nature, would form such a barrier to the exit of pus that infiltration of the surrounding tissues would be the inevitable result. If the perineal incision be not resorted to at an early day, a urethral communication is formed, and we have a true urinary fistula, through which, at every act of micturition, more or less urine escapes. These perineal fistulæ are divided into the *simple* and the *indurated*, scrotal and ante-scrotal, the terms explaining themselves. Of these, the latter are most difficult to heal on account of the small quantity of tissue surrounding the urethra.

In speaking of the treatment of urinary fistula, Sir Henry Thompson, in his Sixth Lecture, published in the *Lancet*, says: "It was sometimes attempted to cure such fistulæ by tying in a gum catheter for weeks or even for months; but this always fails, and for this reason, that urine always finds its way from the bladder by the side of the catheter, along the urethra, and so into the fistula, by the force of capillary attraction, and thus the object supposed to be attainable, in reality never was and never could be accomplished. The practical surgeon soon discovers that tying in an instrument never insures the transit of all the urine through it; some will always pass by the side and defeat your purpose."

If the fistula is small, the application of tincture of cantharides to the opening sometimes produces a good result. The patient's urine must be drawn off twice or thrice during the day with an elastic catheter. Free incisions may then be made to the bottom of the fistulæ or nearly so, and the parts washed with carbolic acid water. Galvanism has also been tried, and, I believe, with good results.

In the ante-scrotal variety, plastic operations may be devised and are sometimes successful. As a general rule, however, the treatment is unsatisfactory.

Cystotomy—Paracentesis Vesicæ.—There occasionally happen cases which require paracentesis of the bladder. These are generally occasioned by stricture, traumatic or other, chronic enlargement of the prostate gland,

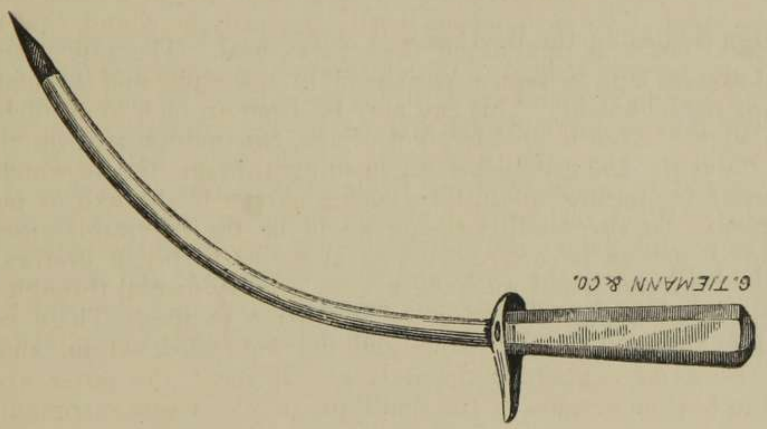
and chronic cystitis. Cystotomy for the latter disease is of late origin, but from the reports of its success, it should be tried by every surgeon, should the case appear to resist all other methods of treatment. In the *Medical Record*,* Dr. E. F. Ingals states that as long ago as 1866, Prof. Powell, of Rush Medical College, resorted to the operation for obstinate cystitis, and considers it as one of the legitimate operations in surgery and not a *dernier ressort*.

There are several methods of performing cystotomy. The perforation may be made either through the rectum, through the perinæum, or above the pubis.

The patient is placed on his back and the limbs well drawn up.

The surgeon then introduces the forefinger of the left hand, well oiled, into the rectum, and determines the situation of the prostate gland and the trigone vesicæ. Keeping the ball of the finger in the position aforesaid, a long curved trocar (Fig. 441), the point withdrawn within the canula, is

Fig. 441.



Rectum Trocar.

passed into the rectum upon the finger already introduced, and pressed firmly upon the bladder from half to an inch above the prostate gland; the point of the trocar is then thrust into the bladder, and the instrument withdrawn, leaving the canula within the bladder. In some cases, a tube may be allowed to remain within the bladder, but usually this is not necessary. Fig. 442 represents the operation.

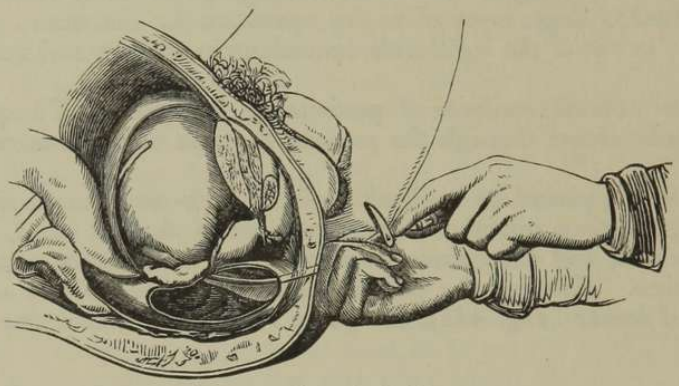
Cystotomy through the perinæum is the same operation as perineal section, which will be treated of further on.

Cystotomy through the hypogastrium is performed as follows: An incision is made just above the symphysis pubis, between the recti and pyramidalia muscles; the bladder is thus brought to view, and the trocar and canula are used as before. An instrument having a side opening connected with india-rubber tubing is better than the ordinary trocar. These operations, however, unless performed with some other especial purpose than relieving the bladder, are all superseded by the aspirator. The puncture should be made above the symphysis pubis, the needle looking downward and backward. The operation may be repeated often without danger. I have per-

* December 2d, 1872, p. 549.

formed it without any hesitation twice a day for several days, and not a single untoward symptom presented.

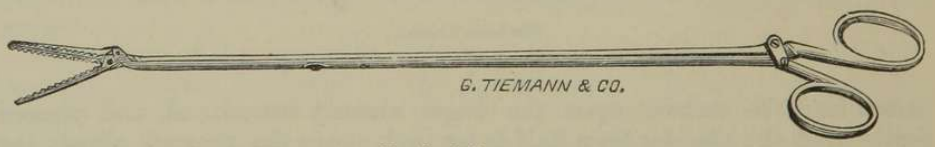
Fig. 442.



Cystotomy through the Rectum.

Foreign Bodies in the Urethra.—A stone may have escaped from the bladder and become lodged in the urethra, or by some accident, a foreign substance may have found its way into the canal. In such cases the irritability of that organ must be allayed by the administration of acon., canth., scill., or calc. carb., nux vom., opium, puls., kali carb., and the patient should be made to drink freely of decoction of buchu, or watermelon seed. When the desire to urinate comes on, it should be restrained as long as possible; when the desire becomes very great the patient should lie on the belly, grasp the penis and draw it outward and downward, and then with a sudden forced tenesmus endeavor to propel the urine forward. If this plan does not succeed a small and delicate forceps (Fig. 443) should

Fig. 443.



Urethral Forceps.

be introduced into the urethra. A still better instrument, and one which can be procured easily for an emergency, can be made as follows: Take a flexible catheter, about No. 9 of the English scale, and cut off its end, in order to convert it into a hollow tube; insert into this a loop of silver wire. Then having it well oiled, introduce the instrument until the end touches the foreign material, when the wire is pushed down and twisted a little, in order to make it encircle the foreign substance in the manner familiar to all in withdrawing a cork which has fallen within the body of a bottle. If this does not remove the obstruction, the effort may be made to push it into the bladder and then perform one of the operations about to be described for lithotomy, or to resort to external perineal urethrotomy.

Stricture of the Urethra.—Stricture may be defined: "An abnormal contraction of some part of the urethral canal." Sir Charles Bell, however, regarding the normal condition of the urethral canal to be that of approximation, defines it as a canal that has lost the power of dilating.

These constrictions have been regarded as being of two kinds, *permanent* and *transitory*, the former being due to organic deposit about the walls of the urethra, the latter to the spasmodic action of the muscular fibres; the latter may be cured by the internal administration of medicine alone. The permanent, to which the greatest importance is attached, claims our attention. John Hunter classifies strictures into the *permanent*, *spasmodic*, and *inflammatory*, while Thompson makes use of the terms, *linear*, *annular*, *irregular*, or *tortuous*. By linear stricture we understand, an obstruction of the canal by a membranous diaphragm; by the annular, that in which the contracted part is thicker than the linear; whilst the irregular include such varieties as cannot be classified under either of the above heads. Dr. Otis contends that "a true stricture always and of necessity surrounds the urethra." Independent strictures may be found in the same urethra. Hunter records six. Leroy D'Etiolles mentions a case of eleven. Seldom do we find the tube entirely obstructed.

The urethra may be long or short, according to provocation; it may be bent like the italic ∽, with its external meatus looking downwards, or, with a single curve, it may point directly upward. It passes from the neck of the bladder to the end of the penis, and, generally, is nine inches in length, and is divided into four portions. First, the *prostatic*, which passes through the prostate gland, about twelve to eighteen lines in length. Second, the *membranous*, ten to twelve lines. Third, the *bulbous*, which occupies about an inch of its extent; and fourth, the *spongy*, which is about four to four and one-half inches in length.

A man with a small penis may have a large urethra, and the tube may be of small calibre in an organ of good size. This is a peculiar fact, but nevertheless a true one. This I know is in direct opposition to the opinion published by Dr. Otis, who contends that there always exists a constant relation between the size of the flaccid penis and the capacity of the urethra, but I think that experiment will prove the truth of my assertion.

The urethra is subject, during its whole extent, to these abnormal contractions, still some portions of it seem to specially favor its location. John Hunter says the bulbous portion is most liable. Sir E. Home writes: "Next to the bulbous portion, the most frequent place is four and one-half inches from the orifice of the glans." Says Mr. Liston: "Stricture is found most frequently about four inches from the meatus." Mr. Shaw, in more than one hundred dissections, has never found a stricture posterior to the ligament of the bulb. Vidal observes stricture to be most frequent at the junction of the membranous and bulbous parts. However much they differ in other respects, anatomists generally agree in assigning the most frequent point to be at the *subpubic curvature*.

From all these authorities Dr. Otis* differs materially, and states that out of 258 strictures, 52 were in the first quarter inch of the urethra, 63 in the following inch; 48 from 1¼ to 2¼; 48 from 2¼ to 3¼; 19 from 3¼ to 4¼; 14 from 4¼ to 5¼; 8 from 5¼ to 6¼; 6 from 6¼ to 7¼. It must be borne in mind, however, that Dr. Otis's method of examination is by very large sounds, and that thereby inequalities of surface unnoticed by the ordinary instruments would be designated.

The earliest symptom premonitory of this affection, is a constant desire to urinate, often causing the greatest pain; uneasiness is also experienced along the canal. As the disease progresses there is a slight discharge of urine, not unfrequently containing mucous shreds. The presence of long-

* Stricture of the Urethra, its Radical Cure, by Fessenden N. Otis, M.D. New York, 1875.

lasting "gleet" should alone arouse the suspicions of the watchful surgeon as to the probable existence of stricture. Then the discharge of urine is no longer subject to the will; there is a sense of heat and soreness of the parts about the bladder, pain during coitus, then retention of urine, followed by engorgement. At this stage we have the condition, simulating incontinence, the urine dribbling away incessantly, drop by drop.

The changes effected by stricture will be apparent in the whole genito-urinary apparatus. Sacculi of the bladder are frequent; some have been found capable of holding from two to three ounces. Nor is this dilatation limited to the bladder alone; cases are on record of its extending through the ureters to the pelvis and calices of the kidneys; especially do we find it in the urethra just posterior to the stricture, and often of sufficient size to admit the passage of a man's finger. Constant contact of the walls of the urethra with urine will often result in ulceration of that membrane. Abscess and fistula will form from urinary infiltration, and extravasation of urine takes place from breaking down of the urethra, consequent upon prolonged retention.

Treatment.—The spasmodic variety of stricture is very amenable to treatment: applications of hot water, the warm sitz bath, and injections of warm oil often relieve the patient in a short space. Of the latter injection I can speak with much confidence. I have relieved patients by this method when the catheter has been tried in vain for hours. My plan is to have four or six ounces of olive oil heated, and slowly inject into the urethra, by means of a two-ounce syringe, a quantity of the lubricating fluid. If this does not relieve the patient in itself, it much facilitates the passage of the bougie or catheter.

Aconite is useful for the inflammatory symptoms, belladonna for frequent urging and tendency to congestion, cantharides for priapism and discharge of blood, and camphor when the urine is very acrid.

Other medicines are, agaricus, clematis, iodine, kali iod., acid. nit., stramonium, digitalis, nitrate of silver, opium, eupatorium purpur., and thuja.

Of late *electricity* has been found of service in treating spasmodic stricture.

Dr. Bagley reports* a case of a man aged thirty-nine, attacked with cystitis. All efforts to empty the bladder by use of the catheter had been ineffectual, although attempted by a number of surgeons. The patient called on Dr. Bagley, stating he had stone in the bladder, and was troubled with incontinence of urine. On examination, a false passage from the urethra, an enlargement and induration of the prostate, a stricture of the membranous portion, and constant dribbling of urine were found. There was capability of performing the generative act, but not ejaculation of semen, it passing back into the bladder on account of stricture. The false passage was irritated with a roughened bougie, and then adhesion secured by pressure; the stricture was readily relieved by use of bougies. Mercurius iodatus acted on the prostate promptly, discussing the chronic inflammation and induration. Eupatorium purpureum restored the nervous tone and energy of the bladder and relieved the irritation at its neck, restoring also integrity of the mucous surface from the kidneys to the glans. The happy patient could again void urine and ejaculate semen.

It appears to me, after a good deal of reading and some experience of my own, that the first great point in the treatment of stricture, is to understand the normal calibre of the urethra we are about to treat. That this can be accurately determined by the circumference of the flaccid penis, a

* American Homœopathic Observer, Detroit, July, 1867, p. 280.

point which is declared by Otis to be demonstrable, and as stoutly denied by Sands and others, must at present be left an open question. The great difficulty in determining the point, must be that the urethra is, in its normal condition, entirely closed, and because it can be enormously distended by instruments is no reason why its overdistension should be considered as its normal size. The vagina is expanded and not ruptured by the passage of a large fœtus, and yet its normal capacity could not be said to be that of its distensibility. We must, therefore, suppose that, following a law of nature, the capacity of the urethra may be said to be that of the volume of the ordinary stream of water that passes through it, and that the passage of very large instruments is not necessary for the permanent cure of stricture.

I think that Van Buren and Keys's measurement, who limit the normal size of the urethra to $31\frac{1}{2}$ m. in circumference, is about the most accurate measurement we have found.

To find the locality of the stricture, the bougie a boule, or the metallic bulbous sound, Fig. 444, are most excellent instruments; they are not, however, so good as the urethra-meter, Fig. 445, of Otis. It will be seen that the dial indicates in millimeters the amount of expansion at the bulb. It is introduced closed into the urethra, and having passed it carefully down to the membranous portion of the urethra, the screw in the handle is turned, until a sensation of fulness is experienced; it is then withdrawn. As it

FIG. 444.

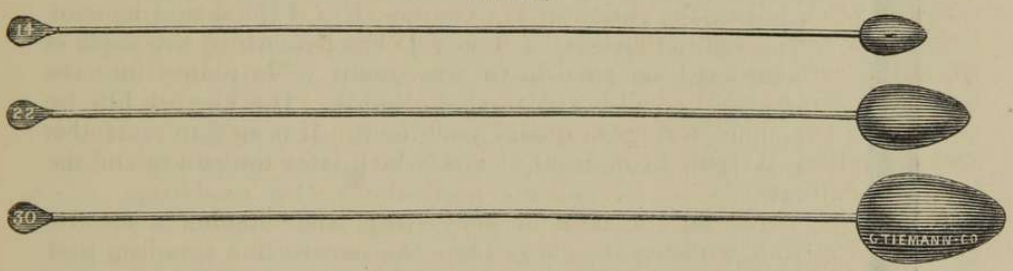
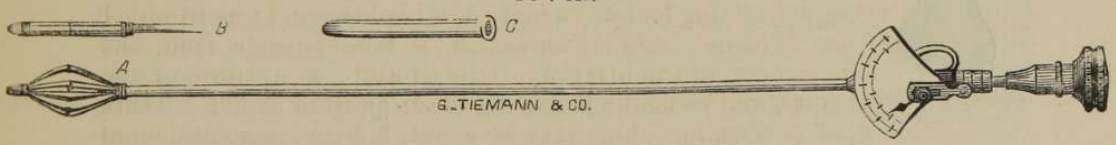


FIG. 445.



reaches the narrowed part of the canal it will of course meet with opposition. The screw must then be again turned until the instrument can be withdrawn. The hand on the dial will mark the size of the stricture.

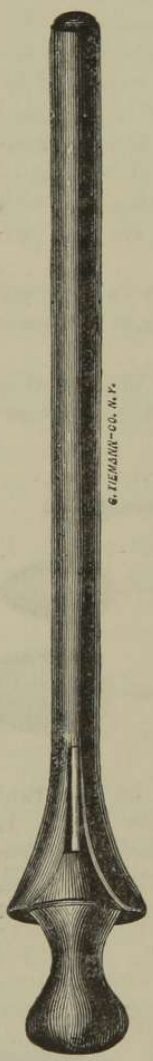
Dr. Otis has also invented an endoscopic tube for the urethra. (Fig. 446.) It is six inches in length, and from No. 17 to No. 19, or thereabouts, of the English scale. By this instrument a partial view may be obtained of the urethra. It is used also to repress hæmorrhage.

In the treatment of organic stricture the main consideration is the restoration of the canal to its normal calibre, and its maintenance in that condition. How may we do this? We may introduce, from day to day, bougies of increasing diameter, until the contraction is overcome, or we may forcibly separate the adhesions at once.

I am still in favor of the treatment of stricture by *dilatation*, because

I know from it I have obtained most excellent results, and though from time to time the instruments must be used, does not the same objection, either in a greater or lesser degree, hold good with other methods? Does not incision have often to be repeated? In some cases I am positive that it does.

FIG. 446.



Otis's Hard-Rubber Endoscope.

The value, however, of ascertaining where the stricture is, and its measurement, and the internal urethrotomy treatment, are points for the proper explanation of which credit must be given to Dr. Otis, of New York, and whether or not we agree with him with reference to his theory of gleet, or his ideas regarding the slitting of the meatus, we must allow that his accurate observations, careful experiment, and manly defence of his doctrines have opened a new field of inquiry and experimentation.

In adopting the method by gradual dilatation, bougies may be used of wax, plaster, softened ivory, gum-elastic, whalebone, or metal. The treatment of a complicated case requires the utmost care, patience, and skill. It may be days before we can pass in the slenderest instrument, and in such cases the "guides" of Dr. Gouley (Fig. 447) should be used. The twisted bougies of Leroy D'Etiolles, which are made of whalebone or gum-elastic, are useful to introduce into the smallest cavities and tortuous canals. The English filiform bougie (Fig. 448) is also much used. It is well to remember that *false passages* may exist, which often mislead in endeavoring to use instruments, particularly when exploring.

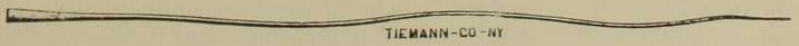
The best method of proceeding, after having selected a proper instrument, is to place the patient in a standing position, grasp his glans penis with the ring and little finger of the left hand, and, by gentle traction, place the penis in a horizontal position; then, having smeared the instrument well with oil, and holding the bougie as a pen, gently introduce it by a slight rotary motion until it reaches the stricture, at which time a sensation will be communicated to the hand; this should be a warning to proceed with increased gentleness. There are several obstacles which may impede the course of the bougie, which it is necessary to mention: it may become entangled in one of the lacunæ, or in some accidental fold of the urethra. A small and soft instrument may bend when pressed against the lower portion of the urethra, or its onward course may be arrested by a spasmodic (spasmodic stricture) contraction of the canal. It is always the better plan to commence with small and soft bougies, for the stricture may be an old one, narrow and tortuous, and much additional suffering and danger thereby may be avoided.

FIG. 447.

Some surgeons recommend a fine catgut bougie; others, a gum catheter, curved and without wire. There is some disadvantage in using these pliable instruments, because, on pressure being exerted, they yield very easily; but a skilful hand can readily distinguish between the giving of the bougie and the narrowing of the canal. If a soft instrument cannot be introduced, recourse must be had to a metallic one. Frequently the obstacle preventing the passage of the bougie arises from the vital action of the part, but this may be overcome by steady pressure on the instrument, using great care, as it

passes down the urethra, that nothing is lacerated. We can generally tell whether the bougie has entered the stricture by endeavoring to withdraw the instrument. If it has passed the contraction there will be a resisting force.

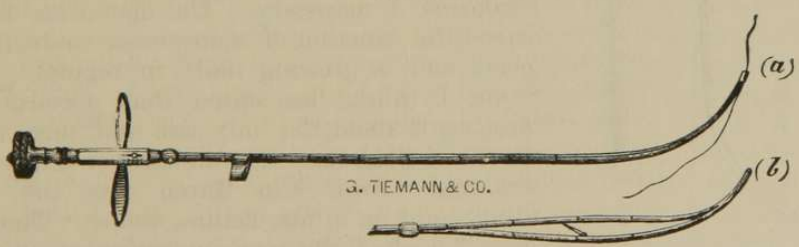
FIG. 448.



Many surgeons object to the term "dilatation" in reference to strictures. It is argued, and justly too, if a stricture were merely a muscular contraction, then the term would be correct, but, as has been before shown, this is not the case, for organic changes have taken place. The passage of the instrument modifies the vital properties of the canal, while the pressure which it exercises on the newly organized parts, induces a tendency to absorption, and gives a stimulus which enables nature to complete the cure.

The effect of the bougie, or, as it has been well termed, the "vital action," is visible from the commencement of the treatment. Hæmorrhage is often experienced, and there is almost always a slight discharge. But whatever be the kind of instrument employed, long experience has demonstrated that, with certain exceptions, the so-called dilatation is the safest and most effectual method for relieving the distressing incidents which attend stricture of the urethra. The mode of dilatation is not by any means to be disregarded. It may be conducted on different principles; it may be temporary or permanent; or it may be employed in a gradual or rapid manner. The size of the instrument, whether it be a plastic bougie or metallic sound, must be regulated by the presumed diameter of the contraction; and after having been selected and introduced in the manner described, it must be allowed to remain for a certain time, and withdrawn at stated intervals. The object is to effect a regular and progressive dilatation of the strictured part, without inflicting any injury on the tissues or exciting any severe irritation in the urethra. On the first introduction of the instrument it ought not to remain more than a few minutes in the urethra. If it has been borne well, it may be introduced on the following day, and so on; but the best practice is to introduce the bougie every third day at first, and then gradually shorten the intervals, at the same time increasing the size of the instrument. All this, however, must be regulated by the effect produced upon the stream of urine, which indicates the progress of improvement. Though dilatation is the safest and most certain, it is nevertheless a tedious method; and hence many surgeons have attempted to procure the same result in a more speedy manner. This is done by first introducing a bougie of small calibre, quickly withdrawing it, and then passing others of larger size, until the patient complains of uneasiness or of pain. The same operation is repeated every day or two, larger instruments being gradually em-

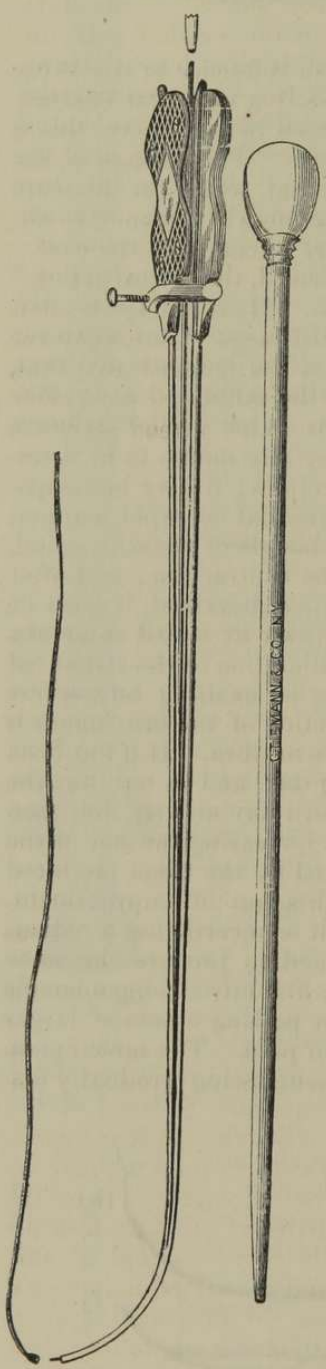
FIG. 449.



ployed. By the adoption of this method obstinate strictures have been cured in five or six days. Cure of stricture by *permanent dilatation*, as its name implies, is effected by leaving the instrument permanently in the

bladder. The treatment should commence by using a metallic bougie, which should be allowed to remain in the urethra from twenty-four to forty-eight hours, and then withdrawn. Temporary dilatation is the method most frequently employed, because it is generally the safest and best. *Rapid and forcible dilatation* may be attempted when the stricture yields readily, or when it is a matter of great moment to the patient to be speedily relieved. Indeed, some surgeons prefer this method to any other, and in the worst forms of stricture it has been very effectual in my own hands. Several instruments are used for the purpose. Among those which I have used with most success is that of Sir Henry Thompson (Fig. 449), and Holt's (Fig. 450), as modified by Bumstead. In the latter the "guide" is first introduced, and upon this the closed instrument is passed into the stricture. The screw is then turned, which separates the sides of the dilator; into this the solid rod is driven home. In thus rupturing the stricture, as a general rule, no untoward results follow the apparently summary proceeding. Dr. Thebaud's stricture dilator works with a screw in the handle, as does also Sir Henry Thompson's (Fig. 449), the difference being that in the former the *jaws* separate by the motion of the thumbscrew, while in the latter the expansion takes place higher up in the body of the instrument. In the treatment of permanent stricture, any disorder of the general health or of the genital organs must be corrected by the administration of appropriate medicines, after which the treatment of dilatation must be resorted to. *Puncturation, or division* of the stricture by means of lance-shaped stilettes has proved successful in some cases of long standing, in which the stricture was in the anterior part of the urethra. If the stricture is situated far back the operation is dangerous, and should not, unless under certain circumstances, be attempted.

Fig. 450.



Holt's Dilator, Bumstead's Modification.

External Urethrotomy.—In obstinate cases or rupture of the urethra and extravasation of urine, or in impassable and traumatic stricture, the operation of *opening the urethra from the perinæum* is necessary. The operation has received the sanction of many most eminent surgeons, and is growing daily in repute. Prof. Syme, I think, has stated that *perineal urethrotomy* is about the only safe and sure means for the radical cure of traumatic or impervious stricture. Prof. Van Buren says the same thing; and in a late lecture, styled "Then and Now," in which the great improvements in medicine and surgery are noted, Prof. Gross gives the same idea. His words I have forgotten.

The patient should be placed in a position similar to that directed for the operation of lithotomy, a director passed into the stricture, the left forefinger introduced into the rectum, in order to feel for the urethra and serve as a guide to the incisions. A straight bistoury is then plunged into the perinæum to the depth of an inch, and carried backward on the director until the stricture is divided. Another method of *external urethrotomy* is as follows: The perinæum having been shaved, a capillary probe-pointed whalebone bougie is introduced into the urethra. If the guide in passing catches in the lacunæ of the canal, it must be withdrawn and again introduced until it enters the bladder. A No. 8 grooved metallic catheter is then introduced by passing through the catheter the free end of the guide. This instrument complete is known as Gouley's staff and director, a full description of which is seen further on. An assistant then takes charge of the staff and guide, while the surgeon, after an examination per rectum, makes a free incision in the median line of the perinæum, which extends from the base of the scrotum to within half an inch of the anus. This, however, only involves the skin and superficial fascia. By dissection the urethra is then brought in view, and the canal is opened on the groove of the catheter. The edges of the urethral incision are kept apart by loops of silk. After withdrawing the catheter, the stricture and about half an inch of the urethra are divided with a modified canalicula

FIG. 451.

knife (Fig. 451). By passing the catheter into the bladder it will be known that the stricture is divided.

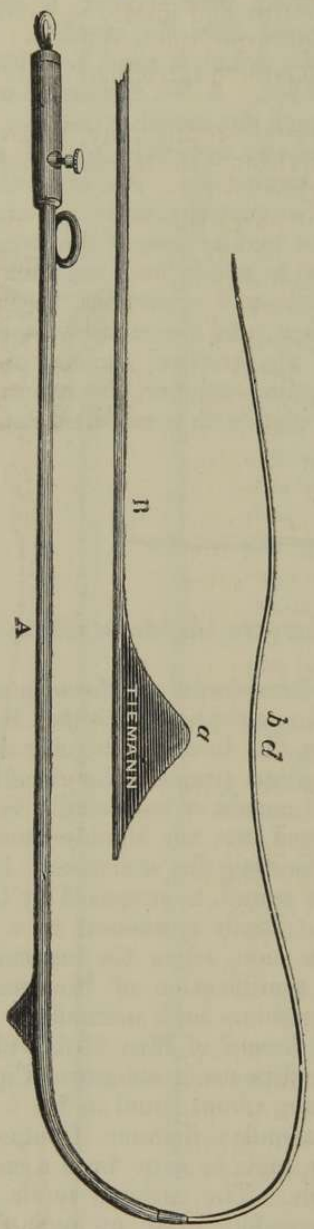
Internal Urethrotomy.—All operations for *internal urethrotomy* may be referred to one of two principles: either the stricture is divided from the vesical side, or the side nearest the meatus, the former being far the best. Many modifications have been made and plans proposed for dividing the obstruction within the urethra, but they all consist of essentially the same steps. A conducting rod or bougie is passed into the bladder, and upon this as a guide the knife is carried, thus dividing the stricture. In some of the instruments a blade is concealed in a canal, as proposed by Civiale, which being made to pass the stricture, the blade is released by a spring and cuts into the stricture from the vesical side, when the instrument is withdrawn. Fig. 452 shows Bumstead's modification of Maisonneuve's stricture-cutter. Charriere's instrument combines both methods.

The following is taken from the *Medical Record* of May 15th, 1869. It is a description of Prof. Gouley's catheter and its use in stricture (Fig. 453). The catheter is three millimeters in diameter, about equal to No. 1 of the same scale. A groove on its convex side extends a distance of four inches, and is bridged over in its last twelfth of an inch, so as to form a canal for the reception of a delicate whalebone guide. The catheter eye is on the concave side of the instrument, about three-fourths of an inch from its point, and is kept close to a well-fitted stylet. Its curve is equal to one-fifth of the circumference of a circle three inches and a quarter in diameter.

The manner of using the instrument is as follows: With a small syringe the urethra is to be filled with olive oil, and an attempt made to introduce a probe-pointed whalebone guide, half a millimeter in diameter, and of the length of an ordinary bougie, the point of which may be made temporarily

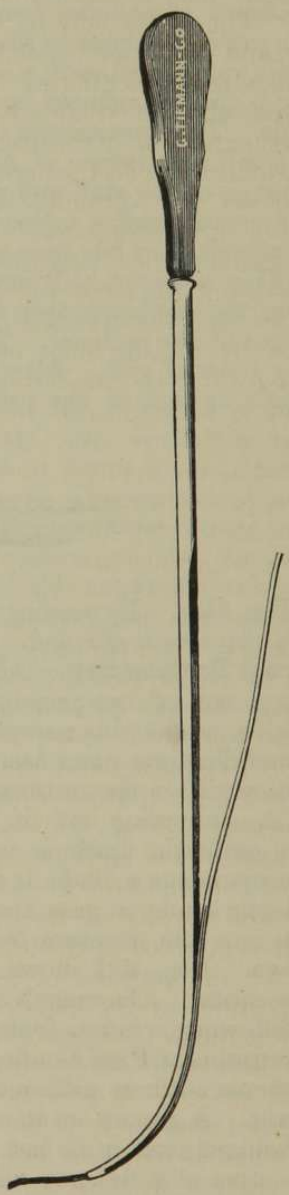
spiral by immersion in boiling water, then twisting around a small staff, and suddenly cooling it. If its point becomes engaged in a lacuna, it is to be withdrawn a little, and carried onward with a rotating movement. If it enter a false passage, it is to be retained *in situ* with the left hand, while

FIG. 452.



Maisonneuve's Stricture-Cutter.

FIG. 453.



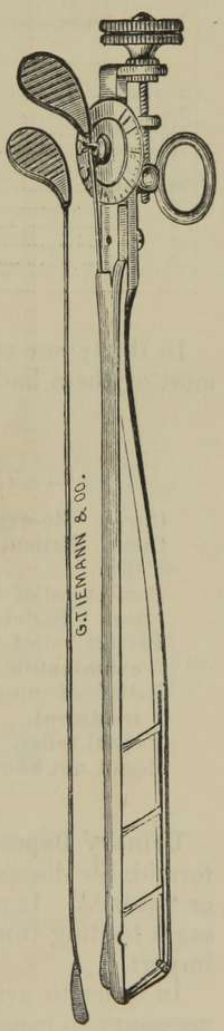
Gouley's Staff and Guide.

another is passed by its side. If this second guide makes its way into the false passage, it is to be treated precisely as was the first, and the operation repeated till one guide be made to pass the obstruction and enter the bladder. Sometimes five or six guides are thus caught before the false passage

is filled up and the natural route discovered. As soon as the bladder is entered by a guide, which is known by the instrument being easily moved in and out, the outer guides are to be withdrawn, the free end of the retained guide passed through the canal at the end of the catheter, and this instrument carried down the urethra along the guide, until its point reaches the stricture. Generally, with very slight pressure in the right direction, the catheter may be made to enter the stricture and finally pass into the bladder. The guide may be kept in position after the withdrawal of the catheter, and dilatation carried on by the successive introduction of the instruments already mentioned.

Dr. Otis, who is a strong advocate for internal urethrotomy, believing in the largest expansion of the urethra and the division—the *thorough division*—of all stricture, to effect a permanent cure, thus writes: "To warrant the reasonable expectation of cure, the stricture must be *completely divided* at some one point, and this cannot be with certainty accomplished without a knowledge of the *normal* urethral calibre. The normal calibre once ascertained by means of the urethrametre, or by measurement of the flaccid penis, the method by which the sundering of the stricture, at some one point, is accomplished, may vary and rest in the judgment of the operator. If dilatation or divulsion be selected as the medium through which to effect this result, the procedure must be carried far enough to *completely* rupture every fibre of the contraction; if division, *every fibre* must be completely severed, or subsequent recontraction is certain. Neither divulsion alone, nor simple urethrotomy, is capable of effecting this with any certainty. It requires a combination of these two methods to accomplish the desired result." To effect this purpose he has devised several most ingenious instruments (Fig. 454), which combine the properties of thoroughly expanding and then dividing the stricture. Of his ordinary dilating urethrotome, he says: "It should measure 18f when closed, and be capable of expansion to 45. It is curved so as to pass readily through the curved portion of the urethra when this is necessary. It is thus well adapted for the division of deep strictures. The blade is guarded at the top like that of M. Maisonneuve's, for the purpose of avoiding incision of the healthy portions of the canal in introduction; in the same way it limits the incision on withdrawal. This instrument is introduced closed, and without the knife, unless the stricture is very large. The knife is then carried down, the screw at the handle turned until the hand on the dial indicates two or three millimeters beyond the previously determined normal calibre of the canal, and the blade is drawn through the stricture or strictures. The instrument is then closed to 25f and withdrawn. Partial closure prevents pinching the mucous membrane. The results are ascertained by examination with the full-sized bulbous sound. If a *trace* of stricture is left, the operation should at once be repeated, either using a wider blade or dilating two or three more millimeters. In very resilient strictures two or more attempts are sometimes

Fig. 454.



unavoidable before complete sundering of the strictures is effected, nothing short of which can produce *permanent* beneficial results.

"The guarded blades of this instrument should not project more than four millimeters, nor less than three, above the shaft; and the guard should not exceed ¼ m. in breadth, as more than this will hold behind the stricture and prevent easy division. In case of very dense and resilient stricture, a perfectly plain blade may be used, always in such event turning the instrument down as soon as the blade has passed through the stricture."

He then gives us the following table:

OTIS TABLE.

Time after operation.	No. of cases.	No. of strictures.	Time after operation.	No. of cases.	No. of strictures.
3 years	1	4	5 months	1	7
2½ "	1	7	4 "	1	3
1½ year	2	8	3 "	4	15
13 months	3	14	2½ "	1	10
1 year	4	7	2 "	4	11
10 months	1	2	1 month	1	1
9 "	1	1	3 weeks	1	5
8 "	1	1	2 "	1	1
7 "	2	10			
6 "	7	21		37	128

In thirty-one cases none of the strictures had recontracted. In six cases most of them had been absorbed, while some remained.

RESULTS.

	CASES.
Cures. Re-examined. No recontraction,	31
Cure. Patient perfectly well when last heard from. No re-examination,	52
Perfect relief for a long time. Return of symptoms. Re-examination. Stricture found to have recontracted,	4
Perfect relief for a length of time. Return of symptoms. No re-examination,	5
Relief of most symptoms. Some remaining. Patient still under treatment,	4
Partial relief,	3
Result not known,	1

Urinary Deposits and Urinary Calculi.—Among the important and often formidable diseases brought to the notice of the surgeon, is urinary calculus or "stone." It may be found in the kidney, in the bladder, or in the passages leading from these organs, but in all cases it is an affection of grave import.

In order to arrive at a proper understanding of this subject it will be necessary to consider the appearance of urine in a state of health, and also its deviations from this condition. It is well known that the ingredients of the urine are modified considerably by the nature of the diet, the time of day, and the habits of the individual. In a state of health, urine is of a clear amber color, gives an acid reaction, and has a specific gravity of 1020 to 1030. In 1000 parts, 954.81 are water and 45.19 solid matters. For

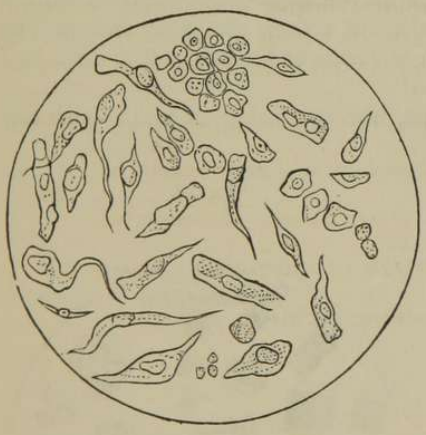
the purpose of analysis, it is always best to obtain a quantity passed in the morning before anything has been taken into the stomach. When this "urina sanguinis," as it is called, contains any ingredient in marked excess, there is every reason to suspect some important change in the system. If there is such an excess of any of the constituents, a deposit takes place, which, if not easily soluble, as the salts of lime and magnesia and also uric acid, a nucleus is afforded for the formation of a calculus.

Urinary deposits may be classed under two general heads, *organic* and *inorganic*. Of the former are urea, which is found in the proportion of from 15 to 35 parts in 1000 parts of urine; and uric acid, which exists only in very small quantities—one half or one grain to 1000 grains of urine.

The *inorganic* deposits are *saline*, consisting of sulphuric, phosphoric, and hydrochloric acids, combined with bases of potash and soda; and *mineral*, comprising phosphoric and sometimes carbonic acid in combination with lime, magnesia, and occasionally alumina; silica is also sometimes found. Of these ingredients, the phosphates are most often deposited.

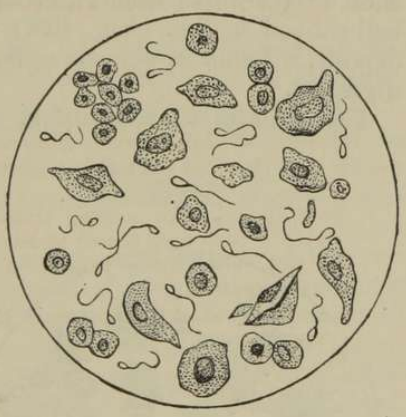
For the sake of distinction, the deposits in urine are called "sediments" when consisting of amorphous matter; when they are composed of small crystals, they receive the name of "gravel;" and when these, by concretion, form larger masses, they are known as "calculi" or "stones"—being denominated "renal or vesical," according as they are located in the pelvis of the kidney or in the bladder. Other deposits take place, such as blood, pus, mucus, epithelium (Fig. 455), spermatozoa (Fig. 456), fatty matter, etc.,

FIG. 455.



Epithelium from Urinary Passages.
BRYANT.

FIG. 456.



Spermatozoa and Vaginal Epithelium.
BRYANT.

the presence of which are to be determined by chemical tests or the microscope.

We find also renal casts, which are sometimes "waxy," at others "oily," sometimes "granular," and "epithelial." *Vide* Fig. 457.

Uric acid deposits (Fig. 458) are very common, appearing in variously formed crystals of a yellow or yellowish-red color, which are generally rhomboid, with the angles rounded, or lozenge-shaped. By aggregation these crystals may form gravel, and finally result in calculi. They are soluble in soda or potash, but not in the mineral acids. Urates of ammonia are common (Fig. 459), but rarely result in calculi. The ammoniacal odor

will be apparent by the application of heat. The presence of uric acid may be detected in a deposit by treating it with nitric acid, and applying heat

FIG. 457.

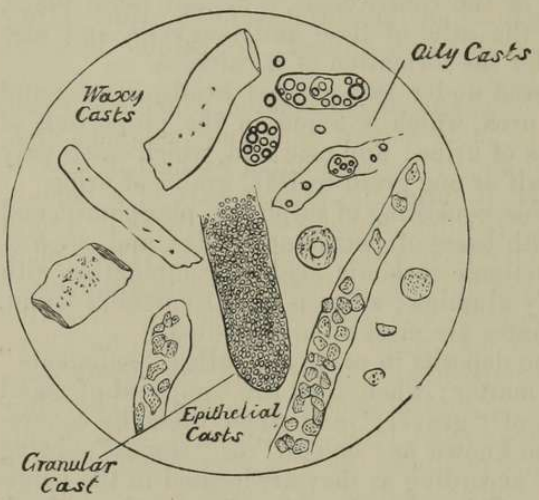
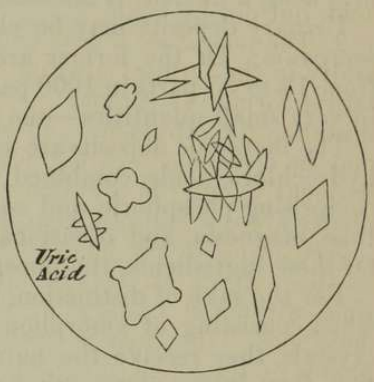


FIG. 458.



until the mass is a dry powder. Add a drop of ammonia and a bright violet color will be produced.

The *oxalate of lime*, which is the origin of the *mulberry calculus*, usually is of a dark-brown color, and the crystals are either octahedral or dumb-bell-shaped bodies. (Fig. 460.) The diathesis which specially favors this deposit, is found in persons suffering from nervous exhaustion and impaired digestion.

The oxalates are not soluble in alkalies, but the mineral acids will dis-

FIG. 459.

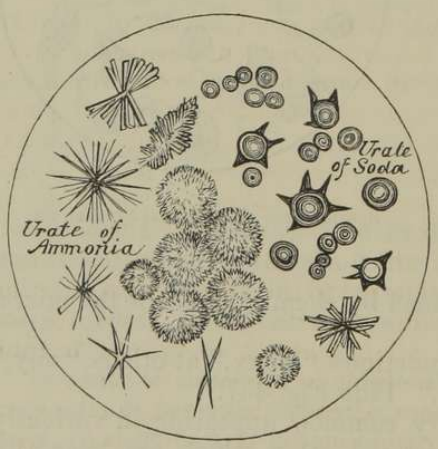
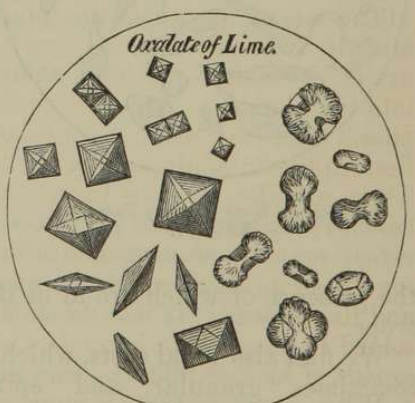


FIG. 460.



solve them without effervescence. If they are subjected to the heat of a blowpipe, and the white ash which remains be placed upon moist red litmus-paper, an intense blue color will result.

Phosphatic Deposits.—These are of two varieties, the *alkaline* and the *earthy*. The *former* include phosphate of soda, the acid phosphate of soda, and the phosphates of soda and ammonia, and seldom form concretions.

The *earthy phosphates* comprise, 1. The *ammonio-magnesian* phosphates (the triple phosphates), which appear as beautiful, colorless, transparent crystals, forming an iridescent pellicle on the surface of the urine. They are supposed to arise from a decomposition of urea; are soluble in acetic acid, but not by heat.

2. The *phosphate of lime* and the *phosphate of magnesia*, which occur generally in the form of a white amorphous deposit, sometimes assume a crystalline form. If it exist in solution, or is precipitated by heat, it may be mistaken for albumen; and when it forms the greater part of a deposit, may be erroneously called pus or purulent mucus; especially as it is most frequently found in alkaline urine mixed with pus or mucus. These phosphates are insoluble by heat, but soluble in acetic and the mineral acids.

According to Sir Henry Thompson, who has lately been experimenting on this subject, an atonic bladder may retain urine unexpelled for a long time, without it undergoing decomposition. When, however, crystals are developed, "the urea is broken up and ammonia is formed. The phosphates of lime and magnesia decompose, their earthy bases being precipitated, and from these actions are produced the ammoniaco-magnesian or triple phosphate, as well as some bibasic salts." Pus also will be formed, and the plastic inflammatory exudation being mixed with these phosphates is with difficulty expelled. Thus portions remain, and form a nidus for the formation of calculus.

Sir Henry arrives at the following important conclusions:

1. That in its healthy condition, the bladder rarely if ever retains, but on the contrary expels all phosphatic deposits.

2. That when the bladder is not healthy, but affected by chronic inflammation, provided it is not considerable or very prolonged in duration, the power of expulsion is still almost as great as in the healthy organ.

3. That there is a diseased condition of the inner coat of the bladder, in which the ability to expel phosphatic deposits is almost lost, and in which the formation of concretions—and if these are neglected, of stone—is certain to occur.*

The *mixed* or *fusible* phosphates, which are a combination of the two already described, and frequently form the crust of calculi, are made up of urates or oxalates, or have their nuclei in some foreign body introduced into the bladder. At other times the stone may consist entirely of phosphates, and may reach a considerable size. They are not soluble in alkalies, readily in acids, and by the blowpipe may be fused into a hard enamel. There are also deposits known as *uric oxides*, also called *xanthic oxides* or *xanthin; cystic oxides*, or *cystin; carbonate of lime calculus; fibrinous calculus; tyrosin; hæmatin* and *urostealith*, which are all pseudo-deposits, and for a description of which the reader is referred to the many works on urine and its deposits. It may be said, in review, that the *urates* alone are dissolved by heat; *potash* renders soluble all except the *phosphates* and the *oxalate of lime;* while *uric acid* only is insoluble in *hydrochloric acid.*

When any of these organic substances, already described, combine, or when they attach themselves to some organic matter or foreign body, they form a calculus. These formations may arise as follows:

1. A precipitation of the salts may take place in the secreting cells of the kidneys, as occurs naturally in the kidneys of reptiles and birds.

* Medical Record, April, 1878, p. 270.

2. A precipitation of some of the ingredients of the urine may take place in the bladder, in consequence of stagnation of contents, etc.

3. The presence of anything which acts as a foreign body in the bladder, causes a decomposition of urine, leading to an abundant precipitation.

Urinary Calculi may be divided into three classes, viz.: Those formed of uric acid and the urates, together with the oxalates; those derived from the phosphates; and lastly, those exceptional concretions already mentioned under urinary *deposits*.

The *uric acid* calculus is found most frequently. It usually originates in the kidney, is carried into the bladder, and then becomes an oval-shaped stone of a yellowish or yellowish-brown color. It is generally composed of layers which are crystalline and fibrous, the fibres radiating from a centre. It is often found in gouty subjects, associated with acid urine.

The *urate of ammonia* calculus is rarely seen, and generally occurs in children. It is commonly ovoid, smooth, and not above an inch in diameter. Its color is somewhat characteristic, being grayish or clay-tinted, sometimes like pipe-clay, or has an earthy appearance.

The *oxalate of lime* forms the mulberry calculus, which, after the *uric acid* calculus, is the most frequent form. The surface presents a tubercular, angular or spinous appearance, being very rarely smooth. In color it varies from brown to almost black, from which it derives its name. A section of it shows an imperfectly lamellated structure with waving lines, simulating the knotted heart of oak. These stones are said to produce less irritation than the smooth varieties, perhaps because they are more stationary.

The *phosphate of lime* calculus is generally found combined with other salts. Those of *renal* origin are of a pale-brown color, with a smooth polished surface, and contain considerable animal matter. The variety which begins in the bladder, and is most frequent, resembles irregular pieces of mortar, or is a granular powder covered by mucus, and is often termed "bone-earth calculus."

The *triple phosphate* calculus, or ammoniaco-magnesia phosphate, is very uncommon. It has been seen a few times with some foreign body as its nucleus.

The *fusible* or *mixed* calculus is the most common of the *phosphatic* calculi. It is found of large size and of different shapes, often moulding itself to the form of the place in which it rests. It is of a whitish gray or dull yellow color and more friable than any other kind, sometimes resembling moist chalk.

The character of the urine will sometimes give a pretty correct idea of the nature of the calculus. If it be *acid*, the stone probably is *uric acid* or *oxalate of lime*, or a combination of both. If the urine is *fixed alkaline*, the deposition probably consists of *earthy phosphate* or the *carbonate of lime*.

In *regard to the frequency of calculus* in the two sexes, it is said to be found twenty times more frequently in men than in women. This probably is due to the fact that in the female the urethra is much shorter and more dilatable than in the male, and permits the natural discharge of these concretions while they are yet small.

The *medical treatment* for the different urinary deposits can scarcely be laid down here, inasmuch as these deposits are so numerous, and are but symptoms of other diseases, which require constitutional treatment. When a calculus has fully formed, of any size, the only means of relief is one of the operations about to be recorded. For the smaller varieties, the best medicines that I know of, are scilla, nitric acid in full doses, phosph. acid, carbonate of lithia, and especially Gettysburg water. From the latter I

have received unmistakable results; in one instance nearly two hundred calculi, varying in size from a shot to a large pea, were passed while the patient drank this water. A singular coincidence was also observed, in the fact that these calculi were dissolved after being immersed in this water, while they withstood the action of hydrochloric acid. The following medicines may also be found serviceable according to their symptoms: apis, can. sat., canth., alnus rubra, digital., chimaphila, erigeron, caust., eupatorium purpureum. Speaking of the latter, Rafinesque says that it is a specific among the country people, who give it the name of "*gravel root.*"

The galium aperinum is also extolled by the eclectics, among whom are Beach, Scudder and Smith.

My own experience, however (being generally called to see these cases after the calculi have formed), is that those medicines which I have first named will give more favorable results than any others. According to Dr. Coe, corydalis formosa is a good medicine in this affection.

Stone in the Bladder.—Although the physical signs of stone in the bladder (chiefly elicited by "sounding") are the real means by which we can unhesitatingly give a correct diagnosis, yet there are certain subjective symptoms which always lead to the suspicion that a calculus may exist, and these symptoms are often so well defined, that the presumptive evidence is in favor of the presence of stone in the bladder. Among these of course we find *pain*, which, however, varies greatly in different patients. It generally occurs in paroxysms, especially in the early stages of the affection; after a time, however, it becomes more constant, and the patients, especially children, lie on their bellies or draw at the prepuce. Together with the pain there is frequent desire to urinate and often urinary tenesmus. During micturition, the stream is often suddenly arrested by the stone falling toward the neck of the bladder. There is often hæmaturia, coldness of the head of the penis and aching in the testicles; there is also in some cases severe priapism.

The symptoms of stone vary in severity according to its size and roughness, the state of the urine, and the condition of the bladder, whether healthy or inflamed. These symptoms may be slight for years; indeed, a little pain and bloody urine when micturating after exercise, may be the only inconveniences experienced. But after a certain time the bladder suffers just as it does from any other cause of irritation; the urine deposits a slight cloud of mucus; the bladder becomes more irritable, and finally inflames; the urine becomes alkaline, loaded with viscid mucus and with the triple phosphate and phosphate of lime; the strength fails, and, after years of suffering, the patient finally sinks under the irritation. Sir B. Brodie remarks, "That if the prostate becomes enlarged, the sufferings from stone are mitigated; because it is prevented from falling on the neck of the bladder."

Perhaps the record of a case which has actually occurred will impress the symptoms more on the mind of the student and relieve the monotony of detail. A patient was brought to my rooms for relief. His symptoms were as follows: Frequent inclination to pass water, which was always worse at night, or when lying down, attended with the most excruciating pain, a few drops only being voided at a time. The little fellow would lie on his stomach and cry aloud from the agony he experienced when micturating. There was some enlargement of the penis, with considerable elongation of the prepuce, frequently recurring erections, sometimes blood being discharged with the renal secretion.

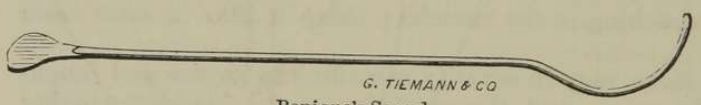
Hearing this account, I decided that there must be a stone in the bladder, and questioned the father as to what had been done to relieve him.

In reply he stated that several physicians had attempted to find the stone, but none of them had been able to detect it, although on one occasion one of the professional gentlemen thought he had discovered the offending material. These were the subjective symptoms, which necessarily called for "sounding."

Sounding for Stone.—To be able to perform this portion of the operation, upon which alone the diagnosis of the case is to be made out, one should possess a thorough knowledge of the anatomy of the urethra and the curves that it makes in different parts of the canal, otherwise not only will the patient be subjected to much additional pain, but most dangerous results may follow the improper management of the instrument.

To sound a patient properly the bladder should contain urine, or should have fluid injected therein. The instrument must possess a proper shape, the curve being the arc of a circle described by a radius of $1\frac{5}{8}$ inches. It should be constructed of solid steel highly polished, with a broad, flat and rather thin handle, in order that any impression made at one extremity may be distinctly appreciated at the other, while that portion which enters the bladder should be of larger calibre than that which remains in the urethra. Fig. 461 shows Van Buren's Sound, and Fig. 462 that of Benique. Grasp then the penis in the left

FIG. 462.



Benique's Sound.

hand and retract the prepuce; put the organ upon the stretch and direct its extremity at about an angle of forty-five degrees from the body.

Taking then the sound, well oiled, between the thumb and forefinger of the right hand, held close to the body of the patient, introduce its point into the meatus urinarius, and allow it to glide along the urethra until the curve reaches the perinæum; then holding the sound and penis in the left hand, gradually depress them or turn them toward the feet of the patient, whereby the point of the instrument is raised, and then with gentle pressure of the right hand cause the curve to pass over the bulb of the urethra, and into the bladder.

This is not "sounding" properly so called: it is merely the introduction of the sound; the more delicate portion of the proceeding, remains to be accomplished. The sound must now be held lightly, and must be moved about in all portions of the bladder until the peculiar click is heard or felt. As soon as the

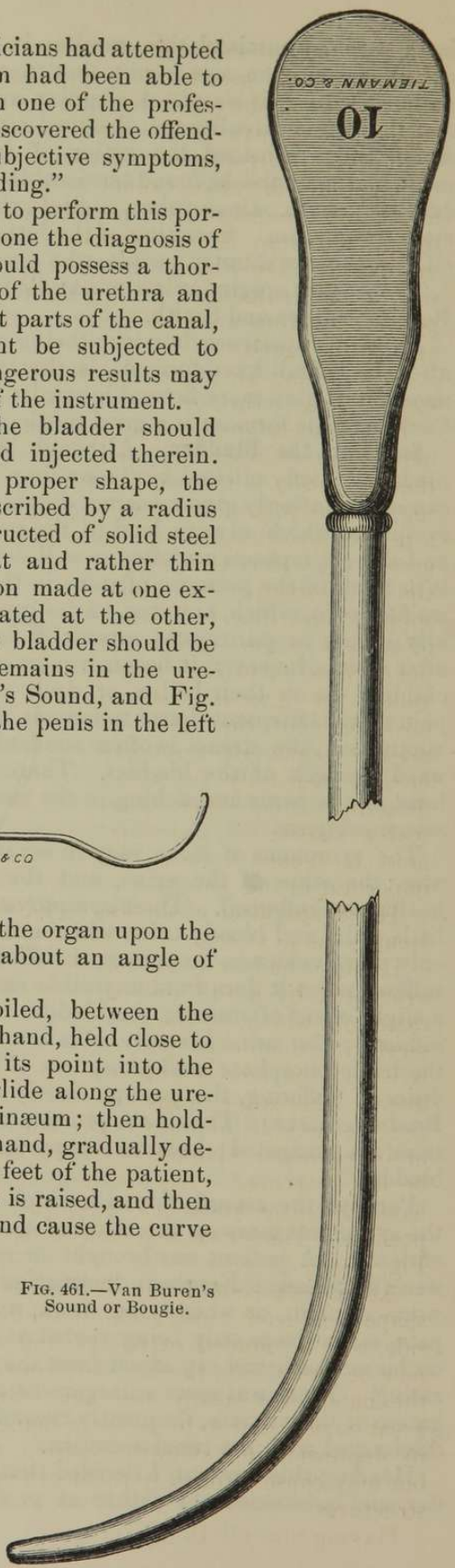


FIG. 461.—Van Buren's Sound or Bougie.

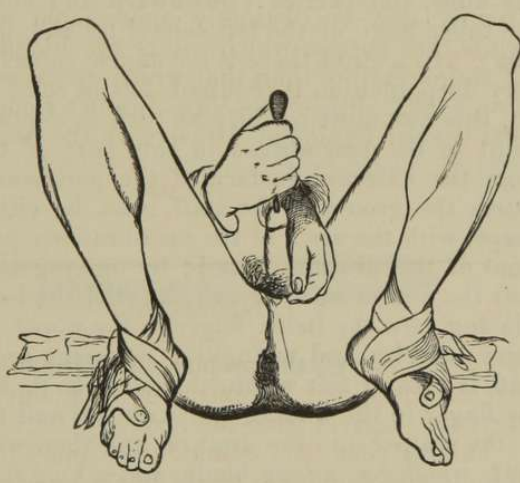
operator has satisfied himself that the steel instrument has touched the stone, he should pass it to other professional friends, that it may be demonstrated beyond the possibility of a doubt that the calculus is present. This rule should always be followed, nor should the operation be commenced until several surgeons have detected the offending material.

Sometimes the stone cannot be detected; in such cases, by introducing a finger into the rectum, and pressing the lower part of the bladder upwards, the calculus may be made to touch the sound. When these means proved unsuccessful, Dr. Physick, whose experience in lithotomy was very extensive, was in the habit of placing the patient nearly upon his head, by which position the stone was dislodged from the fundus of the bladder and thrown against the sound.

In sounding for stone, care must be taken lest the student mistake a stone in the urethra or prostate gland for a calculus within the bladder.

It will, therefore, be seen that sounding for stone is a most difficult and delicate procedure; and when men who have devoted a large portion of their attention to the consideration of stone in the bladder, say of "sounding," "that to perform it well requires great tact in the use of instruments, a perfect knowledge of the anatomy of the urinary apparatus, and a degree of experience which multiplied observation can alone supply," and that "the want of success in the operation is not confined exclusively to the young, the ignorant, or the unskilful, but that men of most consummate dexterity have occasionally failed in detecting a stone where stone really existed;" the procedure must be looked upon as all-important in the operation.

FIG. 463.



Position of the patient for Lithotomy (Cheselden's Operation).

The Preparation of the Patient is the next step.

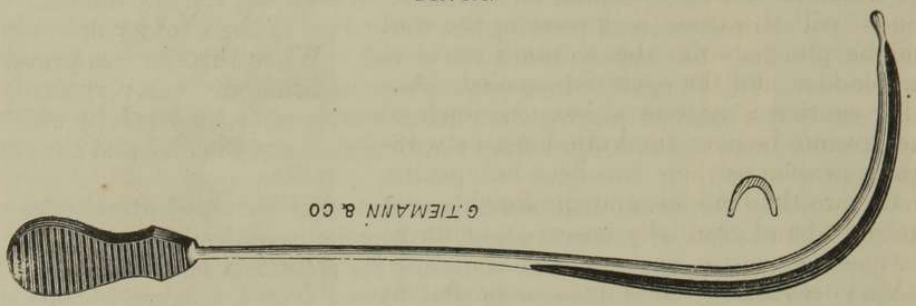
Having had the bowels evacuated by a full dose of castor oil, which, by the way, serves the double purpose of relieving the bowels and inducing thereafter, constipation, he must be brought to the edge of the bed, over which an oil cloth, or india-rubber blanket has been laid, and the wrists and ankles are to be firmly secured. An assistant must stand on both sides, and with his hands upon the knees of the patient, must separate the thighs as widely as possible. The wrists and ankles may then be bound together, as seen in Fig. 463.

Anæsthesia should now be complete, and an instrument resembling in shape a catheter, constructed of solid steel, with a groove a little to the left side, with a rounded extremity, and which is called a staff, Fig. 464, must now be passed into the bladder, drawn up against the pubes and placed in the hand of a steady assistant. Gross says: "A poor staff-holder is a great curse," and so he is, for a change in the direction of this instrument, its depression in a sidewise position, may not only embarrass the operator, but may cause ultimately the death of the patient, by a division of wrong structures.

Having now all things prepared, the patient anæsthetized and well se-

cured, the staff-holder steady, and the staff in position, sponges, etc., at hand, the instruments beside him in convenient position, and a good light falling upon the perinæum (which, if the patient be an adult, must be carefully shaved), the surgeon seats himself in front of the patient, takes an

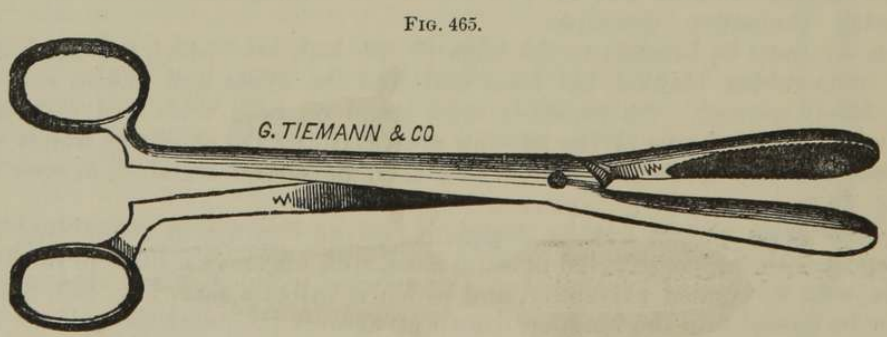
FIG. 464.



Lithotomy Staff.

ordinary scalpel in his right hand, and with the thumb and forefinger of the left, puts the skin upon the stretch, and enters the point of the knife on the left side of the perinæum about an inch and a half above the margin of the anus, and carries it downward and outward to a little distance below the tuber ischii of the left side (Fig. 463, page 825, shows line of this incision). In a child there is not much subcellular tissue, and therefore not a very deep incision is required, but in some instances, where the patient is fat, this cut must be fully an inch in depth. There is also one important point to be remembered in this part of the operation, viz., the incision from the external surface of the perinæum to the point where the knife enters the groove in the staff, must be either conical or triangular in its shape, with the apex at the membranous portion of the urethra, a little in front of the prostate gland; by bearing this in mind it will be perceived that the nearer we approach the staff the less extended will be the incisions. Placing now the index finger in the upper angle of the wound, the transverse muscles and triangular ligament are successively divided until the staff is clearly felt within the canal at its membranous portion. Keeping the finger in the wound, and with the nail for a guide, introduce the point of the scalpel into the urethra, and then withdrawing it, substitute for it a knife which has a long blade, and a long handle, and a short cutting edge, and a buttonlike extremity which fits into the groove in the staff. At this

FIG. 465.



Lithotomy Forceps.

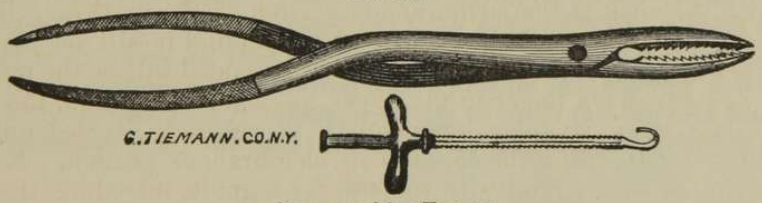
stage of the operation it is well to pause a moment, and have the staff drawn up under the pubes and ascertain if it is in the proper position, and finding it in place, push forward the knife; it readily enters the bladder, which is indicated by the gush of urine which generally follows.

Let me remark here, also, with reference to the direction in which the knife is pushed. It should be carried straight along into the bladder, keeping the probe-point well into the groove, care being taken not to elevate the hand or allow the blade of the knife to look downwards, for if this be done it will slip from the groove in the staff and be plunged into the rectum instead of the bladder, and the operation spoiled. Another caution is necessary, lest too much of the prostate be cut; the knife must be withdrawn as soon as there has been an opening made into the bladder, and the forefinger of the right hand gradually inserted to enlarge the opening.

Fig. 466.

Very frequently the stone can be felt at the opening of the bladder, and by introducing a pair of forceps with broad serrated jaws (Fig. 465) the stone can be readily removed with the assistance of the finger (Fig. 466). If it be impossible, from the size of the offending mass, to accomplish its removal, the wound must be carefully enlarged to its utmost extent. If still the calculus cannot be withdrawn, it must be broken in pieces with a crusher (Fig. 467). The bladder must now be very thoroughly washed out with tepid water by means of a good-sized syringe, and the finger again introduced to ascertain if other calculi be pres-

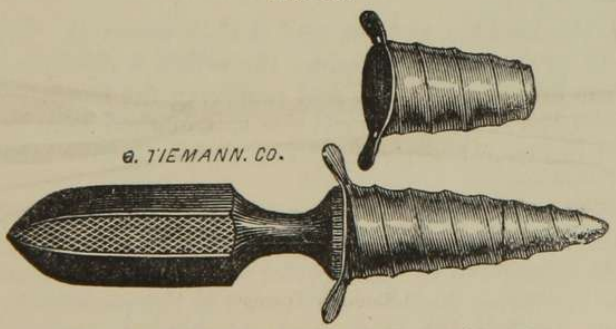
Fig. 467.



Stone-crushing Forceps.

ent. If there be none, release the patient from his bands, place him comfortably in bed on his left side, with an india-rubber cloth under the but-

Fig. 468.



Guide for the Forceps through the Perineal Opening.

tocks to catch the urine which escapes, and the operation is completed. In these operations I employ neither compress, straps, bandage, or catheter. To

enlarge the internal opening and facilitate the passage of the crusher or forceps, without further entanglement of tissues, an instrument has been devised, as seen in Fig. 468.

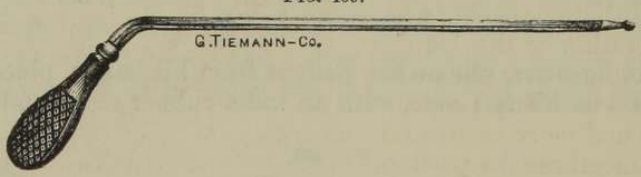
Key's Operation.—This operation of *lateral lithotomy* was somewhat modified by Aston Key, of Guy's Hospital, in which he used a staff nearly straight, instead of the ordinary curved director of Fergusson and others. When the groove in the staff has been exposed, "the point of the knife being kept steadily against the groove, the operator with the left hand takes the handle of the director and depresses it to an angle of 65° or 70°, at the same time keeping the right hand fixed. Next, by moving both hands simultaneously, the groove of the director, with the edge of the knife, are turned obliquely toward the left side, and the knife has now the correct bearing for the section of the prostate; which may be safely accomplished by carrying the knife slowly forward in an exact line with the director."

Besides these methods of procedure, other operations have been adopted by eminent surgeons, as improvements on the general operation already described.

Allarton's Operation.—The *median section* is an ancient method, also known as the *Marian* or *Italian* operation. It either adopts the plan of making a vertical incision through the prostate, as practiced by Vacca, or follows the method revived by Allarton, in which only the apex of the gland is incised.

In this operation the common grooved staff is passed into the bladder, and its handle then intrusted to an assistant. The surgeon now introduces his finger into the rectum as far as the apex of the gland, and there retains it as a guide to the next part of the proceeding, which consists in entering a long straight bistoury with its edge uppermost, about a half inch in front of the anus, in the median line; cutting down to the membranous portion of the urethra until the groove in the staff is reached, and then pressing it toward the bladder for about half an inch; then carrying the incision upward, the membranous portion of the urethra is freely divided, and also the soft tissue of the perinæum. A long ball-pointed probe, or what is better, the director of Dr. Little (Fig. 469), is now carried along

FIG. 469.



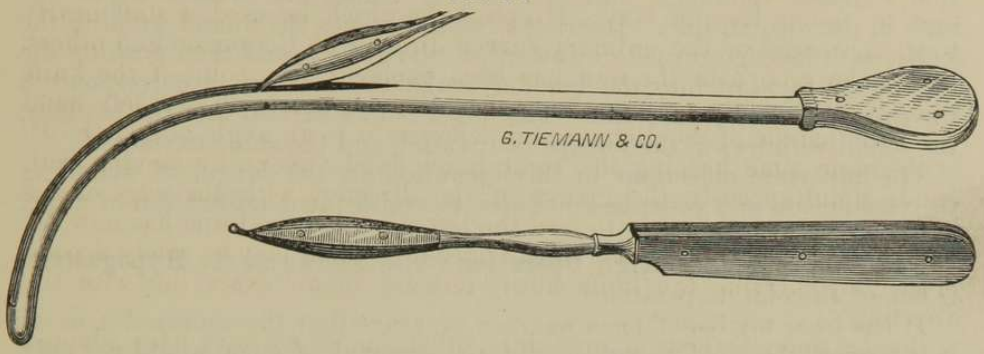
the groove into the bladder, and the staff is then removed. By passing the finger along this probe into the bladder the orifice is dilated; it also serves as a guide to the forceps in seizing and removing the stone.

In cases where the stone is of small size this method may be successfully employed; but in general, experience has failed to give much support to this mode of operation.

Bilateral Section.—Dupuytren recommended a *bilateral incision* through the prostate gland, making a semilunar incision transversely through the perinæum. He considered this a superior method for the removal of large calculi, but the operation finds few advocates at the present day. The first incision having reached the staff, a double-bladed curved lithotome is pushed close along its convexity into the bladder. The blades are now opened transversely, and by withdrawing the instrument, the neck of the bladder and the prostate gland are divided. Dr. Wood, of New York,

employs frequently the bilateral section, and to facilitate the operation has devised a bisector, with fixed open blades, as seen in Fig. 470.

Fig. 470.

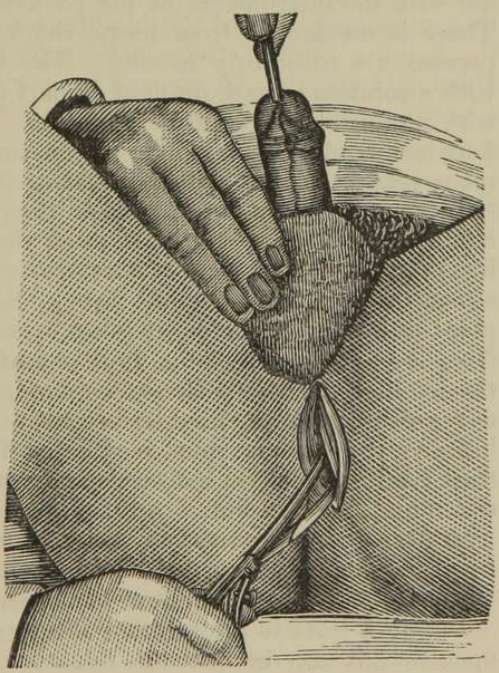


Wood's Lithotomy Staff and Knife.

Civiale's Medio-bilateral Operation differs but slightly from the above, except that the first incision is made in the median line.

Buchanan's Operation is another method of removing stone from the bladder. A staff bent at right angles, three inches from its point, with a deep lateral groove and a posterior opening, is introduced into the bladder, and, guided by the finger in the rectum, its angle is made to correspond to the apex of the prostate gland. With the finger still retained in the rectum and the staff in the hands of an assistant, the perinæum is entered by a long straight bistoury held horizontally, with the edge turned to the left, directly opposite the angle of the staff. When it enters the groove it is pushed toward the bladder until it reaches the stop at the end of the staff. On withdrawing the knife, a curved incision is made through the soft tissues to the left of the rectum, about 1¼ inch in length. The incision can also be made with a lithotome caché (Fig. 471). The author of this claims several advantages over the ordinary method, viz.: The prostate gland is reached more easily and rapidly, the membranous portion of the urethra is avoided, all bloodvessels of any importance are out of danger, there is less liability of the rectum being injured, and not so much risk of deepseated urinary infiltration.

Fig. 471.



The *recto-vesical operation*, or *lithotomy through the rectum*, was at one time frequently resorted to, but at present has almost fallen into disuse, so much so, indeed, that it has been omitted from some modern works on surgery. The grooved curved staff being in position, a straight bistoury laid flat on the palmar surface of the finger

is carried into the rectum about one inch. With the other hand, the edge is turned up and the knife thrust through the wall of the rectum until it reaches the groove of the staff, when by withdrawing it, the rectum, external sphincter, and surrounding tissues are divided about one inch in the median line. Insert the left index into the wound, guiding the knife, with its edge turned downward, to the groove, and then pushing the instrument forward into the bladder, make the incision to correspond to the supposed size of the stone. The finger is now carried into the bladder, the sound withdrawn, the forceps introduced, and the stone extracted.

The important objections to this operation are the danger of wounding the peritoneum and vesiculæ seminales, the subsequent infiltration of urine, or recto-vesical fistula.

The Suprapubic, or High Operation; also known as the **Hypogastric**, is one of the oldest operations.

It has been my belief for a number of years that the *suprapubic*, or as it is termed, the "*old operation*" for the removal of stone would not only be revived, but would come into general favor, and that the objections which have been urged against it, have been more apparent than real. John Douglass conceived the idea, and Cheselden put into practice this method. The objections urged against it, are chiefly the wounding of the peritoneum and urinary extravasation. In these days, when the operations of laparotomy and ovariotomy have been so frequently and successfully performed, surgeons have not such a dread of wounding the peritoneum as in the olden time; and urinary extravasation, if the lower angle of the wound is left open, may be prevented, although with proper precautions it is not always likely to occur. The advantages of this operation are apparent. If the bladder be sufficiently distended, the peritoneum is pushed up and out of harm's way. The instruments used are few (indeed Dr. Thomas W. Deering* removed by the suprapubic method two calculi from the bladder with the instruments of his pocket-case, having no one to help him). There is no danger from hæmorrhage, and the parts, except in very fat persons, are constantly in view. The bladder should first be washed out with a solution of carbolic acid (1 part to 60). It then should be distended with a solution of the same strength. The incision should begin three or four inches above the pubis, in the linea alba, and carried up from the mons veneris. This brings the fat of the bladder to view. The catheter (which, provided with a stop-cock, should still be in the bladder) may now be moved within the viscus, in order that the operator may feel sure of the locality; this being done, a curved needle, armed with a good ligature, or a tenaculum should be passed through the bladder. This is a very important point in the operation; if it is not attended to, when the bladder collapses from the withdrawal of the fluid, it may sink deep behind the pubes. After the bladder has been secured, the stop-cock should be turned, and a portion of the contents of the bladder be allowed to run off. With a sharp-pointed bistoury the bladder must be incised from below upwards. The stone is then readily seized with forceps and withdrawn. The wound in the bladder must then be closed with catgut sutures, and the abdominal wound with deep silver wire sutures extending through the adipose and muscular tissues. The bladder should be emptied every two hours for the first seventy-two hours, and after that at longer intervals.

Dangers.—As to the relative danger attending these several methods of operation, it may be stated as follows:

In 1827 cases, of all ages, in the various metropolitan and provincial

* Medical and Surgical Reporter, Philadelphia, April 29th, 1876.

hospitals, upon whom the *lateral operation* was performed, the ratio of mortality was about one to eight.

The *recto-vesical* operations show the proportion of fatal cases to be about one in five and one-fourth.

In *suprapubic lithotomy* a death ratio has been found of one in four. This is hardly a fair estimate, because of the character of the cases which have heretofore been subjected to the suprapubic. In a late paper, by Dulles,* the mortality is shown to be 1 in 10 in the table he has collected for the past ten years.

Under twelve years of age the *lateral operation* is said to be the safest and most successful. After that age the various other modes of procedure have been instituted, hoping to diminish the mortality, but the results thus far are by no means flattering to the authors of the several operations.

The *causes of death*, after the operation of *lithotomy*, may be briefly stated to be—1. *Disease of the kidneys*, which is generally present if the calculus has existed a long time; indeed, if the source of irritation remain in the bladder, death will probably result from the cause above mentioned; and where there exists any serious lesions of the kidneys, the operation is much less likely to prove successful. 2. *Deaths from shock*, so called, are undoubtedly often dependent on this same condition. 3. *Hæmorrhage* may be one of the causes, but is very rare. 4. *Pelvic cellulitis* is the most common cause of mortality in adults after lithotomy, and generally arises from urinary infiltration into the cellular tissue. 5. *Peritonitis* is much less common. 6. *Cystitis* has sometimes given rise to fatal results. Other causes are *phlebitis*, *pyelitis*, and *uræmia*.

Stone in the Female Bladder.—It is probable that calculi are formed in the kidneys of the female as often as in the male, but having once passed into the bladder, the anatomical relations of the urethra to that organ are such as to render the escape of small concretions comparatively easy. No prostate gland obstructs the passage, the urethral canal is short, straight, and largely dilatable, so that calculi of nearly an inch in diameter have, by natural efforts, been expelled with but little pain.

The above causes will explain why vesical calculi in the female so rarely require surgical interference.

The symptoms occasioned by the presence of stone are similar to those already detailed as occurring in the male; but the *special* symptoms are *bearing-down* pains, pains in the urethra, and incontinence of urine, and these may so simulate the symptoms of uterine disease that a correct diagnosis can only be attained by a vaginal examination and the use of the sound. Sometimes nature sets up a method of her own for the removal of stone, in which ulceration of the bladder takes place, and the mass is discharged into the vagina, leaving, however, a vesico-vaginal fistula, an accident very much to be deplored.

Urinary calculi in the female are more easily removed than in the male subject, as the operation generally consists of dilatation of the urethra, followed by extraction; or of lithotrity. By the process of dilatation, stones three-fourths of an inch in diameter may be removed from children, while from adults calculi, one-fourth to one-half inch larger in diameter, may be extracted with safety.

There are two methods of dilatation,—the *slow*, performed gradually by means of tents, bougies, dilators, etc., until the urethra is sufficiently enlarged to introduce the forceps; and the *rapid*, which is accomplished while

* Suprapubic Lithotomy, by C. W. Dulles, M.D. American Journal of Medical Science, April, 1878.

the patient is under chloroform, by the use of the urethral dilator, and the whole operation completed at one sitting.

The first method is much more liable to be followed by incontinence of urine than is the second. If the stone prove too large to be removed by these means, it should be broken up by the lithotrite, and the pieces extracted, which may be generally done with but little danger. If the bladder is so much diseased as to render lithotrity impracticable, an incision must be made through the septum of the vagina into the bladder—avoiding the urethra—by means of a director passed into it, which will serve as a guide in the operation. The wound is then to be closed by sutures, as in the operation for vesico-vaginal fistula. Experience has taught, that any incision into the neck of the female bladder is reprehensible, as it is very liable to be followed by incontinence of urine.

The *suprapubic* operation has received some support, and the same remarks that were made respecting males are equally applicable in cases of females.

Other foreign bodies are sometimes found in the bladders of both males and females, and their extraction will be effected by the same general means as those already described for the extraction of stone.

LITHOTRIPSY—LITHOTRITY.

The term lithotrity signifies the boring or drilling of the stone, and was most successfully accomplished by Civiale. His instrument consists of a straight canula, containing a drill and three claws, which can be protruded after the instrument has been introduced into the bladder. These claws, however, are liable to catch in the coats of the bladder, and the operation has fallen into disuse. The term lithotripsy is now generally used by all surgeons.

By this is understood the crushing of the stone within the bladder, and it is preferable to all other methods of disintegration. It can be most successfully employed in cases in which the patient is an adult, the urethra free from stricture, the bladder void of irritability, and the prostate gland not enlarged. The mulberry calculus, on account of its hardness, is the most unfavorable for the performance of lithotripsy.

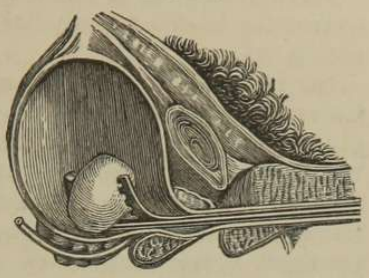
Heurteleup's Operation.—The instrument of Heurteleup consists of two blades, which are made to slide one upon the other. The instrument is introduced into the bladder as a simple sound or catheter, and the blades are afterwards expanded, for grasping the stone. In the original form of the instrument, the male blade was struck with a hammer; now, however, the crushing force is exerted by means of a peculiarly adapted screw. The extremities of the instrument are fitted with teeth, for the retention of the stone after it has been grasped, and fenestræ, or perforations, to allow the escape of the powdered stone or sand.

It is advisable that, previous to the operation, the urethra be dilated, and the urine should be retained in order that the bladder may not be in a collapsed condition, and thus endanger its coats being caught by the instrument.

The patient should lie on a convenient bed or table, with the pelvis elevated in such a manner as to throw the stone into the fundus of the bladder. The instrument, having been oiled and warmed, is then introduced, and, after encountering the stone and fairly grasping it—an operation which requires skilful manipulation—the calculus is crushed by slowly and gradually

turning the screw (Fig. 472). The instrument should then be withdrawn, and after the irritation consequent on its presence has somewhat subsided, may again be introduced to crush the fragments; thus many introductions of the instrument may be necessary, before the stone has been broken to sufficiently small particles to allow of their passage through the urethra. If this manœuvre does not suffice, the beak of the lithotrite may be turned in various directions to search for the stone.

FIG. 472.



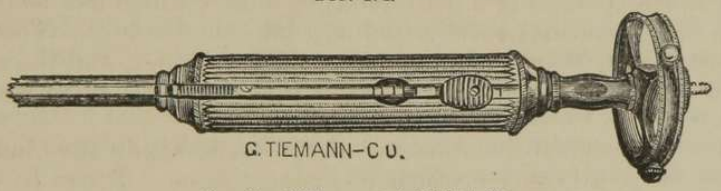
Lithotripsy by Thompson's Method.— The method of Civiale and Thompson are much the same. The instrument should be carefully introduced, following the rules already laid down for catheterism and sounding. Of course

FIG. 473.

Thompson's Lithotrite.

the blades are closed during this portion of the operation. In Fig. 473 the jaws are represented as open. The mechanism of the instrument can

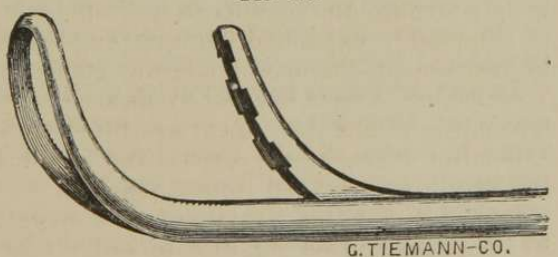
FIG. 474.



Handle of Thompson's Lithotrite.

be seen by the construction of the handle (Fig. 474). In Fig. 475 is seen the mechanism of the blades. As the handle of the lithotrite is depressed to enter its point into the bladder, the curve will probably strike against the calculus lying in the bas-fond of the bladder. The beak must then be brought to the centre of the bladder, the male blade slowly withdrawn, and the instrument rotated to the right. If the stone be caught it must be gradually crushed; if it be not secured, the instrument must be rotated to the left side; if this does not secure the calculus, the opened beak must be pushed toward the posterior wall of the bladder to catch the stone, and the screw turned slowly. The patient should then be made to urinate, when fragments of the calculus will escape. If the particles should become entangled in the membranous portion of the urethra they can be pushed back into the bladder; if they

FIG. 475.



Jaws of Thompson's Lithotrite.

should pass still further along the urethra, pressure on the under surface of the canal or the use of the urethral forceps will extract them.

In the majority of cases, it takes from half a dozen to a dozen sittings to free the bladder completely from the fragments. Sometimes a single sitting suffices.

Sir Henry Thompson, in a paper read before the Royal Medical and Chirurgical Society, which appeared in the *Lancet*, July 4th, p. 805, 1870, gives some very important items in regard to the success of this operation. "The 184 cases were consecutive in point of time, no case being omitted; they were all adults and mostly of advanced age. Many of them were feeble in health. The mean age of the 184 cases was 61 years, the youngest being twenty-two years old, and only three of the persons being below thirty years. The oldest patient operated upon was 84 years of age, and there were 46 cases of 70 years and upward. All stones which were discovered to be over an ounce were reserved for lithotomy, and all below that were crushed. He says further of these, that not one case was refused operation, not one was left unfinished, and lithotomy was not resorted to in a single instance to complete the cure. The recoveries were 93 per cent., and omitting five cases of deaths, not to be in anywise attributed to the operation, the mortality amounted to not over four per cent. A second operation was necessary for 13 of the cases."

Professor Moore, of the University of Buffalo, proposes, by an instrument lately devised by him, to perform lithotrity at a single sitting. This ingenious contrivance consists of a steel net, which holds the stone, which "is rubbed down with a series of scrapers which cut its proximate face. The scrapers are not to be confounded with drills, after Civiale's first manner, which penetrated the stone, so that its honeycomb condition caused it to break; they remove the surface and are intended to cut the whole face of the calculus and not to go through it. There is no difficulty in doing this with the chisel-shaped points, or their surfaces, and that too with rapidity, while the bladder is perfectly protected by the steel net."

A French instrument has also been invented, which reduces the stone by friction of the blades of the lithotrite.

Dr. Henry J. Bigelow* furnishes one of the most valuable additions to the literature of lithotrity of this century. Instead of allowing several sittings for the removal of the stone, he contends for and practices its removal at one sitting if possible. He says, "I believe that, in any case which is as favorable to lithotrity as the average in these days, when stones can be detected early, this can be effected, and that if the bladder be completely emptied of detritus, we have as little to apprehend from the fatigue of the organ consequent upon such manipulation as from the alternative of residual fragments and further operations."

Important Points in connection with Lithotrity.—Sir Henry Thompson† says that, after lithotrity, the appearance of muco-purulent matter in the urine indicates cystitis from irritation of the bladder by the remaining fragments, and advises further crushing without delay. He points out the necessity of drawing the residual urine by means of the catheter as soon as the slightest inability to evacuate the bladder, even to the extent of a drachm or two, comes on after lithotrity. In this way alone can the formation of subsequent phosphatic calculi be prevented. When the urine becomes ammoniacal and the earthy phosphates are deposited, he washes out

* American Journal of the Medical Sciences, Jan. 1878.

† Monthly Abstract of Medical Science, October, 1876; Lancet, January 8th, 1876.

the bladder with weak nitric acid, etc. He has found one admirable remedy for that low chronic cystitis, associated with the production of phosphatic calculi, viz., the injection every other day of a solution of silver nitrate, one-half grain to four or six ounces of distilled water.

ACUTE AND CHRONIC PROSTATITIS—ABSCESS OF THE PROSTATE—SENILE HYPERTROPHY OF THE PROSTATE.

The prostate gland is liable to inflammation, which is always serious in character because of the difficulty in management and because of the close intimacy which exists between it and the surrounding structures. It is really a very difficult thing to define exactly or dissect minutely the prostate so that we may actually detect its boundaries. It appears to submerge itself into the surrounding structures, and can only with the greatest difficulty be separated from them. The gland, no doubt, receives its name from "standing before" the neck of the bladder, and thus forming or blending with the structure. For these reasons an acute attack of prostatitis *per se* is a rare disorder, but its inflammation from an extension of disease from bladder, urethra, or rectum is not so uncommon.

The *causes* of the affection are, extension of urethral inflammation, strictures of the urethra, particularly those of old standing, which are tight and contracted, cystitis, calculi in the bladder, wounds or bruises in the perinæum, long-continued and drastic purgative medicines; diseases of the rectum, as hæmorrhoids, fissures, etc., constant straining at stool, and sometimes violent horseback exercise.

The symptoms are, pain, weight, and fulness in the perinæum, weight and heaviness in the loins, a fulness in the rectum, pressing at the cervix vesicæ. These pains are most particularly aggravated by straining at stool, and by passing water. The attempt to introduce the catheter also gives excruciating pain to the patient. With these symptoms there is fever, thirst, and more or less vascular excitement throughout the system. If the finger is introduced into the rectum, the gland is found hardened and enlarged, the anterior wall of the rectum is also hardened, and, together with this, there is a constant desire to go to stool, with pains extending down the thighs and along the penis.

If these symptoms be not subdued, the inflammatory process may end in suppuration, thus producing *abscess of the prostate.* Such a condition may be feared, if the inflammation has not yielded to the appropriate treatment, and the difficulty of micturition and defecation either remain the same or increase in severity. The usual symptoms of the formation of pus are then noticed, and fluctuation may be perceived either in the perinæum or in the rectum. There is a variety of abscess which is known as *periprostatic,* in which suppuration has taken place external to the gland. Such abscesses are not nearly as troublesome or dangerous as those previously named.

An abscess of the prostate may discharge itself into the urethra or the rectum, the former being generally the locality at which the pus finds exit.

The chief trouble in this disease is the long-continued suppuration which generally follows the acute abscess, and this continues for such a length of time, that the entire gland is destroyed; then the bladder and other organs sympathize, until finally great emaciation, hectic, and death result.

If entire resolution does not take place, and the more violent inflammatory symptoms subside, then there remains those symptoms which point to *chronic inflammation of the prostate.* These are weight and fulness in the perinæum, extending to the anus; pain in passing water, with diminished

power in propelling the stream; the urine is cloudy; a gleety discharge often exists; there is pain in coitus and defecation, and sometimes spermatorrhœa.

Treatment.—It is scarcely necessary to repeat here, what has been so often mentioned throughout the volume, viz., the indications of aconite and belladonna for the feverish conditions belonging to the commencement of all inflammations. Besides these, cannabis, merc. prot., pulsatilla, and thuja are medicines that may be called for; and hepar, silic., and sulphur, with calendula for abscess.

For the chronic inflammation, the medicines which are best are, thuja, kali hydriod., calc. carb., conium mac., pulsatilla, and sulph. A very useful application to the perinæum I have found to be a compress saturated with the tincture of cantharides.

Hypertrophy of the Prostate.—This most serious affection which is encountered among the aged, and receives the name *senile hypertrophy of the prostate*, has been denominated "the common inheritance of mankind." Although there can be no doubt that very many old people pass away without suffering from it, Mr. Thompson states: "I have never seen or heard of a true example of it before the age of fifty-four years."

The tissues constituting the enlargement are: "First, unstriped muscular fibres and the connective tissue always associated; they form at least three-fourths of the prostate body. Second, interspersed among this structure are numerous branching glandular tubes and their accompanying ducts."

The first symptom of the disease is merely a diminution in the force of the urinary stream, which may exist for a considerable time without giving much inconvenience or exciting particular attention. After a time, however, the desire to urinate increases, but the patient feels less ability to accomplish the act. During these times there is a sense of weight, heaviness, and dull pain in the perinæum. There exists a degree of irritation about the rectum, which may increase to such a degree that fæces pass with the efforts to urinate. The fæces are flattened, and hæmorrhoidal tumors result. After a time, inflammation of the neck of the bladder comes on, which greatly adds to the discomfort and uneasiness of the patient. As the hypertrophy increases, the urethral canal becomes more and more closed, and consequently micturition more incomplete, while urinary tenesmus is also aggravated. At this stage of the disease, incontinence of urine takes place during the night.

While these symptoms are gradually developing themselves, the constitutional symptoms are more and more marked; there are frequent attacks of fever, sweats, emaciation from loss of sleep, and constant urinary irritation; and paroxysms of complete retention occur, which are most distressing in character.

The obstruction thus offered to the natural outlet for the renal secretion, combined with the irritation of the urinary apparatus, are quite sufficient to cause changes in the chemical characters of the urine. There is a large amount of glairy and slimy matters deposited; the chemical reaction is alkaline, the odor is fetid or ammoniacal, and the color often altered by the admixture of blood.

From these changes it is not surprising that, after a time, *calcareous formations* take place, which, of course, add materially to the suffering. In such cases as these there is constant, and often agonizing, pain at the neck of the bladder, pain at the end of the penis, with purulent or bloody discharges. If, in addition to these symptoms and appearances, portions of the calculus can be detected in the urine, the diagnosis may be made out;

otherwise, in the absence of the last symptom, the true nature of the affection may not be so readily discovered.

Great assistance may be rendered in making a diagnosis, when senile enlargement of the prostate is apprehended, by physical examination. The forefinger of the left hand should be introduced within the rectum, and the size and position and relations of the prostate ascertained; by then passing a catheter into the bladder and (keeping the left forefinger still in the rectum) moving it gradually and gently from side to side, the dimensions and relations may be determined. If the ordinary catheter does not pass through the increased length of the gland, the prostatic catheter must be used. This catheter is from two to four inches longer, and possesses a larger curve than the ordinary instrument. If, in the passage of this catheter, the handle appears to turn to one side or to the other, the enlargement may be expected to be found on that side toward which the handle of the instrument is deflected. Sometimes a sound with a short curve may be used as an explorer.

Treatment.—*The urine, if possible, must all be removed from the bladder several times a day.* This may be accomplished either by the prostatic catheter, or by the use of Squires's vertebrated prostatic catheter, a cut and description of which is found in the first part of this chapter. By a little instruction, patients soon learn how to manage the instrument, and, after a time, become quite dexterous in its application. I have known several who could quite surpass their professional attendant in the introduction of the catheter.

The medical treatment of this disease by our brethren of the old school is professedly weak. Our medicines have a much more decided effect; among these are mercury, the iodide of potash, iodine, pulsatilla, calc. carb., thuja, and sulphur. Long-continued treatment with medicines in no very low potencies will often produce a cure, the main secret, however, being the continuous use of the drug.

In the *American Homœopathic Review*, vol. iii, p. 150, Dr. Lippe has given the indications for the following medicines: Thuja, pulsatilla, digitalis, cyclamen, selenium, causticum, lycopodium, secale, copaiba, zinc, agnus castus, alumina, hepar, apis, and sulphuric acid. The student may refer for further information to the article in question, or to Raue's Pathology.

CHAPTER XLI.

DISEASES OF THE MALE GENITAL ORGANS.

Malformations.—There may be a failure in the development of the testicle, or failure in the formation of either of its parts. It is well known, that the body of the testicle is produced, in fœtal life, in front and independent of the Wolffian body, and that the epididymis comes apparently from the lower part of that body itself. Either of these parts may be absent in imperfect development of the testes. The *vas deferens* is also sometimes wanting, although the virile power may be unimpaired, the person, however, being necessarily sterile.

When speaking of the diagnosis of hernia, mention was made of the *retained testicle*, which retardation, according to Sir Astley Cooper, takes place in one out of five infants.

Orchitis.—Inflammation of the testicle proper is denominated *orchitis; epididymitis* being the term used when the epididymis is involved. Often both testicle and epididymis are implicated, and the cause is generally a

badly managed gonorrhœa—a sudden suppression of the discharge, either from cold or strongly astringent injections. The pain is severe, the parts enlarge, are redder than usual, the rugæ of the scrotum are lost, and there is exquisite sensitiveness to both touch and pressure. High fever, and often delirium, accompany the disease. The urethral discharge abates, but the patient may be troubled with nocturnal emissions.

Pain in the back and loins, sometimes extending down the thighs and into the perinæum, is often present, and the attacks are frequently accompanied with nausea and vomiting.

If the inflammatory process be not arrested it passes on to the suppurative stage, and *abscess of the testicle* results. If such condition take place the fever increases, the pulsation, redness, and pain seem more seated in the organ, and shiverings are present. Touch—even the pressure of the bedclothes—is insupportable, and the pus when formed is mostly ill-conditioned. Fluctuation often appears at different points, and the abscess discharges at several places.

I have noticed a particular feature in cases—especially neglected ones—of suppuration of the testicle, and that is the apparent unwillingness of the openings to heal, through which the pus has been discharged. Very often through these openings a *fungous growth* protrudes, of which more will be mentioned in the following portions of this chapter.

Treatment.—It is astonishing how rapidly the proper medicines, if administered early in this affection, arrest the disease. I use neither ice-bags or hot fomentations, nor other application save a compress wet with water, laid over the part, and begin the treatment with aconite, which I administer always in a low potency, even a few drops of the mother tincture in water. *Belladonna* is excellent also, in plethoric persons, with tendency to delirium, and congestion to the head and face.

Gelseminum is a superior medicine when the disease arises from a suppressed gonorrhœal discharge, from exposure to sudden cold or wet, when there are also indications of biliary disorder and congestion.

After the inflammatory symptoms have in a measure subsided, *clematis erecta*, in the 30th potency, is an admirable medicine, especially if the epididymis is particularly involved, and there appears to be a tendency of the disease to assume a chronic form.

Pulsatilla is applicable to those mild and rather delicate men, who "have gone astray" and are "sorry for their sin," even unto tears; when the gland is more involved than the surrounding structure, when the pain shoots down the back, or into the thigh, and changes place, with but little or no thirst during the fever.

Mercurius after the inflammatory symptoms have subsided, and there appears to be a tendency to the formation of pus, with shiverings and profuse perspiration. The gland is hard and sensitive, but not in such a degree as would indicate clematis.

Hepar is called for in abscess of the testicle. When the pus has formed the fluid should be evacuated with a simple puncture, and the wound closed with a piece of adhesive plaster. After the evacuation of pus, *silicea* 30th, and *phosphorus* 30th are generally sufficient to complete the cure. The patient must wear a suspensory bandage, and must keep the recumbent posture. During the treatment if there be priapism or burning during the act of micturition, *cantharides* or *cannabis* are necessary as intercurrent medicines.

In *Hale's New Remedies*,* Dr. Ludlam speaks of hamamelis; Dr. Hale of phytolacca dec. and pulsatilla nut., and Dr. Osgood of veratrum viride, in the treatment of this disease.

Chronic Orchitis.—*Chronic inflammation of the testicle*, or, as it is termed by some, *sarcocele*, may result from acute orchitis imperfectly resolved, or the action may be chronic from the commencement of the disease. It may be either primary or secondary, that is, it may occur as an independent

* *Vide* pp. 509, 792, 866, and 1059.

affection, or as a concomitant result of gonorrhœa; it not unfrequently results from disease of the urethra, and in some instances the affection may be traced to syphilis. The tumefaction extends from the epididymis, which is usually the primary seat of the disorder, and gradually involves the whole testicle, which presents the appearance of an inelastic, uniform tumor, which is usually of an oval form, and seldom exceeds two or three times the bulk of the healthy gland. The accompanying uneasiness is slight, is more severe at night than during the day, and as the disease advances, the characteristic sensibility of the organ to pressure is lost. Occasionally the disease, in its latter stages, is accompanied with a degree of effusion within the tunica vaginalis, constituting what is termed *hydrosarcocele*. Upon examination more or less yellow solid lymph is found interspersed throughout the substance of the testicle, extending into the vas deferens, and according to Mr. Curling, deposited in the tubuli seminiferi. By the smoothness and uniformity of the swelling, its gradual progress, and the absence of glandular enlargement, the affection may be distinguished from malignant disease of the testicle.

Treatment.—Rest and a recumbent posture are necessary in the first instance; and in the milder forms of the disease, or at its commencement, resolution may be effected by means of the following medicines: aurum, clematis, lycopodium, agnus castus, graphites, rhododendron, and sulphur.

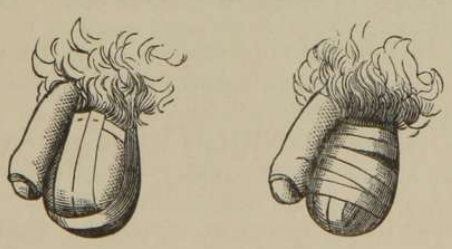
When the disease has a syphilitic origin, a careful investigation, and an accurate knowledge of the character of the syphilitic affection from its commencement, are required. Calc. carb., carbo veg., aurum, kali carb., lycopodium, spongia, merc. sol., acid. nit., clematis, mezereum, etc., are indicated in this form of the disease; but other medicines may be required. Graphites, lycopodium, oleander, and belladonna, are recommended if the disease is complicated with a general scrofulous condition, chronic eruptions, glandular enlargements, etc.

Where the tumor, in an advanced stage, gives evidence of the supervention of a malignant condition, arsenicum, clematis, diadema, carbo veg., and thuja, may possibly arrest the progress of the disorder, though in the majority of such instances, the use of the knife can scarcely be avoided.

In very chronic cases, especially in syphilitic patients, I have succeeded by the internal administration of the iodide of potassium, five grains three times a day. Strapping the testicle evenly with adhesive plaster is necessary in some cases; in all, the suspensory bandage must be used.

Bryant says: "To strap a testicle requires some skill. The patient should be made to stand against the edge of a table and separate his legs. The surgeon should then with his left hand grasp the organ from behind, and press it down to the bottom of the scrotal sac, making the scrotum tense over its surface, the thumb and index finger of his left hand holding its neck. A piece of elastic strapping, spread on leather half an inch or more wide, is next to be wound round the neck of the tumor once, twice, or even thrice, to hold it in position, for if this point be not attended to, all the subsequent steps will be useless." (Fig. 476.)

FIG. 476.



Strapping the Testicle.—BRYANT.

Fungoid Growths of the Testicle.—Fungoid growths from the testicle after chronic orchitis are by no means uncommon, and are oft-times very troublesome to manage. They are of two varieties, the

benign and *malignant.* This distinction, however, was unknown to the older writers, who believed that every growth presenting the well-known objective symptoms of fungoid tumors, was certainly of malignant character. Later researches have proven that there are two distinct species of fungus, called the benign and the malignant growths. The benign has also received the names of *hernia testis*, and *granular swelling.* The symptoms which render the diagnosis more certain in such cases are these: In the malignant disease there is frequent hæmorrhage, and liability to bleed upon slight irritation. This condition is very rarely noticed in the benign growth. In the latter the protruding mass presents a granulating appearance, while in the former it is soft and spongy. In the benign variety the color is paler than in the malignant, the growth is much more consistent, and pressure on the tumor causes that peculiar sickening sensation, which attends the compression of the healthy testicle; while in the other variety no such sensation is experienced. To make the diagnosis certain, the microscope should be employed.

The following case may illustrate the course and history of a fungus, when proceeding, as it very often does, from chronic orchitis. The patient was a young man, who was a conductor on a sleeping car. He fell astride a large iron bar, causing a most severe contusion of the right testicle. The pain was severe, the swelling enormous, the testicle very hard and extremely sensitive; there was weight and dragging in the loins; the spermatic cord was tumefied; and all the symptoms of severe acute orchitis followed. The patient was treated *secundum artem*, and after a considerable period, a sensation of fluctuation being apparent, the scrotum was lanced. In a short time a fungoid-looking substance, presenting an ashy or yellowish-white appearance, protruded from the opening, which continued to grow for some time.

The whole tissue of the scrotum was very much thickened and much indurated, the color of the integument being purplish. The epididymis was pushed upward, and the cord enormously thickened. Castration radically cured him.

Treatment.—If mercurius, thuja, phosph., or those medicines already mentioned for the treatment of acute and chronic orchitis are not available, one of two operations may be selected. The one proposed by Mr. Syme, of Edinburgh, 1845, consists in carefully loosening the fungoid testicle from the scrotum, pressing it within the cavity and stitching the walls over the growth, thus producing a certain amount of steady pressure. "The surface of the fungus," says Mr. Syme, "being coated with granulations becomes incrusted with effused lymph, and in order to facilitate the healing process, the hard ring of skin through which the fungus protrudes must be also removed."

The other operation is castration, which must always be performed in the malignant disease. The methods of operation are noticed on the next page of this chapter.

Cystic or Adenoid Disease of the Testicle.—This is rather a rare disease, and the growth is so insidious and so slow that, in its early stages, it gives rise to scarcely any inconvenience to the patient. The tumor is oval in shape, somewhat elastic, and can be handled without much pain. The swelling is smooth in the majority of instances, but, at other times, it may be lobulated or slightly irregular. At some portions of the tumor, generally at its upper portion, there may be fluctuation, which may resemble hydrocele of the cord.

The usual symptoms of weight, heaviness, and dragging are experienced in the groin, and there is aching and numbness of the part.

The chief trouble in these diseases of the testicle, is the correct diagnosis of the case. Distinguished surgeons have been misled, and Sir Astley Cooper confesses to have several times plunged a lancet into a tumor of the scrotum expecting fluid to pass away, when nothing but blood flowed from the wound. The disease may be diagnosed from hydrocele by the following symptoms:

In hydrocele we have translucency.

In cystic disease none.

In hydrocele the tumor is pyriform.

In cystic disease the tumor is oval.

In hydrocele, pressure on the part usually occupied by the testicle produces no pain.

In cystic disease there is a slight pain, but as a general rule, the swellings are painless.

Hydrocele is occasionally double; cystic disease is always single.

Treatment.—The only remedy is complete removal, which generally radically cures the patient. Upon examination of the testicle after removal, if will be found enlarged and situated within the tumor; it is somewhat harder than natural, and here and there a cyst containing a small quantity of straw-colored fluid is found.

Cancer of the Testicle.—The testicle is affected with medullary cancer, already alluded to, as well as scirrhus. According to recent authority we find that the majority of cancerous affections attacking the testes are of the soft or encephaloid or fungoid variety. (For the differential diagnosis the student must refer to the preceding page.) There are two especial forms of cancer—one being the tuberous, the other the infiltrating form. In the substance of the glands, cysts are generated, which become filled with blood-stained glairy fluid, containing cancer-cells in great profusion. The swelling is tense, firm, and elastic; has a somewhat unequal feel, some parts of it being firm, others presenting appearances of fluctuation. The peculiar feeling, known by some as "testicular sensation," is soon lost, and the parts growing rapidly soon acquire large bulk. The pain is not very great, although sometimes a sharp shooting pain is felt; the veins are full and enlarged. The infiltrating form may be complicated with cancer in other portions of the body, and is characterized by smoothness and infiltration.

Treatment.—By referring to the Chapter upon Cancer, those medicines will be found which are best adapted to the treatment of the disease. Conium mac., phosph., the protoiodide of mercury, iodine, the iodide of potash, arsen., iodide of arsenic, hydrastis, phytolacca, scutellaria, may be of service, but, as a general rule, time is lost by internal medication, and operative measures must be resorted to.

Castration.—This operation is demanded in several varieties of affections of the testicle, and indeed, sometimes, by men in the full enjoyment of their health and faculties. I was once requested to castrate a young and healthy man (a patient of Dr. J. F. Talmage, of Brooklyn), who desired to preserve his voice as a falsetto in an opera troupe. It is needless to say that the request came from the patient himself, who preferred to be a eunuch with a good voice than a man with procreative powers. I declined to perform the operation, for which he has since thanked me.

The following methods may be resorted to: The scrotum and groin having been carefully shaved, and the patient placed in a recumbent position, the surgeon grasps the tumor behind, in order to render the skin tense. An incision is then made from the external abdominal ring, reaching to the bottom of the scrotum; or the scrotum may be gathered into a fold by the fingers, and transfixed at its base, when a suitable incision will be

made by cutting directly outwards. The cord having been exposed, is separated from the surrounding textures, and intrusted to the firm grasp of an assistant, to prevent retraction within the abdominal aperture when divided; the bistoury is carried behind the cord, which is then cut across, and the operator seizing its lower portion draws it forward, and proceeds to dissect out the testicle—a dissection rendered comparatively painless and bloodless, by early section of the cord. The arteries should then be tied, and the wound kept open until the bleeding has ceased; the lower portion seldom healing otherwise than by granulation, need not be closely approximated. Care should be taken, during the operation, not to wound the septum, and thus expose the sound testicle.

The operation also may be performed by first separating the testicle from its integuments, before dividing the cord; all fear of irrepressible hæmorrhage by retraction of the vessels may be avoided, by dissecting up their cremaster envelope for a considerable distance towards the abdominal ring, and passing a ligature around them before severing the cord. Where, however, there is but a very small portion of the cord to be found, where there may be tedious dissection required to separate the diseased tissues from the healthy, and where the walls of the scrotum are very much distended, then the dangers are much more apparent, and an operation which, under most circumstances, is exceedingly simple, becomes one which may not only prove embarrassing to the operator, but fatal to the patient. For instance, where the cord is very short, and has to be divided close to the ring, a retraction may take place, which at once renders the condition alarming. "In a case which came under the observation of Sir A. Cooper," says Mr. Curling, "the bleeding from the vessels of the retracted cord was so profuse, that the operator was convinced that he had wounded the iliac artery, and unfortunately proceeded to place a ligature on that vessel. The patient died the day after the separation of the ligature. The iliac artery, though not wounded, had been tied securely enough; but the vessels of the cord, the source of the hæmorrhage, had been neglected." The same author records two instances which came under the observation of Mr. Benjamin Bell, in which two patients died from hæmorrhage from retraction of the cord, before the vessels could be secured. Secondary hæmorrhage is another serious complication, which is very likely to occur after the operation, and chiefly from the vessels of the scrotum.

Taking all these circumstances into consideration, I prefer a method of operation which I have not seen anywhere recorded, and which I believe may be recommended to the profession for the ease with which it may be performed, and the safety of its results. Having placed the patient under the influence of chloroform, take the cord between the thumb and finger of the left hand, just at its exit from the external abdominal ring, and having rendered the integument tense by firm pressure, enter an acupressure pin at right angles with the cord, and having depressed the head, bring out the point on the opposite side. To make the matter still more safe, another pin may be placed about half an inch below; over these, to keep them in position, draw two slight rings of india-rubber. Then make an incision upon the tumor and dissect out the gland. Then divide the cord with a single stroke of the knife, *and neither will a drop of blood exude, or a particle of retraction take place.* Thus, by pins properly applied, two most serious difficulties of the operation are removed. The acupressure prevents the hæmorrhage from all the vessels of the cord, and does not allow it to retract.

Hydrocele.—The tunica vaginalis testis secretes, in its natural state, a limpid fluid, which lubricates its internal surface and that of the tunica

albuginea ; and whenever this fluid, from any cause, is secreted in an undue proportion, it distends the tunica vaginalis, giving rise to a tumor of the scrotum, which is termed *hydrocele.*

It is probable that the accumulation is the result of excited action in the parts, for its origin is most frequently attributable to external injury, blows or bruises, followed by rapid swelling, which, after a time subsides, leaving, perhaps, some enlargement of the testicle, or of the more superficial tissues, and succeeded by the gradual appearance of the disease in question. It is also owing sometimes to inflammation of the testis, and is frequently combined with stricture of the urethra, or local irritation along its course. Dr. Physick succeeded in curing a case of this disease by dilating the stricture with a bougie. When the communication between the cavity of the abdomen and the tunica vaginalis is not closed as it should be at the usual period of time, the fluid descends from the cavity of the abdomen into the cavity of the tunic, forming what is denominated a *congenital hydrocele.*

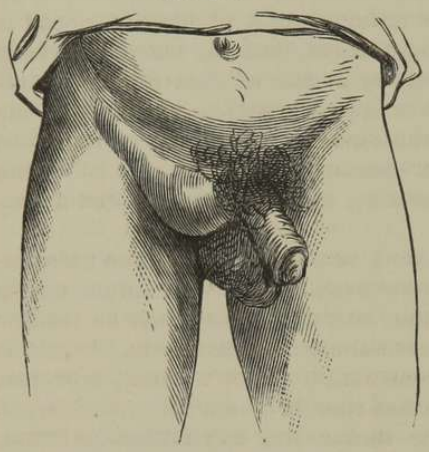
This affection is sometimes conjoined with sarcocele, or chronic enlargement; in which case it is termed *hydro-sarcocele.* It is very important to distinguish between these two diseases; and this distinction may be readily made by attending to the following circumstances: In sarcocele, the tumor is oval and flattened; it may attain a considerable size, without, however, ascending so near to the external abdominal ring as does a large hydrocele. In sarcocele there is a space between the tumor and the abdominal ring, whereas, generally, there is none in a large hydrocele. The tumor may also be known by its weight and opacity. In hydrocele the swelling commences at the bottom, and is generally confined to one side. At first the tumor is flaccid, and the testicle may readily be distinguished; but as it increases in size, it becomes firm and incompressible, and the testicle can scarcely be felt. The swelling assumes a pyriform shape, the corrugations of the scrotum disappear, and the raphé is displaced to the opposite side; generally there is little or no pain or inflammation, and no alteration of color. When inflammation, however, precedes this disease, there is pain, swelling, and hardness. The swelling is translucent, and on placing a lighted candle on one side of the scrotum, the light can be discerned through it. In some cases, however, the tunica vaginalis becomes thicker and harder, the fluid is opaque and dark-colored, thereby obstructing the passage of the rays of light. Under these circumstances there would be no translucency.

Sometimes an accumulation of fluid takes place in the tunica vaginalis of the spermatic cord, forming an *encysted hydrocele of the cord.* This variety occurs more frequently in children than in adults. The fluid is thin and clear, and contained in a distinct cyst, of a smooth, shining, serous appearance internally; this cyst may be either an unobliterated portion of the congenital spermatic structure, or composed of thickened and condensed cellular tissue, strengthened exteriorly by the expansion of the cremaster muscle. This variety of the disease may be confounded with hernia, from which it is very necessary to distinguish it. In hydrocele of the cord the accumulation takes place gradually, unattended with pain, and is always below the external abdominal ring. When the patient coughs, there is no impulse communicated to the finger, and the tumor is not capable of being returned into the cavity of the abdomen; whilst in hernia, the swelling takes place suddenly, after some violent effort, attended with pain; and a peculiar impetus is communicated to the tumor when the patient coughs, and it may generally be returned by pressure into the abdomen. It sometimes happens, however, that both these affections coexist in the same individual, and in such cases the diagnosis is very difficult.

If, in the withdrawal of the fluid with the hypodermic needle, it is found to be *whitish*, the diagnosis of *spermatozoa* in a cyst may be arrived at, and spermatozoa may be said to be pathognomonic of *encysted hydrocele of the cord*, although in some instances the disease may exist without them.

Sometimes accumulations occur in the meshes of the cellular tissue of the cord; the cells expand and form receptacles for the fluid; these vary from the size of a pea to that of an almond. We then have the affection known as "*diffused hydrocele of the cord*." (Fig. 477.) In this disease, the swelling is uniform, has a defined shape, grows slowly, and is productive of but little pain. By careful manipulation the swelling may be separated from the vaginal tunic.

Fig. 477.



Diffused Hydrocele of the Cord.

Of itself, hydrocele is not a dangerous disease. Persons may have it for years, and yet be free from pain; but, if the swelling increase to a great size, pains in the spermatic cord and renal region are experienced. On account of the enormous size of the effusion, the penis becomes much retracted, and sexual intercourse is rendered impossible. The discharge of urine may be interfered with, and the emission of semen is likewise impeded.

The diagnostic symptoms may be arranged as follows:

Increase of the tumor from below upwards.

Fluctuation, or want of solidity.

Translucency.

Lightness as compared to solid growth.

Sickening sensation experienced by the patient when pressure is made in the region of the testicle.

Smoothness of surface.

Absence of cough-impulse.

Absence of pain.

The history of the case.

By carefully examining these symptoms, we may find that all, or certainly a majority of them, are so equivocal in complicated or old cases, that they cannot be relied upon entirely.

The increase of the tumor from below upwards is decidedly the most apparent sign of the accumulation of fluid; but in many cases, when the disorder has progressed without pain, the patient has not really noticed whether the swelling began at the bottom of the scrotum, or not; he can say he has observed a swelling, but it appeared uniform, and therefore he did not carefully note the direction of its increase. But this is not all; the position of the testicle may be so altered, that enlargement cannot take place from below. Such cases are on record.

Fluctuation.—In some instances, fluctuation may not be at all distinguishable. Prof. Gross says: "In old cases, or where the accumulation is very considerable, amounting to fifteen or twenty ounces, the tumor is very hard, tense, and *devoid* of both fluctuation and translucency;" therefore, neither this or the following symptom (*translucency*) is always present.

The latter is absent when the fluid is red, brown, or dark-colored, or

when the testicle is situated in front of the tumor, thus obscuring the passage of light. Dr. Snelling, in the *North American Journal of Homœopathy* for 1852, describes such a case of hydrocele.

It has been proven by several surgeons, that the lightness of a hydrocele, as compared with solid tumors of the scrotum, is oftentimes more imaginary than real.

Speaking on this point, a distinguished surgeon (*vide* Druitt) thus writes: "The statement just made, that solid enlargements of the testis may be distinguished from hydrocele *by their weight*, though one often made, is erroneous. We have, for example, seen a cancerous testicle, when removed, placed in a glassful of water, standing in a basin so as to receive the displaced liquor. This displaced water, of course equal in volume to the testicle, was then weighed, and after it the testicle itself. The cancerous mass weighed two hundred and fifty grams, and the water two hundred and forty-five grams. Now, it is impossible for any hand to detect so small a difference as this; and, moreover, it must be recollected that the contents of a hydrocele is serum, which is heavier than water. *Greater weight cannot then be considered a symptom of solid tumor of the testicle.*"

With regard to the sickening sensation produced by pressure, I may observe that in every case of varicocele or sarcocele that I have seen, this peculiar feeling was manifested upon pressure; nay, in very sensitive people the same effect is produced, even in a state of health.

Smoothness of surface, as will be seen by Dr. Snelling's case, is not always present, and, besides, may be found when there exists, either with or without the accumulation of fluid, a scrotal hernia of considerable size.

Absence of cough-impulse is found in many diseases of the testicles—in sarcocele, in hypertrophy, in circocele, and cancer; besides being present in hydrocele, accompanied by hernia, especially epiplocele.

Mr. Curling, on page 17, says: "I have never experienced greater difficulty in the diagnosis of the affection than in a case of large hydrocele, extending upwards as high as the internal ring, and receiving, *constantly, an impulse on coughing*, as distinct as is commonly felt in a scrotal hernia."

Absence of pain is found in simple reducible hernia, and there are some cases of hydrocele in which very decided pain is complained of by the patients. This has happened in cases which have come under my observation.

The history of the case, indeed, may, and does often assist us in the diagnosis, but certainly not more in hydrocele than in any other disorder.

It therefore will be understood that the greatest discrimination, the most careful examination, and the most rigid comparison of symptoms must be instituted before we can arrive at a definite knowledge in these cases.

In such, then, how must we proceed?

First.—By a careful comparison of the *tout ensemble.*

Second.—Especially by the use of the exploring needle or aspirator.

Third.—If the diagnosis be very obscure, by carefully cutting down upon the sac with a scalpel, instead of puncturing with a trocar.

There are, also, peculiar cases, in which the symptoms may be rendered more obscure by the formation of one or more partitions in the sac, forming multilocular hydrocele. This may give rise to *unevenness of surface*, and may perplex the surgeon during an operation, in which the ordinary trocar or acupuncture-needle is only thrust into one of the compartments. In such an instance we have a flow of serum and suddenly a stoppage of the fluid, and but a partial diminution in the size of the sac. These cases are rare, but it is of these that we desire to speak especially.

The Quantity of Fluid.—Sometimes the quantity of the fluid is so great that the records appear almost incredible; yet, when we remember how much serum may collect in those cavities of the body, the walls of which are extensible, we will not be astonished at the quantity that may collect in the scrotum. Who does not recollect the famous epitaph recorded by Watson of Dame Gregory Page, who, in sixty-seven months, was tapped sixty-six times, and had taken from him two hundred and forty gallons of water?

Gibbon, the historian, is said to have had removed from his scrotum six quarts of water. In the tables of many cases of hydrocele prepared by Dr. Duyat, at Calcutta, the quantity of serum varied from ten to one hundred ounces.

Analysis of the Fluid.—The following analysis of the fluid, made by Dr. Bostock, of 100 parts, of the specific gravity of 1024, were found to contain:

Water,	91.25
Albumen,	6.85
Uncoagulable matter,	1.1
Salt,	.8
	100.00

The fluid, as has been before mentioned, in old cases, is a thickish, dark color, and even may contain cartilage and osseous deposit. Albuminous sediment is present.

The *treatment* of hydrocele may be divided into medical and surgical, and the latter into palliative and radical.

Let it here, however, be remarked that hydrocele, especially in infants and young children, often disappears spontaneously; and, indeed, in adults, such cases have been recorded. Mr. Pott describes two cases of confirmed hydrocele, which disappeared without any treatment whatsoever.

The small accumulations that are so often noticed in very young persons need no treatment, except, perhaps, a suspensory bandage, which latter, in the majority of instances, is rendered unnecessary, because a certain degree of pressure is exerted by the diaper.

In *Humphrey's Ruoff*, page 121, there is a case mentioned, cured by pulsatilla, in which there was swelling of the scrotum on one side, and of the left spermatic cord; also, a successful case, in which arnica was externally applied, and conium internally, together with sulphur, nux vomica, puls., and graph.

Dr. Black, in the *British Journal of Homœopathy*, volume iii, page 525, gives a very interesting account of hydrocele successfully treated by homœopathic medicines, and records, especially, the action of graphites in the disorder.

Dr. Hastings records, in the *British Journal of Homœopathy*, volume xviii, page 351, a remarkable cure of hydrocele by rhododendron.

Dr. Ozanam (*Bulletin de la Soc. Med.*, April 15th, 1869) cites a number of cases, where he employed rhododendron. A boy, aged 1½ years, suffered from hydrocele; rhodo. 6th potency, internally and locally, compresses saturated with a solution of the same medicine, removed the difficulty in one month. After ten days' treatment a marked diminution was observed.

"A boy six years of age had already two attacks of hydrocele, the first about two years ago. This patient was cured with rhodo. in one month. A year and a half after, he had another attack, caused by a long ride upon a donkey. The parents did not call for advice until three months after the attack; rhodo. internally and locally produced a speedy cure."

In several cases of long standing, one of forty years' duration, the improvement was more tardy, yet the enlargement was reduced to half its former size.

Ozanam's observations led him to the conclusion that rhodo. not alone manifests very positive action upon the tunics of the testicles in the male, but also upon the ovaries of the female, and, perhaps, also upon the fibrous and muscular tissues of these organs.

Raue (*Pathology*, page 402), says: "Those hydroceles which are dependent upon a general hydræmic state of the blood, must be treated with reference to this whole general state and its symptoms. Hydrocele in consequence of a blow, requires arnica and pulsatilla; those of unknown causes, aurum, graphites, iod., psoricum, rhodo., silic."

The medicines which have proved most effectual in my hands are as follows: Calc. carb., conium, dig., dulc., graph., iodium, merc. sol., puls., rhod., sil., sulph.

Of these, **calcarea** should be chiefly relied upon, where there is a scrofulous taint pervading the constitution, and the reproductive system is depressed, as indicated by loss of appetite, debility, emaciation, dryness of the skin.

Conium is particularly suitable when the affection can be traced to mechanical injuries or contusions.

Digitalis is useful, if there is a constant desire to pass water; and is particularly suitable when children are the subjects of the affection.

Dulcamara, when it arises from a cold, suppression of tetters, suppression of a momentary or habitual sweat by exposure to a draught of air, dampness, etc.

Iodium is a valuable remedy in hydrocele, and is particularly adapted to a general scrofulous taint, characterized by glandular swellings and emaciation.

Rhododendron has been highly recommended (as above stated) in this affection. In a case of several years' standing, where there was no disease of the testes or spermatic cord, it effected a permanent cure in a few months.

Graphites and **pulsatilla** are of the highest importance, and have the most marked symptoms of hydrocele in their pathogeneses.*

The *palliative treatment* of hydrocele consists in evacuating the sac either by the aspirator or the trocar; while the radical treatment consists in exciting inflammation in the sac after the withdrawal of the fluid, thus preventing its return.

Some persons, especially those in the upper walks of life, prefer the palliative treatment; but, if the patient be healthy, it is always better to endeavor to persuade him to have the operation thoroughly performed, and prevent further accumulation in the tunica vaginalis. There are, however, circumstances where only palliative treatment is required.

Treatment by Acupuncture.—The method of acupuncturing a patient is simple, and, if properly performed, causes so little suffering, that I prefer it in all cases where mere palliation is required.

The needles, which should always be of different sizes, are very sharp; one of these is set in a handle by means of a small thumbscrew; its point is applied to the most dependent portion of the tumor; the handle is twirled rapidly between the thumb and fingers, gentle pressure being exerted at the same time. The sac must be punctured in several places.

Dr. Lanyin, in the London *Lancet*, in speaking of the palliative treatment, states that he has met with several cases where the introduction of a common needle of a large size into the sac, has invariably caused the removal of the fluid, after an interval of *twenty-four hours*.

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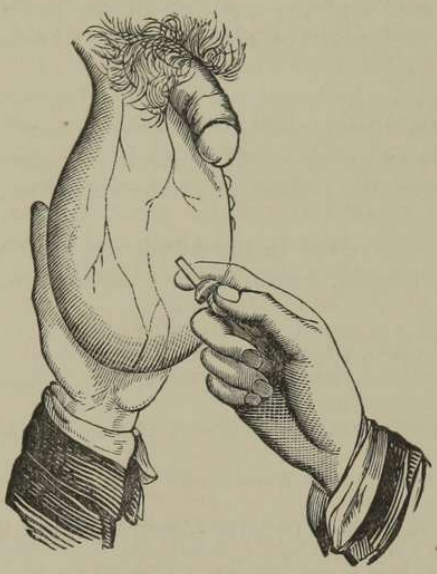
* For a very interesting account of hydrocele successfully treated by homœopathic medicines, and particularly concerning the action of graphites in this affection, see a paper by Dr. Black, in the British Journal of Homœopathy, vol. vii, p. 525.

The *palliative treatment by the trocar.*—When this is contemplated, a round trocar and canula are to be used. The patient is placed in the erect posture, with the thighs separated; the surgeon then takes the scrotum and posterior part of the tumor in his left hand, rendering it tense and prominent in front; the instrument is then entered at the lower and anterior part of the tumor, passing obliquely upwards and backwards (see Fig. 478), so as to avoid wounding the testicle, yet at the same time taking care that the obliquity is not such as endangers separation of the coverings of the sac, and non-entrance into the sac itself.

FIG. 478.



The trocar being withdrawn, the canula remains, and the fluid allowed to pass out.

The *hypodermic injection* of 10 drops of compound tincture of iodine into the hydrocele, without any attempt to draw off the fluid, should always be tried first. In some instances one injection cures, in others several are necessary, and in others again the relief is but temporary. I have cured some patients, but by far the greater number have only been relieved. The operation is, however, so simple, and so free from pain or danger, that it may be tried before more severe measures are resorted to.

The radical methods of cure are the withdrawal of the fluid, and establishing adhesion within the scrotum. This is accomplished in a variety of ways. I may here be pardoned for giving a few extracts from the authorities on the subject, and I do so because I desire to show that, in many instances, the methods employed are not sufficiently complete, or the directions sufficiently explicit, for the student or practitioner, if he meet with intractable cases.

Mr. Miller, for instance, speaks (page 571) of the palliative and the radical cure, the latter being effected by injections; and on page 514 remarks "that the operations of seton, caustic, and incision, are fallen into complete disrepute." It is to this latter statement I must dissent.

There are cases in which injection treatment has failed; indeed, this method is not resorted to by surgeons of considerable experience and skill.

John Mason Warren, in his *Surgical Observations*, made during an extended term of years at the Massachusetts General Hospital, on page 251, speaking of injections, says: "This treatment is, at best, very uncertain."

Dr. Gross, vol. ii, page 946, prefers the seton, on account of its simplicity, its freedom from danger, and its never-failing certainty. He then describes the method of operating (which will be mentioned toward the close of this section), and refers to incision as consisting of simply opening the tunica vaginalis with the knife, and dressing the wound with lint, or irritating substances.

It may, however, be remarked here, that *simple incision* has cured hydrocele. Mr. Cooper has related several instances of the kind, and Mr. Cook states that, after such operations the whole fibrous tunic was thrown off by the sloughing process.

A case is related by Paul F. Eve, in his *Remarkable Cases in Surgery*, page 371, in which a large hydrocele was cured by a stab inflicted with a bayonet.

Erichsen, pages 950 and 960, speaking of the caustic treatment by injections of iodine, as that most commonly employed, says: "When the injection *fails*, the seton will be the most certain means of accomplishing our object."

Nowadays, the injection treatment is the most common, and, in *ordinary* cases, is successful.

The operation is simple: the surgeon ascertains, first, the position of the testicle; avoiding it, he inserts a trocar and allows the fluid to run off. Through the canula he injects the tincture of iodine, which in some cases may be allowed to remain, and in others, to escape from the scrotum after a few minutes. Some surgeons use the dilute tincture of iodine, and others the pure article; my preference is for the compound tincture of iodine, in small quantities. It should be retained in the tunica vaginalis.

Dr. Bellingham is averse to the employment of the ordinary preparations, and prefers the following:

R. Iodidi potass.,	℥ij.
Aquæ dest.,	℥ss.
Adde,	
Tinct. iod.,	℥iv.

He states that, in using this formula, there need be no fear if the injection does not return, as it will readily be taken up by the absorbents.

It would be useless, in this place, to give, in detail, successfully treated cases of ordinary hydrocele of the tunica vaginalis with iodine injections. Every practitioner has either used the treatment successfully, or known of cures being accomplished by it.

Professor Syme states that he has, for some years, used the tincture of iodine alone, and without a single case of failure, either in private or public practice. The quantity he employs is about one teaspoonful.

Bransby Cooper has used the iodine injections in about thirty cases, and in all, without a single exception, the cure was effected. But he states that the compound tincture must be used, in preference to the ordinary preparation of the shops. He injects ℥ij of a mixture composed of one part tr. iod. comp. to three of water, and allows it to remain.

But the injection treatment fails sometimes, more often, perhaps, than is generally supposed, and especially in those obscure and difficult cases we have already considered; then recourse must be had to other methods.

The proportion of cases in which iodine injections fail has been variously estimated. Mr. Martin affirms that in India the failures scarcely amount to one per centum. Velpeau calculates them at about three per cent., and Mr. Erichsen says: "I have, during the last few years, seen a considerable number of cases of hydrocele of the tunica vaginalis, both in hospital and private practice, in which a radical cure has not been effected, although the iodine injections had been had recourse to by some of the most careful and skilful surgeons of the day." In such cases he prefers the seton, which is introduced by a large needle, and the fluid allowed to drain away through the puncture, or the method recommended by Mr. Green, and lauded and practiced by Dr. Gross.

Treatment by Seton.—The method of using the seton is as follows: Having drawn off the fluid, through the canula, insert the trocar again, and push it up until its point emerges from the upper part of the scrotum. Then, having withdrawn the trocar, pass through the canula either a probe or long needle, armed with a ligature, which is drawn out at the upper ori-

fice made by the reintroduction of the trocar; this done, remove the canula and make fast the ligature, which is allowed to remain until suppuration is established.

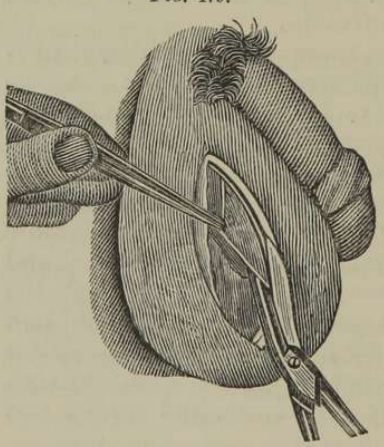
The Treatment by Incision.—This treatment was employed by John Hunter. He opened the scrotum, allowed the fluid to escape, and then sprinkled flour on the surface of the tunica vaginalis, to excite inflammation. Pott, however, strongly repudiates such proceeding, because of the frequency of sloughing. Where there is difficulty in diagnosticating a case, or where other methods have failed, incision may be practiced. Chelius prefers incision, because all complications are more readily made out, and existing intestinal rupture can be properly treated; whereas, he is of opinion that the injections, especially of iodine, act violently on the testicles, or the fluid may be poured into the cellular tissue, which has been known to produce mortification and death of the patient, and also, because the disease is likely to return after the injections. It is very singular to remark, that the very objections urged here are said to be provocative of cure by other surgeons; thus Mr. Stanley, F.R.S., recommends the fluid *to be evacuated into the cellular tissue of the scrotum*, and records cases where the fluid was speedily absorbed in forty-eight hours.

Some of the German surgeons prefer the treatment by incision. I had a most interesting case under treatment; the injection method with compound tincture of iodine had been tried, and the fluid had reaccumulated in the sac. I made an incision into the sac, and having introduced a grooved director, opened the scrotum about an inch and a half; into the sac were passed long strips of lint, until the scrotum was packed full. This dressing was allowed to remain for three days, when it was removed, and others applied. The pain was very severe, but the cure was complete.

Some surgeons, after the opening is made, sprinkle the parts with mercurial powder. Mr. Lloyd, of St. Bartholomew's, introduces into the sac, finely levigated, the powder of hydrarg. nitr. oxidum, and has employed it in a large number of cases, with complete success.

Treatment by Incision and Removal of a Portion of the Vaginal Tunic.—Having placed the patient in the usual position, the walls of the scrotum are divided with a scalpel, and a fold of the tunica vaginalis taken up with the forceps, and a portion thereof cut away with the scissors. (See Fig. 479.)

Fig. 479.



Treatment by Faradization.—The mode of application is thus described by Althaus, of London: Two acupuncture-needles are introduced, the one in the upper, the other in the lower part of the tumor, and the free extremities of the needles are then connected with the poles of the induction machine. Care should be taken that the points of the needles project into the fluid, and the current passed through them should be mild, and gradually increased until the patient complains of pain. The operation should continue twenty minutes. At first, the scrotum appears puffed, but soon after diminishes in size. Cases are known in which hydrocele has disappeared in twenty-four hours after one application of the battery.

Dr. J. C. Minor* states that in seventeen cases treated with electrolysis, but three failures occurred. In the treatment of ten of these cases, the needles were connected with the negative pole, completing the circuit by the positive sponge applied externally. In seven cases the inserted needles were connected with both poles. In six cases one application was sufficient. In one case of a large hydrocele of long standing, twenty-four hours sufficed. Another was cured in two days, and the majority in two weeks.

In conclusion, I may allude to the treatment by *alcoholic fomentation*, as introduced by M. Pleindoux, who has been successful in several instances, and which was accidentally introduced to his notice. A wine merchant of Nismes had been affected for a length of time with a considerable hydrocele of the left side of the scrotum, and, for private reasons, desired the palliative treatment. A puncture was made, and more than a pint of water drawn off. Nine months after, a second puncture was made to evacuate the fluid; it then occurred to the patient to envelop the scrotum with a large compress, steeped in alcohol at 30°. The application was renewed every evening, and was kept in its place by a suspensory bandage. The first effect was to produce great contraction of the scrotum. These fomentations were continued forty days, and the patient was completely freed from his hydrocele, which had not returned in eighteen months.

Hæmatocele.—By this term is understood an accumulation of blood in one of three localities,—the areolar tissue of the scrotum, the areolar tissue of the cord, or the tunica vaginalis. It may be either of spontaneous occurrence, or the consequence of external injury.

When it attacks the scrotum it is the result of a bruise or oblique wound; the scrotum becomes swollen, and assumes a blackish hue, like that of urinous infiltration; the swelling has a doughy feel, and at one or more points, where the cells are broken down and much blood has collected, fluctuation is perceived more or less distinctly. Hæmatocele of the cord arises from the giving way of a spermatic vein, from external injury, or great bodily exertion, when extravasation into the areolar tissue will result, forming a tense, discolored tumor. Hæmatocele of the tunica vaginalis is the most common variety; and to it, in strict accuracy, the term may be limited. The blood is extravasated into the cavity of the tunica; it may be associated with hydrocele, from a wound of the testicle in tapping, or by a blow or other external injury, or by the spontaneous giving way of a bloodvessel. A hydrocele may at any time be converted into hæmatocele, the diagnostic marks of hydrocele thereby being lost. The tumor suddenly increases in size, and is the seat of pain; and when handled is found heavier and less fluctuating than before. The blood, if in small quantity, becomes diffused in the serous fluid; when copious, a portion coagulates, and assumes the fibrinous arrangement. This, acting as a foreign substance, may excite inflammatory action; and suppuration may take place, with much increase of swelling and pain.

Treatment.—The treatment of this affection, when unconnected with hydrocele, is as follows: When the accompanying inflammation assumes a high grade, a few doses of aconite should be administered in the first instance; and when it results from a contusion, or any other mechanical injury, arnica or conium should be given internally, and applied to the affected parts as a lotion; pulsatilla also may prove availing in such cases; and nux vom., rhus, sulph., or zinc. may also be found efficient. The use of the knife is not necessary unless suppuration has unfortunately occurred.

* The Medical Union, July, 1873, p. 154.

When the extravasation supervenes on hydrocele, and the medicines mentioned for that affection prove unavailing, simple tapping is in the first instance to be employed. To inject then, however, would be productive of evil rather than good result. The fluid is allowed to collect again, and tapping is repeated, and when, after several withdrawals, the fluid is found once more to be of the same character as in simple hydrocele, then injection may be resorted to with safety, and with much probability of success—provided the testicle be sound. In confirmed cases, however, and more especially when suppuration is already threatened, the only means of obtaining a radical cure, is by free incision; laying the cavity fully open, turning out the coagula, and obtaining closure of the wound by granulation; care being taken during the performance of the operation, to avoid wounding the testicle.

Varicocele.—*Varicocele, circocele,* or *spermatocele,* express a varicose condition of the veins of the scrotum or spermatic cord. Usually the latter is affected. It commonly commences close to the testis, and extends upwards towards the abdominal ring. It is caused by obstruction to the return of blood, the dependent nature of the part predisposing to the affection. Laborious and constant exercise in the upright position, constipation, corpulence, the wearing of tight belts or trusses, tumors, or whatever affects the upward flow of blood, give rise to the disease. It is much more frequently observed on the left than on the right side, in consequence of the spermatic vein of that side having a longer and more tortuous course, and consequently having to support a greater column of blood than that of the right, and by its being much more liable to compression, by accumulation of fecal matter in the sigmoid flexure of the colon. The affection is chiefly met with amongst young, vigorous, unmarried men, who have led exemplary lives. The whole of the cord appears to consist of knotty and tortuous veins, which feel like a bundle or congeries of earthworms twisted upon each other; it is sensitive to the touch, creates a feeling of weight in the scrotum and loins, and often a degree of numbness in the thighs. It may be distinguished from hernia in the following manner: After the patient has been placed in a recumbent posture, and the swelling reduced by compression of the scrotum, the fingers are then pressed on the upper part of the abdominal ring, and the patient is directed to rise; if it be circocele, the swelling will reappear in increased size, from the obstruction offered by the pressure to the return of blood; but if hernia be present, the recurrence of the tumor cannot take place so long as the pressure is continued.

Treatment.—The radical cure of this affection by means of homœopathic medicines is attended with much difficulty, and in many instances palliative relief is all that can be obtained. Pulsatilla and hamamelis are the most useful medicines; the treatment may be commenced with puls., and the testes should be supported by means of a suspensory bandage, or bag truss, made of silk network. When the affection has been occasioned by a blow, or other external injury, or by pressure from the pad of a truss, arnica should be applied in the form of a lotion. As a constant application, hamamelis, one part of the tincture to three of water, is excellent as a palliative means, while the same medicine administered internally has relieved the pain and dragging of the cord. Nux vom. is suitable when constipation exists, and puls. is found inadequate; sulphur will sometimes prove useful after nux; and arsenic and carbo veg. may be selected when burning pains are experienced in the tumor; graph., lyc., and sepia may also be found useful in some cases. But when the symptoms do not yield to these medicines, and the tumor is large and painful, and there is danger of the testicle becoming atrophied in consequence of the pressure, the varicose veins should

be obliterated. Several processes have been adopted (none of them, however, being free from danger) for this purpose.

It must be recollected that the cord is composed of the spermatic arteries, which arise directly from the aorta; of the veins, which constitute the pampiniform plexus, coming from the back of the testes; and of the vas deferens, which is the excretory duct of the testicle and a continuation of the epididymis. Now the obliteration by pressure, suture, injection or otherwise, of either the artery or the excretory duct, is equivalent to castration, and therefore—setting aside the danger of phlebitis, which is of itself a disease of the greatest danger and liable to occur in any operation of the kind—the operation is one which requires, not only a very correct knowledge of the anatomy of the parts, but very delicate manipulation.

It was the elder Delpech, who had attained an enviable position among the first surgeons of the world, who performed the operation upon both sides, and unfortunately included in the ligature the spermatic arteries; atrophy of the testicles occurred; the mind of the patient brooded over the terrible mishap, and his brain, crazed with sorrow and mortification, thirsted for revenge. He waylaid Delpech, who, unconscious of wrong and unmindful of danger, was pursuing his usual course of duty, and rushing upon him as he left his carriage, stabbed him to the heart.

There are very many methods of treating this disease.

1st. By *Compression*. Breschet's method consisted of applying to the enlarged veins two iron clamps, the jaws of which were tightened with thumbscrews. Curling uses a peculiar variety of truss.

2d. By *Suture*, as employed by Velpeau, and others.

3d. By *Ligature*, as recommended by Reynaud of Turin, Gagnebe, Ricord, and many others.

4th. By *Rolling up the veins of the spermatic cord*, as performed by Vidal.

Dr. Packard, of Philadelphia, employs a double wire loop (Fig. 480).

Dr. Gross formerly passed a needle behind the veins, and then applied a figure-of-eight suture (Fig. 481), but states, that after very unexpectedly losing one of his patients with phlebitis, he has since resorted to the subcutaneous ligation of the veins.

Fig. 480.

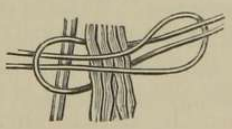
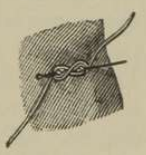


Fig. 481.



The simplest, and to my mind the best method, may be described in the following case:

Mr. D—— consulted me for varicocele of some years' standing, which gave him very great uneasiness of body and distress of mind. He had been operated upon some years since by a distinguished surgeon of Boston, and for a time the disease had been cured; but it again manifested itself with increased severity and with all its accompanying symptoms. After a careful examination, he was informed that nothing but an operation would cure him, to which, after some deliberation, he finally concluded to submit. The patient was desired to rise early in the morning, to take a light breakfast, to leave off the suspensory bandage, which he had been accustomed to wear, and to use as much exercise as possible. By such means the veins were much enlarged at the hour appointed for operation. He was then seated upon the edge of a chair, and with the forefinger and thumb of my left hand, the palmar surface being *toward the anterior part of the scrotum*, the vas deferens and the spermatic artery were searched for. Those accustomed to anatomical manipulations in the dissecting-room are aware that the vas deferens comes up behind, and may be distinguished from the sur-

rounding structures by its *fibrous feel*, or somewhat cartilaginous hardness. So soon as the duct was found, the ball of the index finger of the hand aforesaid was pressed between it and the veins, thereby making it lay against the nail or posterior surface of the finger, by which it was readily pressed against the pubic bones; the artery was readily felt by its pulsation and held aside with the thumb, thereby having nothing between the finger and thumb of the left hand but the bundle of veins. This is a very important step in the operation, and should never be hurried. The patient then was placed under the anæsthetic agent, while I held the veins as already mentioned. It is also better to resort to this method of deferring the administration of chloroform, because the patient can very materially assist the surgeon by describing the sensations which are experienced when pressure is made upon the excretory duct of the testicle. Taking then a strong hempen cord, and doubling it, the loop was passed through the eye of a large needle similar to that used by sailmakers, which was then with the right hand introduced in front of the thumb of the left hand, and made to pass behind the veins and to emerge *in front* of the index finger, which held *behind* it the vas deferens. The ligature was then drawn through and the needle removed, which was again inserted in the same opening, but this time directed in front of the veins and directly behind the skin of the scrotum. The point was then brought out at the same opening from which the loop projected. By this means the double ligature was behind the veins, and the needle in front of them, where it was allowed to remain. The loop was then brought over the point of the needle, and by making traction on the ends of the ligature at the point of entrance, and tying them firmly over the shank of the needle, and then again over a piece of cork, the veins were thoroughly compressed. To prevent any irritation resulting from the point of the needle, it was also covered with a small cork. On the fifth day the knot was tightened, and on the eleventh day the whole removed, the operation being perfectly successful.

This method is the safest that can be possibly employed. In the first place, but two punctures are made in the scrotum; in the second place, should any of the important structures before mentioned, by accident, become entangled in the ligature, by withdrawing the needle the whole apparatus is removed. This is the method recommended and employed by Dr. Pancoast, of Philadelphia, with great success, and from its simplicity and safeness, should always be borne in mind by the surgeon about to operate for varicocele. Lately I have employed a needle set in a handle with the eye in its point. By this means a single loop of cord may be drawn through instead of a double loop.

The *injection of the persulphate of iron* has also been employed with success in this disease. The solution should be weak and very small in quantity. It may consist of from two to five drops of the following solution:

℞. Ferri persulph. (liquor), ... gtt. x.
Aquæ font., ... gtt. xxx.

The superficial veins are the first to be injected, and afterwards the deeper seated ones are to be treated in the same manner. A clot appears after the injection, which ulcerates out and obliterates the veins.

In double varicocele, by operating on one side, sometimes the disease disappears. I recorded a case of this kind in the *Western Homœopathic Observer*, for February, 1870. The patient resided in Brooklyn, and was under the care of Dr. P. P. Wells. The cure was complete.

Dr. Clark's Method.—In a *Report on the Progress of Surgery*, made to the St. Louis Medical Society, and afterwards published in pamphlet, Dr. Clark thus describes his operation: "It consists in excising a portion of the redundant scrotum, by taking up a fold of it between the blades of a forceps, or with Ricord's fenestrated forceps for phimosis, and thus exposing the cord with its vessels, so that they can be manipulated separately, and the veins be distinguished from both the artery and the vas deferens. This part of the operation was originally proposed some years since by Sir Astley Cooper, who, after excising a portion of the scrotum, brought the wound together by sutures, relying upon this procedure to effect a cure. I, however, after a fold of the scrotum has been removed, and the vessels of the cord exposed, so that the vas deferens can be isolated, pass a needle around with a wire ligature beneath the cord, excluding the vas deferens and including all the other contents of the cord. The needle is then disarmed, removed, and the two ends of the wire passed through a small tube about two inches in length, and wound over a cylinder fixed at the other end of the tube, so as to grasp the vessels as the écraseur does, and compress them sufficiently to arrest their circulation, and induce their complete obliteration.

"After the lapse of thirty-six or forty-eight hours, the 'écraseur' is removed and the wound closed by the ordinary interrupted suture or needles, the former being preferable. The operation is comparatively devoid of all danger, as any excessive inflammatory action may be controlled at once, by cutting the wire and withdrawing the écraseur."

Carcinoma of the Scrotum.—This disease is, in the generality of instances, of the epithelial variety, and is very formidable in its nature. It is called also *chimney-sweepers' cancer*. It is not very common, but is intractable in its nature. A small excrescence forms at the base of the scrotum, which soon degenerates into a malignant ulcer, which extends rapidly, consuming the neighboring integument, and involving the testicle and other subjacent parts. The induration often extends along the spermatic cord, and the lymphatics participate in the diseased action at an early period. The discharge from the sore is acrid, sanious, and possessed of much fetor; sometimes fungi protrude, but more commonly the surface is excavated and smooth. Not unfrequently the skin surrounding the ulcer is studded, to a considerable extent, with numerous clusters of warts of an unhealthy and angry aspect. The general health is soon undermined, and the disease advances from bad to worse, with the usual certainty and rapidity of malignant action.

"Other people besides chimney-sweepers," says Pott, "have cancers of the same part; and so have others, besides lead-workers, the Poictou colic and the consequent paralysis; but it is, nevertheless, a disease to which they are peculiarly liable, and so are chimney-sweepers to the cancer of the scrotum and testicles."

It cannot always be determined why a cancerous growth should arise in one locality rather than in another, but there appears to be conclusive evidence that the habitual handling of certain substances and direct violence are much concerned in the development of cancer in particular regions. Mr. Lawrence once operated on a chimney-sweeper, who presented cancerous formation anterior to the concha of the left ear. This patient appeared especially obnoxious to the action of soot, for previously a genuine chimney-sweepers' cancer had been removed from the scrotum; but it is probable that when the disease reappeared on the ear it was caused by the same substance, for the patient was in the habit, whilst engaged in his trade, to carry bags of soot on his left shoulder, and it is very likely that

the ear on that side was often covered with the substance; thus the growth of the tumor may be accounted for.*

Treatment.—*Arsenicum* appears to be very serviceable in the treatment of this affection, when there is inflammation and swelling of the scrotum, and the ulcer is particularly painful in the morning, with burning in the circumference, and uneasiness when the part becomes cold; also when the ulcerative process rapidly consumes the adjoining structures, and the constitution of the patient is in a debilitated and impoverished condition. It would seem that this medicine, together with carbo veg., were especially indicated by the habits and mode of life of that class of persons who are liable to the affection. The latter medicine should be administered when the parts surrounding the ulcer are bluish or purple, or when there are pressure and tension round the sore, which emits a corrosive humor.

Thuja may be prescribed in the commencement of the disease, when the warty formation presents itself, and when the surrounding integument appears indurated; also when there is itching and stinging in the tumor.

Secale should not be overlooked when the parts assume a blackish hue, become dry, or, in fact, when gangrene threatens.

China may also be suitable if the swelling be large and the gangrene humid.

Rhus tox. may be useful when the ulcer spreads rapidly, and the skin of the scrotum appears thickened, or becomes thicker and harder, with itching; or when there is tingling and smarting in the sore.

Clem. erect., hell., iod., mur. ac., merc. corr. sub., may also prove serviceable in this affection.

If, however, the disease appear to be spreading, *complete excision* should be practiced. In this operation every bleeding orifice should be secured with fine ligatures, or secondary hæmorrhage will be likely to result.

Elephantiasis Scroti.—The student, for a description and cut of this formidable disease, is referred to pages 331 and 332. In that chapter, also, will be found a reference to the hydrocotyle asiatica in the treatment.

In *Hamilton's Surgery*, p. 884, will also be found a most interesting account of Dr. Thebaud's case—that of Isaac Newton—as seen in Fig. 111 of this volume. During the operation "nearly one hundred vessels, most of which were large and open-mouthed veins, were tied. His recovery was rapid and complete."

In describing this operation, which I have never performed myself, and which is rather rare, I have been guided by the rules of Dr. Allen Webb, a Calcutta surgeon.

Amputation of the Scrotum.—Before the surgeon begins this operation, he will by examination ascertain: 1st. If there be hernia (best recognized by percussion if the tumor be large); 2d. If the glans penis be drawn near the external opening; 3d. If there have been abscesses in the perinæum, dragging down the fascia; 4th. Whether or not hydrocele exists; 5th. The situation of the testicles; 6th. The consistence of the tumor and skin; 7th. If the patient is completely under the influence of the anæsthetic. While the operator is being satisfied on these points, the assistants, of whom there should be at least six, arrange the instruments, prepare the patient, and take their respective positions as follows: The first assistant provides the instruments for immediate use: bistouri-caché, double-edged catling, guarded with a nodule of wax, one small Liston knife, and one long knife of same pattern, a strong-handled scalpel, six forceps, six tenacula, many sponges, ligatures, chloroform, brandy and ammonia, bandages and split cloth, tow and lint; also, a hospital cot, folded blanket, oilcloth, and pans of sand

* London Lancet, November, 1850, p. 488.

and water. Having placed the patient on the cot or table, he administers the anæsthetic, at the same time sees that the pubis is shaved. The second and third assistants separate the patient's legs, and, having extended them, place them upon stools on a level with the trunk, which lies with the nates projecting over the edge of the table. The business of the fourth assistant will be to support the tumor, moving it as required, and managing it throughout the operation; he stands at the right of patient. If the tumor is large, two assistants may support it on a cloth placed beneath.

The fifth and sixth assistants, standing at the patient's hips, keep the sponges wrung out for immediate compression. The surgeon should be assured that each assistant is in his place, and fully competent to perform the part allotted to him, and that all the instruments are ready at his hand; he now seats himself on a low chair between the patient's legs, and directs the fourth assistant to raise and reverse the tumor that it may be drained; he then endeavors to feel with the left index finger, the reflexion of the prepuce from the penis; if found, the tumor is depressed at the same time that the knife (guarded by wax at the end), aided by the weight of the tumor, is thrust through the point of reflexion till it cuts itself out, and the penis is fairly exposed up to its root on its dorsum. The fifth assistant now, keeping apart the edges of the incision, clears it with a sponge, and then grasps the penis firmly, raises it from the attachments and preserves the urethra from the knife. The surgeon then severs the frænum and attachments of the under surface of the penis already drawn up. The fourth assistant now raises the tumor, rendering the integument lax, so that the operator may pinch it up over the right spermatic cord, and, by thrusting the knife under the raised skin, cuts it through horizontally on a line with the root of the penis.

The surgeon follows this by another incision bold and deep from top to bottom of the tumor in the course of the cord—going less deep if any portion of the cord appear—as far as the testicle. If hydrocele exists, it will probably be opened and reveal the testicle at the back part of the sac. The fifth assistant instantly thrusts both thumbs into the incision, grasps the mass and compresses the vessels. Using his knuckles as a fulcrum, he turns out the bottom of the incision, revealing the attachment of the testicle and presenting it to the action of the knife. He lifts the testicle with a firm grasp up to the abdomen, and holding it there by the left hand, thrusts a sponge into the cavity with his right, compressing the vessels at the neck of the tumor. The testicle and cord being lifted they are rapidly dissected upwards toward the abdominal ring. The surgeon next proceeds with the left side, by pinching up the skin and cutting it through as with the right testicle. He cleaves the tumor by a firm and deep incision from top to bottom as before, and exposes the left testicle. If a large hydrocele presents, it is opened, and the testicle and cord are dissected from the mass, carrying them upward. The sixth assistant immediately thrusts in both thumbs and turns out the testicle, with his fingers placed behind the tumor; lifts the testicle, carries it up to the abdomen, and holds it there with his left hand, while with the right he presses a sponge on the vessels at the neck of the tumor. The fourth assistant now draws the tumor toward the operator, rendering it tense like an apron spread out if it is small, or if very large, supporting it upon his arm. Taking care that the penis and testes are well drawn up out of harm's way, the surgeon with a long catling divides the remaining attachments of the tumor close to the perineal fascia.

The assistants now proceed to draw out and ligate all vessels of any importance, keeping them compressed with sponges, and exposing but one at

a time. They will also raise the patient's legs at right angles to the trunk, and administer restoratives if necessary. At the same time the operator examines the testes, castrates, if they are diseased, cuts away portions of the hydrocelic sac if it be abundant, and removes any diseased blubber which may remain.

As soon as these details have been properly attended to, the dressing of the wound will be accomplished by the first assistant securing a T bandage around the abdomen, and bringing the split-tails of it between the legs. At the same time the operator fixes each testicle at the root of the penis where he intends them to adhere, until the bandage is brought up by which they are secured, while the assistant applies strips of oiled lint over the wound, and over that some teased tow, to support the testicles and prevent them from slipping down from the fingers of the operator. Over this are brought the tails of the bandage, which cross under the penis, and are carried on either side and secured to the horizontal band. A water-dressing will be found serviceable, and the surgeon, having ordered the patient to be carefully watched in case of supervening hæmorrhage, can now leave the wound until the discharge renders dressing necessary.

Dr. D. W. Osgood, surgeon to the Medical Missionary Hospital, Foochow, China, in a communication to the *New York Medical Record*,* after remarking that about three-fourths of the patients treated at Foochow had the disease located in the legs, and the remainder in the scrotum, gives a description of his method of operating. This consisted: 1st. In the elevation of the scrotum for an hour or more before the operation. 2d. The use of Fayrer's tourniquet, which was of prime importance in the suppression of hæmorrhage. 3d. Dissecting up lateral flaps, which should not include any of the diseased skin. 4th. Dissecting out the penis and testicles. 5th. Holding the genitals well out of the way, and removing the scrotum with a few well-directed strokes of the scalpel. 6th. Arresting the hæmorrhage by pressing upon the wound and by ligating or twisting the arteries. When hydrocele existed, the sac was opened with a free incision. In some cases the spermatic cords were much elongated, but they retracted soon after the operation, and in a few days the testicles were drawn up close to the inguinal ring. The parts were usually covered with granulations in two or three weeks, after which time skin-grafting was advantageously resorted to. The writer appends a table of fifty cases of elephantiasis scroti, operated upon in Southern China, all of which recovered. Thirty-three of these were known to have had ague; about one-half had hydrocele, which was frequently connected with atrophy of the testicle. The average age of the patients was 38 years, and the average duration of the disease eight years and a half.

Phimosis.—Phimosis signifies a preternatural constriction of the edge of the prepuce in front of the orifice of the urethra. The prepuce occupies its natural relative situation, but great difficulty is experienced in uncovering the glans, and frequently this is impossible.

There are two varieties of this affection, the *natural* or *congenital* and the *preternatural* or *acquired*. The former exists at birth; but the latter may occur at any period of life, and is most frequently the result of an acute inflammatory process following external injury; or of the cicatrization of an ulcer or wound; or is sympathetic with gonorrhœa, balanitis, or venereal sore.

Congenital phimosis is by no means an uncommon affection, and will be met with in two or three varieties. Sometimes, though rarely, the prepuce

* April 8th, 1876.

is imperforate, and consequently the urine, not being emitted, collects between the glans and prepuce, forming a large bag or tumor.

Another variety is that in which an opening exists at the extremity of the prepuce, which, however, is not sufficiently large to allow the urine to escape with the same rapidity, as it issues from the urethra; consequently it collects under the prepuce, and distending the latter to a great size, is then forced off gradually in a fine stream and to a great distance. If the disease continues in this state for several years, pus, and even calculi, may collect within the cavity of the distended prepuce, keeping up a constant irritation.

In the majority of instances, however, there is no impediment to the flow of urine, and no extraordinary elongation of the prepuce, yet it is so closely contracted at its orifice as to prevent the exposure of the glans. This gives rise to many inconveniences. A whitish, sebaceous matter collects in large quantity between the glans and prepuce, exciting great irritation; and inflammation sometimes ensuing, adhesion takes place between the glans and prepuce, only to be relieved by painful dissection.

In after-life the preputial contraction may have the same effect as a tight stricture of the urethra; causing, first, irritability of the genito-urinary system, afterwards organic change, stricture of the urethra, alteration of the coats of the bladder, dilatation of the urethra, and finally renal disease. Should the patient, at an advanced age, have escaped these dangers, ulceration is apt to take place at the contracted part; or a cancerous condition may ensue, which, involving the glans and body of the penis, demands amputation; for in nine cases out of twelve in which Mr. Hey* had occasion to amputate the penis for cancerous disease, the patients were affected with natural phimosis. It is expedient, therefore, on many accounts, to remove this source of evil as early as possible.

Preternatural or acquired phimosis may be either acute or chronic. In the acute variety the areolar tissue becomes infiltrated with serum; the swelling thus caused prevents the glans from being uncovered in the usual way, and secretion accumulating, aggravates the disorder. The chronic form may result from gradual increase of original malformation, or, as before stated, may be occasioned by the cicatrization of a wound or ulcer.

The constitutional symptoms which are developed by this peculiar disorder are numerous and are often overlooked. They are all affections of the nervous system, and vary in intensity from ordinary sleeplessness and nervous jactitations, to complete incoördination of movements and loss of equilibrating power. Sometimes the affections simulate hip disease, sometimes locomotor ataxia is present. I insert here a typical and interesting case as exhibiting to what degree these symptoms may be present. The case is reported by E. P. Hurd, M.D.,† and was cured in a short time by circumcision. It was that "of a bright lad of seven years, who for several months before coming under observation had been losing strength, appetite, and flesh, and was restless and 'nervous,' and took but little notice of anything. Locomotor ataxia was a marked symptom: cannot coördinate his members in any act; could not walk across the room without staggering and pitching headlong. The same want of coördination was manifested when he attempted to feed himself; he made bad work of it, and was soon forced to give it up. It seemed impossible for the will to guide the hand to the mouth. Intellect not disturbed, only the hebetude before mentioned was marked. Responded to questions in monosyllables,

* Practical Observations in Surgery.

† Boston Medical and Surgical Journal, January 18th, 1877.

and speech was not very distinct. Pupils widely dilated; at times an outward and slightly upward squint of both eyeballs, from paresis, as was supposed, of the third pair of nerves. Marked dulness of hearing. No febrile heat; pulse normal. No pains complained of. Could not elicit from him whether he experienced any abnormal sensations on attempting to put his feet on the floor, or whether the tactile or muscular sense was perverted. Hyperæsthesia of general surface. Shortly after coming under treatment he had a severe fit of epileptiform type. There was no constipation or difficulty of micturition.

"For upwards of a week he was treated with nervous sedatives with a view to quiet the excessive nervous irritability manifested during the night, with only partial benefit, as his general condition did not improve. One day, at an early morning visit, the patient lay naked in his mother's arms, when a glance revealed phimosis, the prepuce was greatly elongated, strangulating the glans, and the urinary punctum was minute. Circumcision was performed, and from that time steady improvement set in," and complete recovery soon followed. Dr. John Thompson, of Albany,* records a case of epileptiform convulsions produced by phimosis, and I have frequently relieved intense nervousness, jactitations, and vomiting by circumcision.

Treatment.—In the acute variety of acquired phimosis, the difficulty may be relieved by well-directed homœopathic treatment, thus obviating the necessity of an operation.

The remedies most appropriate for this affection are as follows: Acon., arn., bell., bry., calc., camph., cann., canth., caps., cinnab., hepar, merc., rhus t., thuja, sepia, sulph., and viola tric.

When the inflammation has been produced by constant friction, or any other mechanical cause, arnica should be employed both internally and in the form of a lotion. If, however, the inflammatory action should be very violent, a dose or two of aconite is advisable, to be followed by arn. If no beneficial effect appears to result from the use of the latter remedy, calend., rhus or puls., may be administered. When the disease has been caused by uncleanliness, aconite should be employed, if there is a high degree of inflammatory action, together with frequent ablutions. When the affection is accompanied with suppuration, merc., caps., or hepar, may effect a cure; and when induration of the affected part, and surrounding integument supervenes, sepia and sulphur are the most appropriate medicines. When gangrene threatens, or when it has actually commenced, particularly if the disease is associated with gonorrhœa, ars. is highly recommended.† When young children are the subject of this affection, acon., merc., calc., and sulph. are most suitable. When this difficulty arises from syphilitic causes, the homœopathic remedies with which it should be treated are, merc. sol., rhus t., thuja, cinnab., sulph., and viola tric. Balanorrhœa generally accompanies this variety of phimosis; indeed, some authors state this to be always the case; and when the above-mentioned remedies are insufficient to effect a cure, it may be necessary to make slight incisions into the prepuce, for the purpose of allowing the secreted pus to escape.‡

The congenital and chronic variety of acquired phimosis, however, *can seldom be relieved without recourse being had to an operation;* which may be performed by several different methods.

When natural phimosis existing at birth is complete, an immediate

* New York Medical Journal, July, 1875.

† For an interesting account of several cases of this nature, effectually treated by arsenicum, *vide* British Journal of Homœopathy, vol. iv, p. 265.

‡ Gollmann's Diseases of Urinary and Sexual Organs, p. 64.

operation is required to save the patient's life; generally puncture with an ordinary lancet in the most prominent portion of the tumor, will be sufficient, as the stream of urine will afterwards prevent the closure of the wound.

When the orifice of the prepuce is not entirely closed, but merely contracted, a simple and very suitable method of operating is that recommended by Mr. Liston;* which consists in passing a grooved director, open at the end and well oiled, under the prepuce, alongside of the frænum, taking care that it is not passed into the urethra. A sharp-pointed knife is passed along the groove, and emerges at its extremity; then with one sweep the prepuce is divided. If the edge of the prepuce is thickened, it should be seized between the blades of the forceps, and be shaved off. Several fine sutures will now be necessary to prevent the separation of the integument and mucous membrane, in order that they may unite by adhesion.

In phimosis the stricture is caused by contraction and rigidity of the internal membrane of the prepuce, the external portion consisting of cellular tissue and skin, remaining generally sufficiently loose and yielding. Hence the constriction may be relieved by dividing merely the internal lamina. This operation may be effected, in cases in which the phimosis is not very complete and rigid, by drawing back the external portion of the prepuce as far as practicable, until the tense ring of the inner prepuce, which forms the stricture, is exposed, and then dividing the latter with a bistoury or pair of scissors, at one or more points, sufficiently to permit of the free motion of the prepuce over the glans.†

Another very neat operation is that of Cullerier. It is applicable to those cases of phimosis, in which the integuments appear to be not much condensed or indurated, but in which the stricture is due chiefly to the more unyielding mucous membrane. The instrument employed is a pair of small straight scissors, of which one of the blades is terminated by a little button, like a probe-pointed bistoury. This blade is passed between the glans and prepuce, while the sharp-pointed blade is thrust into the substance of the prepuce, being separated from the other blade by the mucous membrane; the latter is then divided a sufficient length to allow the prepuce to be drawn back.‡ This operation has frequently been performed by Dr. Peace, of Philadelphia.§

The operation which I have performed most frequently is as follows: Make the first incision as that directed by Mr. Liston, and then with the scissors trim the mucous membrane and integument neatly around to the frænum præputii, then unite the mucous and integumentary surfaces; or, having drawn the integument well forward with a pair of "bull-dog" forceps, it is given in charge of an assistant. Then, with a pair of narrow-bladed forceps, held at right angles with the first, the prepuce is grasped transversely. With a single sweep of the knife or scissors all the part anterior to the forceps held transversely is divided; both pairs of forceps are then removed, and it will be found that scarcely any of the mucous surface has been cut through; this must be lifted up with the forceps and trimmed with the scissors, after which the sutures are applied as before.

Some surgeons prefer introducing the stitches first, and forceps with fenestrated blades (Vidal's) have been invented for that purpose. The prepuce

* Elements of Surgery, p. 410. † South's Chelius, vol. ii.
‡ Miller's Practice of Surgery, p. 587.
§ For an interesting article on the Operation of Phimosis, *vide* Med. Chir. Rev., April, 1851, p. 445.

is drawn out, the fenestrated blades, held perpendicularly to the penis, grasp the prepuce (Fig. 482), the ligatures are then passed through the openings in the blades, two being sufficient; the prepuce is then removed, and through the preputial orifice the threads are drawn forward and cut, thus making four ligatures, which, being tied, unite the mucous and integumentary surfaces (Fig. 483).

FIG. 482.

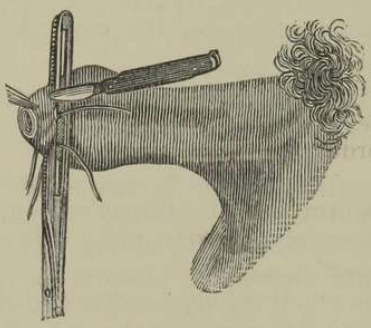
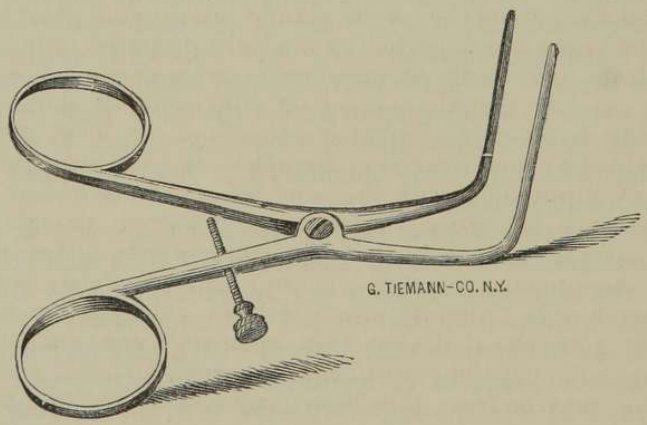


FIG. 483.

Dr. Hutchinson, of the Brooklyn City Hospital, has devised a pair of forceps "for rupturing the mucous membrane in accidental phimosis." (Fig. 484.) The doctor says: "The operation consists in introducing the blades

FIG. 484.



of the forceps closed, through the preputial opening and along the dorsum of the glans penis as far as the corona. They are then suddenly expanded, and withdrawn fully dilated. The prepuce can at once be retracted behind the corona glandis, when it will be found that the mucous membrane has been split at the seat of stricture, the skin being uninjured unless the phimosis has been produced by a cicatrix at the preputial orifice, which existed in one of my cases, and was ruptured. The patient is now directed to retract the prepuce behind the glans several times a day, especially during micturition, both in order to prevent the contact of urine with the wound, and also the too rapid union of the ruptured edges, which would reproduce the disease. The patient should be cautioned not to leave the

foreskin retracted behind the glans, for swelling might occur to such a degree as to cause paraphimosis. This indeed happened in one case at the Brooklyn City Hospital, which was operated upon by house surgeon H. T. Pierce. The prepuce was drawn forward by the usual manipulations, aided by ether spray thrown upon the glans by Richardson's atomizer, to diminish the size of the organ. This operation should not be practiced when chancroids are present, for fear of inoculation, nor until sufficient time has elapsed for the phimosis to disappear spontaneously.

"The above operation has now been repeated nine times by myself and house surgeon H. T. Pierce with the most satisfactory results. It will be found, I think, to possess the following advantages over the methods of treatment ordinarily practiced:

"1st. It is preferable to circumcision, or slitting up the prepuce, because it is simpler, is done more quickly, and there is no hæmorrhage requiring the use of hæmostatic agents. But when the prepuce is much diseased, circumcision should be preferred.

"2d. It is better than simple dilatation by means of Thompson's urethral dilator, as suggested by Mr. Erichsen, because the contraction is less likely to recur after rupture than after dilatation.

"3d. It is preferable to simple division of the mucous layer of the prepuce, which is done by thrusting one blade of a sharp pair of scissors between the layers of the prepuce, while the other is carried along the dorsum of the glans penis, so as to divide the mucous membrane to the corona glandis, because there is less danger of a reproduction of the disease after a rupture than after an incised wound."

The above operation I have not used, and though it is condemned by some surgeons, yet it appears to me both practicable and proper; to my mind sufficiently so, to warrant a trial of it on my next patient.

Paraphimosis.—Paraphimosis is the reverse of phimosis—the prepuce becoming retracted behind the corona glandis, leaving the glans uncovered; the body of the organ is constricted by the tight preputial orifice, and gives rise to unpleasant and sometimes dangerous consequences. The superficial areolar tissue becomes greatly swollen on either side of the stricture, the glans also being involved in the tumefaction, and an acute inflammatory process is established under adverse circumstances, the strangulated parts being obviously ill-provided with the power of resistance or control.

The disease may be either congenital or acquired, though the latter variety is by far the most common, It may be the result of a successful retraction of the prepuce, when the patient had previously been affected with phimosis; but it generally proceeds from inflammation, induced by a syphilitic or gonorrhœal disease. In some instances the swelling and constriction are so great, that mortification ensues, and the glans, or even the whole penis, may be lost; this, however, must be considered a comparatively rare termination. In neglected cases ulceration of the body of the penis may take place, perforating the urethra, and producing urinary fistula.

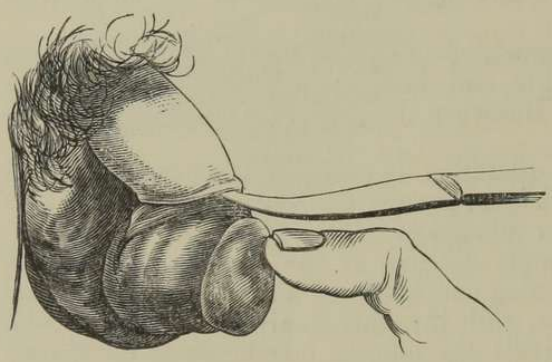
Treatment.—In recent cases, before the swelling has attained any considerable size, reduction is generally practicable. The patient having been placed in a suitable position, and the parts well oiled, the surgeon grasps the glans with the fingers of the right hand, and makes steady pressure thereon, at the same time pushing it steadily from him; then, with the fingers of the left hand, he draws forward the constricting portion—the object being to push the glans, when diminished by pressure, through the narrow preputial orifice. If it should fail, and there is still no marked urgency, the penis should be placed in an erect position, and a stream of cold water

poured on the glans for some time. This may have a happy effect in diminishing the bulk of the formerly turgid part, and it may be replaced within the prepuce without much difficulty.

For many of the symptoms connected with paraphimosis, aconite, cannabis, sabina, and mercurius are the most appropriate medicines; but should these, together with the above-mentioned means, fail, resort must be had to an operation, which may be performed by either of the following methods:

The tumefied parts are to be separated by the fingers, and the strictured band cut through with the sharp point of a knife, when the prepuce should immediately be drawn forward, so as to occupy its normal position; this operation is recommended by Mr. Hunter. That of Richter consists in raising a fold of the skin, and cutting through it; a director is then pushed beneath the stricture, and the latter is divided by a sharp bistoury. (Fig. 485.)

Fig. 485.



Method of making Incision in Paraphimosis.—Bryant.

Epithelioma of the Penis.—Cancer of the penis is generally of the epithelial, and very rarely of the encephaloid variety. The disease generally commences with the appearance of a small warty excrescence or pimple on the prepuce or glans. It almost always occurs in old persons, and may often be traced to the irritation consequent upon phimosis, commencing by ulceration at the preputial orifice, and from thence extending to the body of the penis. The glans becomes hardened and enlarged, ulcers of an irritable appearance penetrate it here and there, the lymphatics on the dorsum of the penis become swollen and indurated, the glands of the groin are generally involved, and the discharge from the sore is fetid and irritating. The disease follows the ordinary course of cancer, and, if not arrested, the patient dies—his end hastened probably by hæmorrhage from the ulcer.

Treatment.—The medicines which have been mentioned for cancer in other parts of the body, may be used in this case; in a great majority of instances, however, amputation is the only resort, and this unfortunately is not always successful, as the disease reappears in the stump, or exhibits itself in the inguinal glands.

Amputation of the Penis.—Ricord's method of amputating is a good one, being well calculated to obviate the difficulty generally attendant upon the operation—namely, tendency to contraction in the orifice of the urethra.

The procedure is conducted in the following manner:

The penis is put upon the stretch by the left hand, and removed with one cut, care being taken to leave integument sufficient to cover the corpora cavernosa; the surgeon then seizing the mucous membrane of the urethra by means of forceps, with a pair of scissors makes four slight incisions, so as to form four equal flaps; then using a fine needle armed with a silk ligature, he unites each flap of membrane to the skin by a suture. The wound heals by the first intention, adhesions form between the skin and mucous membrane (these textures becoming continuous), and the cicatrix, then contracting, tends to open the urethra. When micturition is difficult of accomplishment, in consequence of the shortness of the penis, the incon-

venience may be obviated by allowing the patient to urinate through a funnel-shaped canula of sufficient length, placed against the pubes.

During the operation fine ligatures are generally required. If the penis has to be amputated close to the body, a stout cord or wire may be passed through the base of the organ to draw it downward in cases of retraction and secondary hæmorrhage.

Many surgeons, however, at present use the écraseur, and thus prevent danger of hæmorrhage. The integument may first be divided to form a track for the chain of the instrument.

Spermatorrhœa.—The symptoms of this affection are well known. The disorder is easily recognized. It is a mistake, however, to suppose that because a young person, in all the vigor of manhood, has an occasional nocturnal emission that the above disease exists. It is, in fact, a question, whether certain emissions of semen without copulation are not necessary to the preservation of virility. This fact, it appears to me, is not sufficiently understood, and young persons having had an emission or two, become alarmed, apply to the physician and are " put through " a most disastrous surgical and medical treatment. The most cases of spermatorrhœa are occasioned by masturbation, and this habit must be controlled, by the will and proper medication, if the disease is to be cured.

The symptoms are emissions of semen ; first occasionally, and at night or towards morning, gradually increasing, until they recur with great frequency.

The patient does not feel the loss at first, but gradually, as the frequency of the pollutions increases, the system gives way, there is depression of the mental powers, ringing in the ears, loss of strength, emaciation, and great bodily disturbance, dyspepsia, constipation or diarrhœa, and flatulence, until finally the mind itself shows symptoms of decay.

Treatment.—Some years since I frequently made use of the instrument of Lallemand, and cauterized the seminal ducts repeatedly. I have been led to abandon the practice *in toto*. I have never yet known an instance of its curing, or even benefiting the patient, while I have known it to produce bad results from tampering with a sensitive urethra. I have also tried the perineal pad, perhaps with benefit.

With homœopathic medicine, and especially gelseminum, platina, agnus castus, and nux vom., together with cold sitz-baths, and proper exercise and ventilation, I have cured many cases. My friend Dr. Lilienthal, whose knowledge of the materia medica is known to all of us, has prepared for me the following indications for the treatment of masturbation and seminal losses. I may also in this place, caution the student not to expect any rapid cure ; it never, so far as my experience extends, takes place. Patient and persevering application of the means will accomplish the desired end in due season.

Kafka (*Hom. Therapie*, i, 942) remarks that nux vomica takes high rank in the treatment of onanism and pollutions. Its characteristics are : nervous erethism all over, and especially in the sexual sphere ; frequent pollutions, with lascivious dreams ; sleeplessness in the forepart of the night, and sleep with pollutions towards morning ; ejaculation of semen from the slightest cause without erection, and coldness and weakness of the lower extremities after it ; hypochondriasis, dyspepsia, and constipation.

After nux vom., calcarea will be frequently indicated, especially for pressing pains in the head, neck, and back, after the pollutions ; lassitude and weakness in the lower extremities ; the patients perspire easily from the slightest exertion, and the debility reaches such a degree that their hands tremble.

Sulphur is consecutive to calcarea. It has among its symptoms: impotence, coldness of the genitals, almost complete extinction of the sexual desire, involuntary emission of watery semen, discharge of prostatic juice after micturition and stool.

Mercur.—Burning pains down the back; pollutions without erections and without pleasurable sensations, or where the erections are painful and the semen mixed with blood; icy-cold hands after the pollutions; apathy and disinclination to all work.

Staphisagria.—Long-continuing erections before the pollutions; pollutions with lascivious dreams, and followed by excessive lassitude in the *upper extremities;* eyes sunken, or surrounded by blue rings; hypochondriasis and apathy.

Phosphorus and Phosphoric acid.—Excessive debility and lassitude in consequence of the frequent pollutions; paleness of the face; sunken eyes; heavy dragging gait; mind depressed; loss of appetite; *great erethismus* of the sexual organs; irresistible desire for an embrace; erections day and night; nocturnal emissions without dreams; discharge of prostatic fluid during hard stool.

Acidum sulphuricum has nearly the same range of symptoms, but the patient is already so exhausted that pollutions take place without erections and without sensation of pleasure.

Convalescents from severe diseases frequently suffer from repeated pollutions, which retard their return to health. China or chininum are then indicated, or *ferrum met.*, where anæmia prevails.

In my repertory I find furthermore indications for the following remedies:

Anacardium.—Sexual debility; *nervous prostration* following seminal emissions; weakness of memory and general temporary feebleness of brain-power; hypochondriasis; sullen mood; dread of labor; difficult digestion; weakness of stomach relieved by eating; but all the symptoms return two hours afterwards; frequent urging to stool without being able to accomplish anything; discharge of prostatic juice without the stool and after emission of urine.

Bufo.—Longs for solitude, to give himself up to his vice; quick ejaculation without pleasure, with spasms and painful uneasiness of the limbs; frequent nocturnal emissions, followed by debility; slow ejaculation, or entirely wanting; aversion to coitus; complete impotency.

Cobaltum.—Nocturnal emissions with lewd dreams; pollution waking him from sleep; emissions without erections during sleep, but with lewd dreams; impotence and emissions without erections.

Dioscorea.—Nocturnal emissions with erections and amorous dreams; nocturnal emissions without erections, sensations or dreams, but with great weakness of the knees; depression of spirits; pain in the lumbar and inguinal region extending to the testicles; desire to be alone.

Eryngium aquaticum.—Excessive erotic priapism; nightly emission with erection; semen also passing by day with the urine; great lassitude and depression; depression of the vital force; dull dragging pains in the lumbar region.

Gelseminum.—Pale face; sunken eyes; depression of spirits; heavy dragging gait; excitable sexual desire; nocturnal emissions and lewd dreams, followed the next day by great languor and irritability of mind; involuntary emission of semen without an erection; seminal weakness from irritability of the seminal vesicles; spermatorrhœa from relaxation and debility.

Graphites.—Seminal emission with flaccid penis; almost involuntary emission of semen during an embrace; pollution almost every night; costiveness from previous sexual abuse; emissions from debility of the organs; eruptions on the penis; weakness and pain in sacrum.

Iris versicolor.—Spermatorrhœa with pale face; sunken eyes; depression of spirits; heavy dragging gait; excitable sexual desire; nocturnal emissions with amorous dreams; confusion of mind with great mental depression.

Hamamelis virg.—Amorous dreams with emissions, followed by lassitude, gloomy depressing mood and dull pain in lumbar region; great prostration of the animal passions, with severe neuralgic pains in the testicles, suddenly changing to bowels and stomach, causing nausea and faintness; profuse cold sweat of the scrotum at night.

Kali brom.—Nocturnal emissions with amorous dreams and erections; excessive sexual desire with constant erections at night; diminution or total absence of sexual desire with impotence; profound melancholy and loss of memory.

Lycopodium.—*Mental, nervous, and bodily weakness;* exhausting pollutions, producing emaciation; feeble erections, or entire absence of erections; the penis being small, cold, and remaining relaxed; impotence, desponding, grieving mood, with extreme sensitiveness; weakness of memory; pale, wretched complexion; weakness of digestion.

Naja tripudians.—Gloomy headache, with spinal pains and palpitations from disorders of the sexual functions.

Natrum mur.—Feeling of weakness in the genital organs; sexual instinct dormant, with retarded emission during an embrace; frequent nocturnal emission in spite of frequent embraces; pollutions bring on coldness in the joints and weakness; emission of prostatic juice without erection when thinking of sexual things.

Nuphar lutea.—Complete absence of sexual desire; even voluptuous thoughts do not cause erections; impotency with involuntary sexual losses during sleep, at stool, and when urinating; spermatorrhœa with erections, but more frequently with complete absence of erections.

Selenium.—Seminal emissions with lascivious dreams which waken him; lumbar lameness and weakness; the semen thin and inodorous; weak and ill-humored after an embrace; nervous debility.

Sepia.—After an emission he feels lazy, faint, is sensitive to damp; turbid urine, vertigo, and constipation; feeble thrill during an embrace, with insufficient erection; nightly emission with dreams: a threatening pollution is suppressed by waking up; weak and watery emission; emissions after onanism; despondency; relaxation of body.

Thuja.—Extraordinary excitation or depression in the genital system; irresistible inclination to onanism, even during sleep; nocturnal emissions, which wake him; discharge of prostatic fluid in threads, early in the morning after waking; palpitations; partial debility of the extremities.

Ustilago maidis.—Sexual dreams at night without emission; painful loss of all sexual desire, with great relaxation of the scrotum, which is covered with cold perspiration; painful testicles; seminal emissions and irresistible tendency to masturbation; erotic fancies; great prostration; dull pains in the lumbar region, with great despondency and irritability of mind.

Zincum oxidatum.—Spermatorrhœa in hypochondriac patients, who annoy their physicians by their fears; their nervous system is shaken; they are restless, sleepless, and generally miserable.

CHAPTER XLII.

INJURIES AND DISEASES OF THE FEMALE GENITAL ORGANS.

It is not expected, in a work on General Surgery, that much space can be devoted to gynæcology; indeed, that department of medical science already covers so wide a field, that a series of volumes can scarcely contain all that is known concerning the varied diseases of the uterus and appendages.

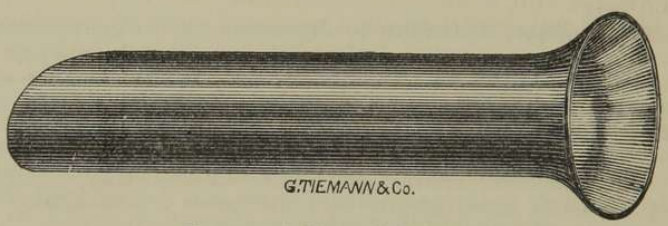
There are, however, some diseases and operations that fall within the province of every physician, and to these a brief allusion may be made. These are tumors of various kinds, including ovarian cysts and ovariotomy; cancer of the uterus, vaginismus, fistulæ, lacerated perinæum and atresia vaginæ.

Examination of the Uterus.—The position is a matter of some import in the examination of a patient, and may vary with the kinds of instruments to be employed, and the operations about to be performed.

If the examination by touch be made, the patient should recline on her back, with the hips somewhat elevated and the head resting on a single pillow. She should be close by the edge of the bed (the right side, if the surgeon is to use his right hand, and *vice versa*), and the sheet and coverlet

should fall sufficiently over the side of the couch to prevent any exposure of person, when the hand is introduced. If the patient is to be examined with her clothing on, a sheet or covering should be placed over the lower parts of the body. The knees should then be slightly raised, and the operator, sitting on a chair facing the patient, having lubricated the fore-finger of his right hand with oil, glycerin, or soap, raises the covering slightly with his left hand, and introduces the oiled finger into the vagina at the posterior fourchette. If the speculum is to be used, the patient should face the light; the thighs should be flexed on the abdomen, and the leg on the thighs, and the knees separated. A sheet should be thrown over the lower portion of the person, and each end of the linen wrapped around the legs, as the thighs are opened. By such a manœuvre carefully performed, there need be no exposure of the person. A great variety of specula have been and are now constantly being introduced to the profession. The old-fashioned one of Fergusson (Fig. 486) is in very many instances the best for optical purposes. It is made of glass, coated with india-rubber on the outside and lined with quicksilver. Most of the specula which are used for

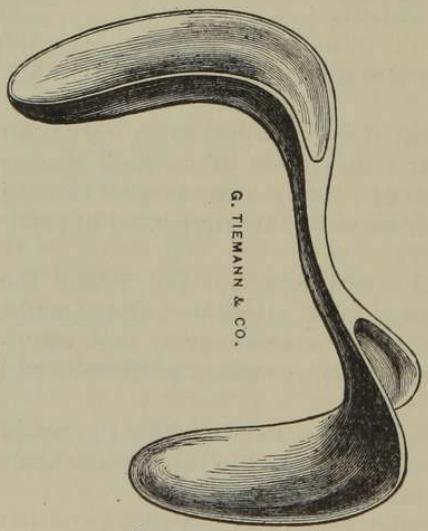
Fig. 486.



Fergusson's Mirror Speculum.

operations are more or less modifications of the instrument of Dr. Sims, and to him belongs the credit of the method of allowing atmospheric air to rush into the vagina and dilate the canal. In a brochure, *Silver Sutures in Surgery*, Dr. Sims details the accidental circumstances which led to his discovery. Fig. 487 shows the speculum, which now receives the name of the inventor. The position of the patient in the introduction of this instrument is very important. The patient must lie in a semiprone position. The right thigh must be flexed, so that the right knee will be above the left, and the left arm must be drawn well behind the patient, that the left side of the thorax will come closely in contact with the couch. When the speculum is introduced, it must be drawn up well to put the perinæum on the stretch; provided the anterior wall of the vagina is to be viewed, it may be drawn under the pubes, its position being reversed if the vagino-rectal septum is to be brought under observation. It will be seen that if any operation requiring both hands is to be performed, an assistant is always necessary in employing this instrument. To obviate this, many contriv-

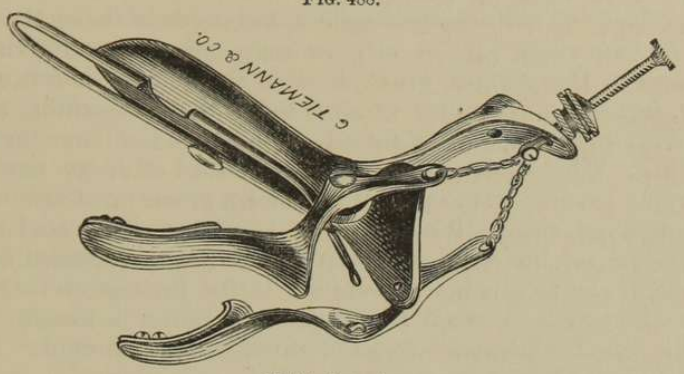
Fig. 487.



Sims's Speculum.

ances are employed. Fig. 488 represents Nott's speculum open. It is self-retaining, and has two short arms, which depress the anterior wall of the vagina.

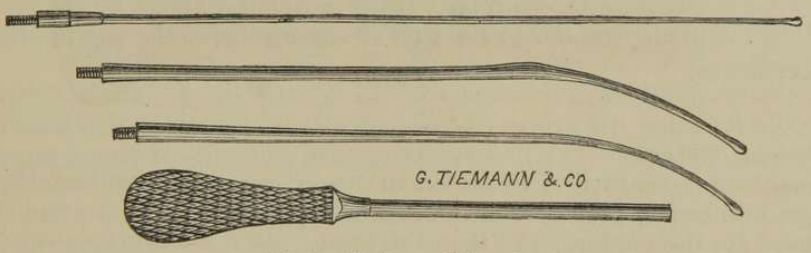
Fig. 488.



Nott's Speculum.

Uterine probes and sounds (Fig. 489) are also necessary in ascertaining the internal condition of the uterus.

Fig. 489.



Uterine Probes and Sounds.

Cancer of the Uterus.—The uterus is frequently the seat of cancer, but there are so many diseases to which the organ is liable, that the diagnosis is often extremely difficult. Venereal ulcerations, polypus, and even prolapsus, have been mistaken for carcinoma, and have been treated accordingly, the error not being discovered until the disease was too far advanced to admit of successful treatment of any kind. A minute examination and inquiry must, therefore, be instituted, and the microscope frequently employed in the examination of the discharges, before venturing to offer any decided opinion concerning the character or termination of the affection.

Hard Cancer of the Uterus.—In scirrhus, the cervix and mouth of the uterus become heavier than usual; there is, likewise, some inequality of surface; hardness and softness of structure may be detected by touching; and the organ appears situated lower down in the vagina than natural. There is pain during coitus, and the lancinations which are experienced in cancerous affections are often exceedingly severe. As ulceration progresses, pain is experienced when touching the part; ulcers appear with spongy bottoms and callous edges, and frequently fungi sprout from the surface of the wound. In most cases the vagina also participates in the disease, losing its natural rugosity and becoming much contracted; and, finally, as the disease advances the whole cavity of the matrix becomes filled with one mass of corruption. There is frequent and profuse menorrhagia, and metrorrhagia with ichorous and watery discharge.

Vegetating Epithelioma.—This affection is sometimes called "cancroid," but is believed to belong to the cancer family, differing chiefly from other forms in the depth of parenchymatous involvement. The name epithelioma was given to it in 1852, by Hannover.

The cauliflower or strawberry-shaped excrescence of the os tincæ is seated generally on one of its lips, or in some instances proceeds from the whole circumference. This fungus grows from a broad base, is soft, of a bright flesh-color, presents a granular or strawberry-shaped surface, and to the touch conveys somewhat the same sensation as that of the uterine surface of a placenta. This abnormal growth is formed of large papillæ with a central stroma covered with epithelium, which grows in nests. The ulceration is superficial, the walls and floor of which are infiltrated with round cells. This disease has been considered at its commencement merely as a local affection, and progresses slowly, the latter feature serving as one of the diagnostic marks between it and cancer. There is another variety of epithelioma, which ulcerates instead of propagating a fungus. To this the term *ulcerating epithelioma* is given.

Ulcerating Epithelioma is the so-called *phagedenic uterine ulcer;* this is not preceded by a carcinomatous condition of the parts, but by a pseudoplastic formation, or infiltration of the surrounding textures. The uterus around the ulcer may be almost in a normal condition, but in the generality of instances the sore is surrounded by a diseased mass, which is soft and yellow, or of a reddish-brown color. If the unhealthy action be not arrested, the destruction may extend to the wall of the uterus, to the vagina, rectum, and perinæum.

In the incipient stages of cancer of the uterus, the disease is frequently mistaken for some irregularity of the menstrual function; for leucorrhœa or chronic metritis. The first symptoms are generally those of menstrual derangement: cessation or too frequent return of the menses, irregular discharges of blood in place of the catamenia, together with fluor albus. The menses, after their cessation at the critical age, suddenly reappear, and even increase to a hæmorrhagic condition. At first, the patient complains of a sensation of heaviness, or drawing within the pelvis, and pressing towards the external organs, these symptoms being aggravated or excited by various circumstances, such as lifting, fatigue, etc. Upon examination, the vaginal portion of the uterus is found to be preternaturally indurated, bleeding readily, of an irregular consistence, swollen, mis-shaped, tuberculous, and sensitive to pressure; the lips of the os uteri are interstitially distended, indented, and elevated, whilst the orifice is more distended than usual. In the course of the disease the pains become excessively violent, particularly at night, pressing, stitching, shooting, and burning, not only in the pelvis, but extending into the lumbar region and along the thighs, with swelling and tension of the inguinal glands; frequently there is a continual burning pain in the lower part of the pelvis, accompanied with shooting pains in the uterus. A pungent acrid ichor, of a reddish-brown or claret-color, and exhaling a deleterious effluvium, is discharged from the vagina, excoriating the surrounding integument, and giving rise to a painful itching of the external organs. Copious discharges of blood, containing coagulated and fibrinous substances, are very frequent, and sometimes cause great exhaustion. The cancer has now changed to an open, irregular ulcer, which is readily recognized by the touch. The neck of the uterus feels rugged, and is studded with the above-mentioned soft, readily-bleeding excrescences, which are narrow at their base, as though a ligature had been placed around them; these fill up the whole vagina, the walls of which

are indurated or disorganized, conveying to the finger the sensation as of a hard, contracted ring. As the disease advances, then the symptoms of the cancerous dyscrasia become more and more apparent; the skin becomes of a pale straw color; the features exhibit an expression of deep suffering; the digestive functions are impaired; sleep is rendered almost impossible, the patient emaciates, and hectic fever supervenes. The disease most frequently occurs between the ages of forty and fifty.

The *prognosis* is very unfavorable.

Treatment.—When the disease is completely established, the physician can do little else than palliate the sufferings of the patient, though in the incipient stages it may be cured. In this latter period of the disease, the uterus feels like a hard body lying immediately above the pubic bones, frequently giving rise to the belief that it is impregnated. Pregnancy is really possible in this stage, and occasionally takes place. The real *carcinomatous* condition can be ascertained by a careful external and internal examination. It is characterized by the following symptoms, which correspond to *belladonna*. Pressing and fulness of the inner parts, rendering it difficult for the patient to stand, accompanied with pain in the sacral region. Likewise when a sanguineous ichor is discharged from the uterus, either continually or at intervals. *Platina* is indicated by spasmodic, or pressing colicky pains, accompanied with a discharge of thick, viscid, venous blood, especially if the patient previously suffered with too profuse menstruation. If constipation, nervousness, and a long-lasting, though regularly occurring discharge of acrid blood, with burning, smarting and itching be present, a few intermediate doses of nux vom. should be administered. The debility which sometimes supervenes in consequence of the pain and loss of blood, is best relieved by repeated doses of china.

Arsenicum is indicated by the following symptoms: Burning sensation in the internal sexual organs and abdomen, exacerbation of the symptoms towards midnight; excessive anguish in the chest, depriving the patient of rest; unquenchable thirst; the uterus is indurated, and there is continual discharge of an acrid, excoriating mucus from the genital organs.

Cocculus should be given, if, instead of the above-mentioned pains, spasmodic contractions occur, attended with discharge of a serous fluid.

Chamomilla corresponds to laborlike contractile pains, accompanied with a discharge of dark, coagulated blood.

The above-mentioned remedies, together with bryonia, ignatia, and some others, are more suitable for the incipient stages of cancer. Other important medicines likewise are **phytolacca** and **hydrastis**, which may be used both internally and locally.

Kreasotum is suitable when the following symptoms are present: Stitches in the vagina, as if proceeding from the abdomen, causing the patient to start as if in affright; voluptuous itching with burning and tumefaction of the external and internal labia; hard tubercles on the neck of the uterus; pain during an embrace, as if from ulceration; the menses appear eight or ten days too soon, and continue for eight days, dark and somewhat coagulated blood being discharged, attended with pains in the back, and succeeded by the discharge of a bloody, pungent, corrosive ichor, with itching and smarting of the contiguous parts; the menses intermit for hours and even days, after which they appear in a more fluent condition, accompanied with violent colic; the pressing downwards continues after the discharge has ceased; a metrorrhagic condition may be present, or occasionally a continuous, corrosive leucorrhœa; the pains exacerbate during the night, and fainting frequently occurs upon rising in the morning. Slight chills are experienced during the menstrual discharge, accompanied with lowness of spirits, and livid complexion.

Iodium is indicated by the following symptoms: Induration of the lower segment of the uterus; cancerous destruction of the cervix; profuse, long-lasting metrorrhagia, coming on even at every stool, accompanied with cutting in the abdomen, pains in the small of the back and loins; emaciation, atrophy of the breasts, yellowish-brown complexion, languor, with disposition to syncope, and spasms.

Thuja for indurations and rhagades of the neck of the uterus and os tincæ, cauliflower-shaped, readily bleeding excrescences, with a pungent smell; or for dry, wart-shaped excrescences, with severe stitching and burning pains during micturition.

Dr. Wahle, of Rome, Italy, prescribed graphites for the following symptoms: The vagina hot and painful; swelling of the lymphatic vessels and mucous glands, some of which are of the size of a filbert; the *cervix uteri* hard and swollen, and on its left side three large and painful tubercles of various sizes, each consisting of several smaller ones, which threaten to change to a bleeding excrescence; upon rising a sensation as of great weight is experienced deep in the abdomen; with increase of pain, debility and tremor of the lower extremities; the sufferings are most acute shortly before and during the period of menstruation; the discharged blood is black, coagulated, and emits a disagreeable odor; a sensation of heaviness is experienced in the abdomen, with violent lancinations in the uterus, extending down the thighs, somewhat resembling the passage of an electric current; the pains are burning and lancinating; little appetite, constipation, frequent chilliness, without subsequent heat and sweat; the patient is sad, anxious, and sometimes desperate; complexion livid; pulse frequent and rather hard.

Secale cornutum is indicated rather for putrescence than carcinoma of the uterus; it should not, however, be entirely discarded as a remedy for the latter affection.

Sabina may be administered for the sensation of heaviness, the laborlike contractile pain in the uterus and lumbar region, and for the copious discharge of coagulated blood, which occurs particularly during exercise.

Mercurius and **staphisagria** are suitable intermediate remedies for pains in the pelvic bones and femora. These medicines are particularly indicated, when the disease is complicated with symptoms of mercurial poisoning or syphilis. In the latter cases, acidum nitricum may be used, particularly when the patient complains of pressure in the abdomen, and pain in the small of the back; spasmodic pains as if the abdomen would burst, depriving the patient of rest, pressing even as low down as the vagina, as though the contents of the abdomen would be ejected, attended with pain in the small of the back, and drawing in the hips down to the thighs; excessive debility, obliging the patient to assume the recumbent posture.

Carbo veg. is an excellent remedy for an intolerable burning pain, seated deep in the pelvis, coming on at regular periods throughout the course of the day, gradually increasing and then decreasing.

Kali carb. may prove availing in this disease, when an acrid, badly smelling menstrual blood is discharged, with chilliness and spasmodic pains in the abdomen.

Conium, which is distinguished for its action on the female generative organs, is an indispensable medicine in carcinoma of the uterus.

It is absolutely necessary during the treatment that injections of disinfecting substances be made use of, and for this purpose Labarraque's solution I most prefer. The reader, however, may refer to Disinfectants for further information on this subject. I must say that I have seen no benefit accrue from caustics applied to the parts, and have tried many of them. When the hæmorrhage becomes very profuse besides the internal administration of medicine, styptics must be used, and those, too, of the most active character, *vide* chapter on Hæmorrhage.

It may be considered necessary, under certain circumstances, to extirpate the cervix uteri, for carcinoma of that portion of the womb. In some instances the patient is entirely relieved from suffering for a length of time, and life may be prolonged. The case recorded by Dr. Croserio may serve for an example: "On the 20th of September, 1841, the doctor assisted Prof. Gueyrard in an amputation of the cervix uteri. The patient was forty-five years of age, of a nervous temperament, and had for two years been

subject to considerable uterine discharges, to which she gave no particular attention till," he writes, "at last she was seized with severe pains in the loins, abdomen, and thighs, when I apprised her of the necessity of ascertaining the cause of her distress. MM. Marjolin and Lisfranc confirmed the diagnosis of disorganization of the cervix, and declared its immediate removal indispensable. Prof. Berard would only undertake the operation on the condition that I should continue my attendance on the patient. I forbade the potions he directed to calm her nervous excitement, arising from the necessity of submitting to such an operation. In order to attain this object, she was only directed to inhale ignatia the day preceding that of the operation, and aconite an hour before its commencement, and at the moment of her being placed upon the table. The operation was performed with the greatest exactness, and lasted twenty minutes; yet this female, so nervous and timid, had no fainting. After the operation she had an injection of the solution of the tincture of arnica, in water, and inhaled very lightly, aconite; and as soon as the patient was removed to her bed, I dissolved arnica 12, in a glass of water, of which she took a teaspoonful every four hours, while the local application of the remedy was continued. The excised portion was of the size of a hen's egg, and embraced the whole cervix. The division was through the healthy tissue of the uterus. The hæmorrhage, during and immediately after the operation, was trifling; but two hours after it became frightful. It was arrested by the two assistants who had been left with the patient, in anticipation of this accident, by compression of the abdominal aorta. After this there was not the slightest unfavorable occurrence; the patient had positively no fever, and the wound cicatrized the twelfth day. The symptoms of abdominal irritation or congestion, which sometimes exhibited themselves, were combated with belladonna and nux vomica. The catamenia has never returned, and her health has been good during the year which has elapsed since the operation."

I insert here a few cases that have been reported cured, giving the names of the gentlemen who have had the patients under treatment. As I have remarked elsewhere, it is unfortunate that the *particular variety* of "cancer" has not been mentioned.

Carcinoma uteri: arsenicum[3], dose night and morning for one week; conium[3], night and morning, one drop for one week. These two remedies were rotated thus for four months with an occasional dose of china for hæmorrhage; perfect cure; no return three years afterward.*

Carcinoma uteri, chlorosis and menstrual derangements: medicines used, cocculus, crocus, ferrum met., pulsatilla and secale; chlorosis yielded to pulsatilla; only two cases required ferrum met., and one natrum mur.; in cancer of womb secale of most service.†

Cancer of the uterus: Mrs. D., aged 56; nux vom., sepia, pulsatilla, bryonia, kreasotum, sulphur, carbo anim., thuja and arsenicum; disease was of too long standing and too deeply ramified to be cured, but under the action of sepia, thuja, carbo anim., and arsenicum, pieces of decomposed cancerous tumor came away from the rectum and vagina.‡

Cancer, uterine: Mrs. F. B. M., aged 70; the groundwork medicines were sepia and silicea, next magnes. carb., sulph., caust., lycopodium; in third place, pulsatilla, arsenicum, belladonna. Other medicines were given to rectify accidental occurrences; so much improved as to be able to walk for two hours as exercise.§

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* Dr. Leon, United States Journal of Hom., vol. i, p. 41.

† Report of Leopoldstadt Hom. Hospital, 1861; British Journal Hom., 1864, p. 402.

‡ Dr. Von Viettinghoff, B. J. H., vol. xvii, p. 64.

§ Ibid. p. 57.

Cancer of womb: menstruation ceased five months since; in its place a continuous fetid discharge with laborlike pains; profuse urination; bryonia removed the severe pains within six days. Belladonna reduced these pains to mere trace of irritation; diminished quantity and fetor of discharge and abated urgency of stool and urine, and cured the headache entirely. Gave drastis[6] and a lotion, ʒij mother tincture to ℥viij water; lotion gave much pain and was discontinued. Hydrastis produced no effect; arsenic. iod.[3] substituted, with rapid change for better in all symptoms. Cold infusion of hydrastis as an injection to relieve pain; still under treatment.*

Cauliflower excrescence of uterus, about six inches in circumference; internal administration of hydrastis, subsequently using paste to reduce the fungoid growths; general health greatly improved; marked diminution of vegetatious growths, and at the close of six weeks almost level with surrounding healthy structures.†

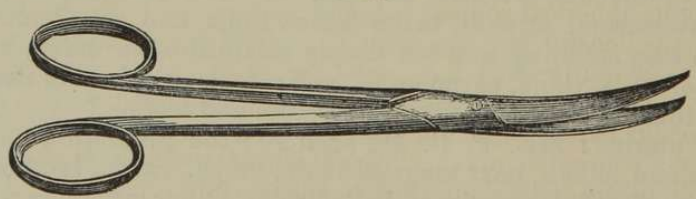
Amputation of the Cervix.—Prof. Osiander, of Gottingen, was the first to conceive and execute the operation of excision of the cervix uteri, and his example was soon followed by Dupuytren and other distinguished surgeons. The first operation of the kind was performed by Osiander in 1801, on a widow, whose vagina was filled by a very vascular fetid fungus, from the orifice of the womb, as large as a child's head. By means of Smellie's forceps the fungus was brought down low in the vagina, but being accidentally broken off, a fearful hæmorrhage ensued; undismayed, however, by this event, the operator determined to proceed, and immediately pushed a number of crooked needles, armed with strong ligatures, through the bottom of the vagina and body of the uterus, until they emerged at the inner orifice. These ligatures served to draw down the uterus, and retain it in the vagina near the external orifice. The surgeon then introduced a strong bistoury above the scirrhous portion, and divided the womb completely in a horizontal direction. The hæmorrhage, though profuse for an instant, was speedily suppressed, and the patient recovered in three or four weeks. Osiander afterwards performed eight similar operations upon different patients, all of whom recovered without difficulty.

Dupuytren also performed the operation eight times; but instead of employing the ligatures and bistoury, recommended by Osiander, he drew down the uterus with forceps, and divided it above the scirrhus, by knives and scissors. This operation is also recommended at the present time.

The operations of to-day may be made either with scissors and knives, with the écraseur, or by the galvano-caustic wire.

The patient should be placed in the position of Sims—see p. 868—and the cervix divided bilaterally; the lips are then seized, drawn downward,

Fig. 490.



and removed with the scissors; these should be curved on the flat, as seen in Fig. 490, or have long handles, with the cutting edge at right angles

* Dr. Bayes, ibid., 1862, p. 8.

† Dr. Marsden and Mac Limont, ibid., 1863, p. 648.

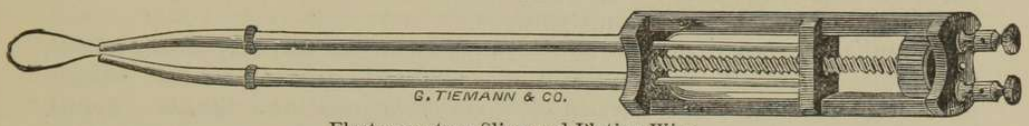
(Fig. 491). Sims, after the amputation, draws down the mucous membrane and stitches it over the raw surface. If the écraseur be used, the

Fig. 491.

Long Uterine Scissors.

chain is applied as high up as possible, and the screw worked slowly. By referring to page 259 *et sequitur*, the student will understand the method of using the instrument. If the galvano-caustic is used, the wire instead of the chain is applied. Fig. 492 represents the looped platina

Fig. 492.



Electro-cautery Sling and Platina Wire.

wire and the sling for its application. This method is safest of the three, and I have had the greatest satisfaction in witnessing its thoroughness and efficiency in several cases of my own, in which Dr. John Butler performed the operation.

Uterine Tumors—Fibroids—Fibroma—Polypi.—There is a great discrepancy among writers concerning tumors of the uterus. They are called fibroid, fibro-cystic, and polypoid. Some classify them according to their seat, some according to the texture of the parenchyma. Virchow denominates them *myoma*, to which term, however, Billroth objects, and declares that *myo-fibroma* should be the term, because there is a mixture of fibrous and muscular substances.

A fibroid tumor consists chiefly of connective tissue and unstriped muscular fibres. It is probable that the preponderance of the latter element caused Virchow to classify these tumors as *myoma*. The connective tissue is hard and firm in the majority of cases, but in others again it is loose, but in either case generally formed in concentric layers.

It appears to me that the terms *fibroid* or *fibroma* are correct as applied to these growths. Rokitansky makes three varieties of fibroid tumors of the uterus.

The first variety is distinguishable—

1st. By its smallness.

2d. By its spherical shape.

3d. By its density.

4th. By its hardness.

5th. By its poverty of vessels.

The second variety is distinguished—

1st. By a concentric arrangement of fibres, which is always much more discernible before their immersion in spirits (fibro-cystic).

2d. By an accumulation of softer tissue in the interstices and their resemblance either to a coarse-grained salivary gland or to a soft mammary gland.

3d. By a peculiar soft, doughy, elastic "feel."

4th. By a somewhat rounded and nodulated exterior. It is this variety that attains the largest size.

The third variety, or *true fibroid polypus fibro-cystic*, is distinguished—
1st. By its distinctly lobulated surface.
2d. Its expansion of fibres making,—
3d. Internal cavities of considerable size.
4th. Its flattened shape.
5th. Its close adherence to the uterine parenchyma.
6th. Its great vascularity.
7th. Its congested and reddened appearance.

By bearing in mind these peculiar characteristic appearances, it will not be a very difficult matter to diagnose the variety of uterine tumor that may be encountered by the physician.

Dr. Bedford* divides these tumors into *submucous*, *subperitoneal*, or *interstitial*, according to their seat and the manner of their development. M. Malgaigne† makes five divisions of the *polypus:* 1st. The vascular: 2d. The cellulo-vascular; 3d. The polypus from hypertrophy; 4th. The moliform; and 5th. The fibrous polypus.

Colombat appears to divide them into *pedunculated* and *non-pedunculated*, the former being the true polypus, the latter the fibroid tumor. Other physicians recognize the *glandular*, the *cellular*, and the *fibrous* polypus. Thomas defines uterine polypus "as a tumor covered by the mucous membrane of the uterus and attached to that organ by a pedicle or stem" (p. 508). It is a well-known fact that submucous fibroids become pedicellated; they would then be classified as polypi. Fibroid is as good a term for these growths as can be applied to them. But decidedly the best and most simple classification is the one arrived at by Rokitansky, and of which I have condensed the main features and given as concisely as possible. With reference to the frequency of their appearance, we may be allowed to quote a single passage from Colombat:

"The fibrous tumors, properly so called, that are developed under the same influences as those that produce the pedicellated sort (polypi), are far more frequent than the latter. Boyle estimates that in one-fifth the number of women beyond thirty-five years of age, he met with samples of one or more fibrous tumors. Patal found a still larger proportion, since in twenty wombs he examined in 1770 there were thirteen exhibiting the fibrous excrescence. Lastly, according to Dupuytren, there are but few specimens of the womb in aged women that are unaffected with tumors." I have enjoyed the opportunity of treating many of these varieties of abnormal growths. Indeed, they occur in the practice of every physician.

A fibroid of the uterus may attain a considerable size before any special symptoms are noted. I had under medical treatment a lady who for two years had, projecting from the os uteri, a fibroid tumor of the second variety, which gave her but little inconvenience, excepting by the occasional discharge, which was mucous and bloody in character. In general, however, from the very beginning of the disorder, the patient experiences a sense of weight and fulness about the uterus, very often accompanied with frequent desire to urinate, which disagreeable sensations always are aggravated at the menstrual period. In two cases I have observed a reflex nervous action upon the stomach, causing constant nausea, and in one of these *vomiting* was quite a persistent symptom. The discharges are not always bloody, although in many cases, particularly in the third variety (that of the true polypus), the hæmorrhage may be so exhausting as to endanger the life of the patient. In the majority of instances, however, there is a bloody mu-

* Diseases of Women and Children, p. 219.
† Colombat, "On Females," p. 390.

cous discharge, which renders the patient more comfortable for several weeks after it has been thrown off. If the tumor be large, it may so press upon the rectum as to cause constipation, or produce strangury, and, strange as it appears, these tumors may grow to a considerable size without the patient's general health being affected in any manner whatsoever. In a *fibroma* which came under my observation some time since, there was no pain or inconvenience, excepting a slight pressure downward after a long walk or other undue exercise. This tumor was within the cervix, with a pedicle or stem extending to the fundus. By seizing it with a pair of clawed forceps (having previously introduced a Sims's speculum), the mass could be drawn down without the uterus. This case underwent no medical treatment whatsoever; the patient would not permit it.

The operation consisted in forcibly extracting the tumor, applying two waxed ligatures by means of a strong curved needle, and dividing the base with a curved bistoury. She was sent to her home with directions to take calc. c. every other night, and ferrum, should any hæmorrhage supervene; she took neither, but has now been perfectly cured for over ten years.

The following case will show the symptoms of the second variety of fibroid: The patient was under the professional care of a brother physician. She suffered from severe hæmorrhage, with excessive pains in the back and hips, together with constant uterine tenesmus, constipation, and most severe suffering during coitus. She also resided in the country, and the husband for several months had applied to the physician for medicines to arrest "hæmorrhage." All the usual remedies were unavailingly tried, until my friend insisted that she should be brought to the city for a careful and critical examination. No sooner was this attempted than the tumor was found lying on the posterior wall of the vagina, with a pedicle extending into the cervix, and presenting the soft doughy "feel" before mentioned. She was in a high degree of nervous excitement, and worn down from the repeated floodings. An operation was at once decided upon. She was brought to the edge of the bed, her thighs as widely extended as possible, a pillow placed under her legs, and chloroform administered. The larger extremity of a Sims's speculum was then introduced under the pubis, and, having been well drawn up, was given in charge of an assistant; then, with a pair of vulsellum forceps (having buried the claws thereof deeply into the substance of the excrescence), it was drawn to the mouth of the vagina; a strong waxed ligature placed around the pedicle within the cervix, and with a curved probe-pointed bistoury the stem of the tumor was divided. No hæmorrhage followed. The patient returned home and has enjoyed perfect health ever since, this being ten years ago.

The following is highly interesting in point of diagnosis: The lady, whom I had attended for some time, informed me that she was *enceinte;* that she had thrice passed over the menstrual period, and that she suffered intensely from morning sickness—vomiting occurring each day, with excessive headache in the frontal region, the sensation being that of a nail pressing into the head, together with a high degree of nervous excitement. I had no reason whatever for doubting her statement, and prescribed for her nux vom., with an occasional dose of coffea, with the most gratifying results. The medicines always appeared to have the desired effect.

In several weeks she informed me that she was afraid all was not right, and though her figure was undergoing change, yet that it was so uneven that it gave rise to considerable anxiety. On both her own and her husband's account, I immediately suggested the propriety of a careful examination. *Per vaginam* I could detect nothing but the usual appearances presented by the os uteri of a woman who had borne children, and who

was again pregnant; but when an examination of the abdomen was instituted, I found a round uneven surface high up upon the right side, which was hard, not sensitive, and slightly movable. The abdomen was enlarged somewhat throughout its whole extent, but more particularly on the right side, and there was occasional discharge of bloody mucus from the vagina. I suspected an ovarian tumor. These symptoms continued for several months, when I was called in haste and found the patient with a very profuse uterine hæmorrhage, accompanied with regular contractions of the matrix. The prescription was five drops of the tincture of secale corn. every fifteen minutes, and in about four hours the discharge had lessened considerably, the pains were much less frequent and less severe, and the enlarged abdomen had diminished considerably in size, excepting on the right side of the uterus, where the tumor could be distinctly discerned. It was at this time that the diagnosis was that of polypus uteri, and the patient was ordered to take calc. carb., and ferr. mur., each twice daily. A very liberal diet was allowed her, but any undue exertion positively prohibited. She soon rallied and recovered for a month or two her usual health, with the exception, however, of an occasional bloody discharge from the vagina, and the appearance on her face of large maculæ of a dark-brown hue. She was occasionally given a dose of sepia and merc. corr., and from time to time the preparations of potash. All symptoms and appearances progressed very favorably for some weeks, when at midnight I was hastily summoned to her hotel; I found her apparently lifeless from excessive loss of blood, with that ghastliness of countenance, blanched lips and almost imperceptible thread at the wrist, with which every physician is acquainted. She had retired as usual in the evening, and feeling an inclination to urinate, had arisen for that purpose, when suddenly, with a most severe expulsive effort, she felt the passage of some foreign substance from the uterus into the vagina and from thence into the vessel; then commenced a tremendous hæmorrhage. She was placed immediately upon her back, her hips elevated and her head depressed, and large doses of secale administered at short intervals to cause uterine contractions, and I immediately introduced into the vagina a tampon saturated with a strong solution of the *liquor ferri persulphatis.* Brandy and water were also given, and she soon began to revive and recovered steadily, but slowly, until she was enabled to visit the seashore, when her health appeared fully recovered. The "moth spots," as they are improperly called, left her face, and she appeared in every respect fully and perfectly restored. But the convalescence did not long continue; an exactly similar condition of things appeared in a few months, and in the course of a year, during which time she was absent, another tumor formed and was discharged with profuse hæmorrhage. Again she appeared to regain her wonted health and strength, but symptoms again were noticed soon after her return to my care, which were too well remembered as diagnostic of a return of the disease. She was placed under rigid treatment, and I am glad to be able to state that she soon passed, but with comparatively slight hæmorrhage, large masses of formation exactly similar in form, construction, and appearance to those which had previously been expelled. So soon as the symptoms of expulsion were noticed, she immediately resorted to ergot, either in powder or in tincture, which invariably produced good results; and during the intervals, the medicines administered were chiefly calc., carb., and kali hydriod. Such, then, is the record of one of the most interesting cases of polypus which I have yet seen.

Treatment.—The question now arises, Can such tumors be removed by the administration of internal medicine? and was the expulsion of the

polypus, as related in the case reported, caused by the proper administration of homœopathic remedial agents? From my own experience I would say that in the earlier stages of the disease, when the outgrowths are small, that it is possible to remove them by the exhibition of drugs, but as there are yet, so far as our knowledge extends, no medicines that will produce a fibrous uterine tumor, or, at least, the provings of such have not been so far extended, it is in the majority of cases an absolute waste of time to attempt to remove the larger growths by any other means than operative procedure.

The *muriate of ammonia* is spoken highly of in the treatment of the fibro-cystic form of tumor. Dr. Minor, in *The Medical Union*, records a most interesting case, in which the muriate was given in from three to six-grain doses, three times a day, dissolved in a large quantity of water. The patient was kept under the treatment ten months, "at the end of that time the tumor was decreased to such small dimensions that it could only be detected with difficulty. . . . . She is now apparently restored to perfect health."

Dr. John H. Thompson furnishes me the following:

Mrs. G. W. M., aged 42; married; has had four children; the youngest, seven years ago.

May 19th, 1875. Has been treated for a tumor by several physicians, without deriving any benefit. On examination, a subperitoneal fibroid discovered in the left hypogastric region, about the size of a small orange.

℞. Ammon. mur. crud., grs. v, ter die in aqua, q. s. f. haustus.

July 22d, 1875. Patient returned, complaining of tenderness of left ovary; examination failed to detect any trace of a tumor. Several examinations made to October, 1878, show no reappearance.

Dr. Kidd, in the *British Journal of Homœopathy*,* states that though sabina, ferrum mur., and secale may be homœopathic to the symptoms produced by these tumors, "yet that their use is only palliative, and in no way curative to the disease." He relates four cases, one of which is reported as successful, the others not at all so. Dr. Sampson† reports in like manner. That the proper administration of homœopathic medicine will alleviate the symptoms produced by such abnormal formations there can be no shadow of doubt. For the expulsion, or to cause the resorption of the submucous tumors, calc. c., kali hydriod., merc. corr. sub., and silic. may be tried; but if after their employment for a number of weeks no diminution in the size of the growth is discovered, the sooner it is removed by mechanical means the better. For the hæmorrhages which supervene I have been better satisfied with the action of secale and ferrum in low potencies than with any other remedies; ham., virg., cinnamon, crocus, sabina, and many others, known to all practitioners, have been employed with more or less benefit; but the two first mentioned are generally sufficiently efficacious. The topical application of the preparations of iron, particularly the perchloride and persulphate, are also very serviceable. In the latter case I am rather disposed to believe that the expulsion was spontaneous, and that the medicines exhibited had only a beneficial action so far as they palliated symptoms. It is a well-known fact that the third variety of fibroid tumors, according to Rokitansky,‡ viz., the fibrous polypus, is frequently spontaneously expelled. Quite a number of such cases are upon record, but those instances in which the growth returned are not nearly so numerous. While, therefore,

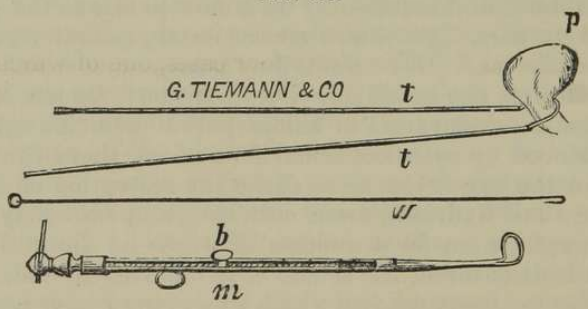
* Fibroid Tumors of the Uterus, No. lxxix, p. 52.

† United States Journal of Homœopathy, No. vi, p. 255.

‡ Pathological Anatomy, vol. ii, p. 211.

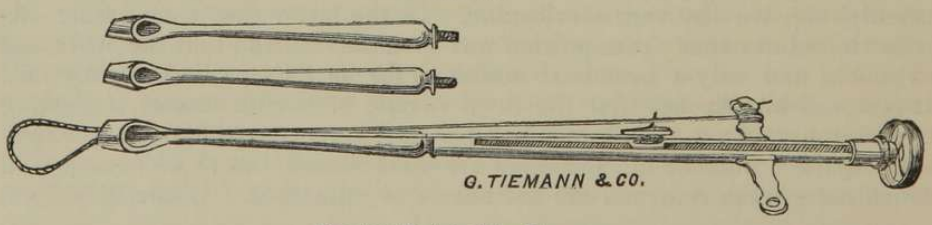
we are disposed to believe in the powerful action of medicines administered according to the homœopathic law in arresting hæmorrhage, alleviating concomitant symptoms, assisting in the expulsion of the foreign body, we must also remember that patients have been relieved by nature, and perfectly recovered without the use of any medication whatsoever. Dr. Meigs relates a case of this kind in his edition of Colombat. The patient was a colored woman, and the polypus was expelled with violent labor pains and profuse hæmorrhage. There yet remains to be described a variety of polypus, of which the most complete description is given by Dupuytren. It is what he terms "*the cellular and vascular polypus;*" the symptoms are said to resemble those of cancer, and to "escape by their minuteness the most careful search. They force both physician and patient to despair. Let the finger be conducted to the os uteri, and within its circuit we shall find one, two, or more small elongated pedicellated bodies implanted in the lower part of the canal of the cervix; they vary in size from that of a pea to that of a kidney bean; they bleed at the slightest touch; and if, instead of trusting to the touch alone, we examine them with a speculum, we find the neck and mouth of the womb red, dilated, and filled with reddish bodies, elongated, pedunculated and implanted upon the neck. There is *no disease with which this malady has not been confounded.*" It is to the latter portion of the quotation that especial attention should be directed, for there can be no doubt that very many such cases have escaped the notice of acute physicians; and therefore the most rigid examination should be instituted in all cases of those obscure uterine affections which develop in the patient a thousand ever-varying symptoms of greater or less severity. The best instrument for the eradication of polypi is certainly the écraseur; care, however, must be taken to place the chain as high up as possible, and, to

Fig. 493.



prevent undue hæmorrhage, to turn the screw very slowly, and frequently allowing it to remain at rest for a moment or two during the course of the operation. There have been invented at different times a very great vari-

Fig. 494.

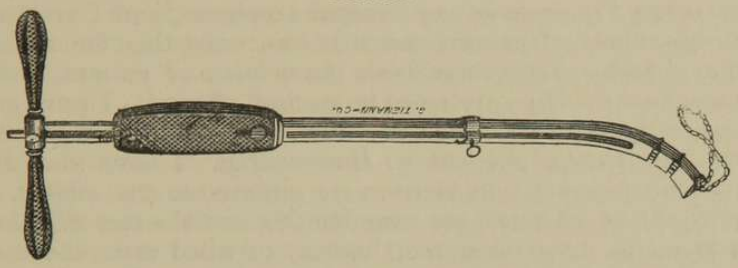


Braxton Hicks's Wire Ecraseur.

ety of canula, knot-tyers, polypi forceps, etc., for the strangulation of the base or pedicle of uterine tumors; the écraseur does away with all these.

There is, however, often considerable difficulty in passing the wire around the pedicle of the tumor; in such, a canula, or the instrument of Van Buren (Fig. 493) should be used: *r* represents a growth to be removed, *t t* are two hollow tubes through which the wire is slipped, and thus holding one in each hand, and with the use of the hook, *u*, the wire is readily manipulated. The two cylinders are then passed into the écraseur. The screw is tightened, and the instrument gradually screwed up.

FIG. 495.



Emmet's Ecraseur.

Fig. 494 represents Hicks's wire rope écraseur, with three wire leaders, and Fig. 495 exhibits the instrument of Emmet.

Very many authors have recommended the gradual strangulation of the polypus by tightening the ligature each day; but if the ligature is used, we agree with Mr. Brown* that it is better to draw the thread or the wire closely around the pedicle, and divide it with a sharp curved bistoury.

Enucleation.—If the tumor is of the submucous variety, enucleation, which is a dangerous operation, should be performed in the following manner, as directed by Dr. Thomas:† "The cervix should be fully dilated with tents or freely incised in two or three places, as practiced by Dupuytren, Amussat, and Baker Brown. After checking hæmorrhage, if any be created by incision (should this have been resorted to), the vagina being dilated by Sims's speculum, and the tumor held firmly by tooth-forceps, an incision is made over its surface and through its capsule. This may be either straight or crucial. The fingers or a blunt instrument being passed into the opening thus made, are swept around the mass, so as to sever its attachment and turn it out of its bed. At the same time, it is lifted from below upward with the forceps. If the mass be removed, all clots should be washed out of the uterus by a stream of water, and the patient quieted by a full dose of opium.

"Sometimes a middle course may be followed with advantage: the os being dilated or incised, a long crucial incision is made over the presenting part of the tumor, and the lips of the capsule separated by the finger, in the hope that the body of the tumor may present through this species of os and be expelled by uterine effort."

I have had under my care a fair share of these cases, both pedunculated and sessile, and as yet have not found them in any instance covered with a capsule. Dr. Emmet says: "It is my conviction that fibroids become pedunculated only when influenced by the force of gravitation, which causes uterine contraction. *I do not believe they have a capsule proper*, the only capsule being the mucous membrane of the uterus, covering their

* On Some Diseases of Women admitting Surgical Treatment.

† A Practical Treatise on Diseases of Women, page 498.

projection; the only line of demarcation between them and the uterine wall, being the difference in the density of the respective tissues."

The distinguished author states, that by *traction* alone these tumors may be brought without the cavity of the womb, and that he discovered the fact fourteen years ago. He states, further, that when the tumor is larger than a pigeon's egg, the best method is to control the hæmorrhage, and assist the uterus in forcing the tumor into the cavity, and remove the same by *traction*. After the thorough removal of all the *débris*, the application of Churchill's tincture of iodine is said to act very beneficially. Here, again, there is no mention of any internal treatment, and I must acknowledge the fact that, so far as I have known, excepting for the arrest of hæmorrhage, homœopathic medicines have been of no avail, and their surgical treatment is the only reliable method of cure. I have given this subject some attention, and several years ago published a paper on the subject in the *British Journal of Homœopathy*. I have looked up our authorities, but found the literature very meagre on the subject. I may mention here, that I lately have seen fibroids, one the size of a hen's egg, and one about as large as a small melon, expelled from the uterus, the patient being under strictly homœopathic treatment; but I cannot say whether the treatment caused the expulsion. Certain I am, that in both instances the patients lost great quantities of blood many times, and I believe would have been cured more quickly by operation. This method of *traction* should be remembered in all cases of this variety of uterine tumor.

Gastrotomy.—Thus far the statistics show but a poor hope of success for the removal of the subperitoneal fibroid tumor. I have performed the operation three times: in two the patients died; in the third case I was obliged to desist by reason of extensive adhesions. The patient recovered.

Hypodermic Injection of Ergot.—This treatment I have used with varying success. It has been advocated strongly by Hildebrant, who uses the following: Aqueous extract of ergot, forty-six grains; glycerin and distilled water, each two drachms.* The preparation which I have made is the following:

℞. Extracti ergotæ aquosæ (Squibb), . . .	grs. 200
Aquæ, ...	♏ 250
Stir, filter, and add	
Aquam, ...	ad ♏ 300

In this preparation each minim represents six grains of powdered ergot. I have also employed Squibb's solid extract, so reduced that each minim represents four grains of the powdered substance.

I have treated by this method in all thirteen cases; some of them are at present under treatment. I cannot agree with Schrœder that the injections are very painful; in my cases, excepting in one or two instances, the pain passed away soon after the injection. Sometimes the suppuration, which often follows the use of the hypodermic syringe, has been set up, but no very bad results have followed. On one or two occasions, when I have injected through the abdominal parietes, some symptoms of peritonitis have developed, which, however, were speedily arrested by aconite or belladonna. In several cases a chill has followed the injection, and in one alarming symptoms of collapse followed. Latterly, I have inserted the needle into the side of the buttock, a process, I think, also recommended by Hildebrant, and with fair success.

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* Ziemssen, Diseases of Female Sexual Organs, p. 250.

I can count three cures; in all alleviation of bad symptoms, and in the majority a diminution of the tumor. I have two cases which have been under treatment for two years, taking an injection every week, or once in ten days, according to circumstances, and always ceasing the treatment during the menstrual period. These cases I trust at some time to give more fully in detail.

The *secale* was administered both by the mouth and the hypodermic syringe, the latter being sometimes inserted into the *cervix*, or indeed into the tumor itself. The substance used was, as already mentioned, Squibb's solid extract, reduced with water, so that each minim of the solution contained about four grains of *ergot* in powder. Internally, a gelatin-coated pill of five grains was administered twice or three times during twenty-four hours.

In these cases we no doubt have not only the wonderful emmenagogue properties of the spurred rye fully developed, but also its hæmostatic powers brought into play. The question now may be mooted, as to whether this method of treatment would not assist the "traction method," as recommended by Dr. Emmet, and whether the physiological action of the drug itself would not allay many of the disagreeable and alarming symptoms of pain, hæmorrhage, and contractions, during the progress of the manipulations.

Dr. J. H. Thompson has furnished me with the details of several cases, which are here inserted.

Mrs. H. D., aged forty-four; married; had two children, both over twenty years ago; she has had uterine diseases during the last ten years. The doctor has made frequent examinations during all of that time.

On September 21st, 1875, he discovered an intra-uterine fibroid, the size of two fists. He had not examined her previous to this for perhaps six months, as she had not complained of any uterine disorders.

November 1st. He gave ergot, crude, in powder, grs. iv, three times a day for two months, to January 2d, 1876, and then gave ammon. mur., grs. v, in aq. q. s. ter die.

February 8th, 1876. Tumor same size.

January 24th, 1877. No diminution in the size of the tumor.

March 3d, 1877. She had an attack of frightful menorrhagia, which lasted ten days, during which time he was obliged to tampon the vagina to arrest it; this nearly exsanguined her. She fainted every time her head was at all elevated above the shoulders, and was confined to her bed for six weeks.

May 12th. She had another slight hæmorrhage, but this was controlled in a few days.

May 31st, 1877. He injected directly into the tumor with a hypodermic syringe eight minims of

℞. Aq. Ext. Ergot, ... grs. xv.
Morph. Sul., ... gr. ½
Aquæ Destil., ... q. s. f. ℥ij. M.

June 7th. He made another injection into the tumor of the same quantity.

June 12th, 14th, and 26th. Injection same.

These injections caused a little pain for half an hour, but never any suppuration, except after the last injection, on which account he desisted.

October 12th. The tumor was much smaller, though there had not since June been any internal or local treatment.

March 13th, 1878. Tumor still decreasing.

June 28th. Could not find any tumor, and has never felt it since, though he has sought for it. Neither has she had any metrorrhagia since the last-mentioned attack.

Mrs. D. W. B., aged fifty-six; married; has had four children; youngest aged twenty-three.

October 10th, 1877. This lady was sent to Dr. Thompson by Dr. B., of Brooklyn. On examination, he discovered a subperitoneal fibroid, three inches in diameter, quite movable, situated to the right of the uterus, also carcinoma of the cervix.

October 28th. Injection made of twelve minims of the R. used in the preceding case, directly into the tumor. She had over an hour's ride in the horse-cars to reach her home, and on her arrival there, was very much exhausted, and suffering great pain.

Nov. 9. Same quantity injected at her house.

Nov. 20. Six minims injected.

Each of these injections produced such severe pains and lasted so long that their further use was abandoned. The tumor at once began to decrease in size, and since April, 1878, he has failed to find anything of the fibroid, although the cancer of the cervix remains the same.

Morbus Brightii lately developed, and the patient is now confined to her bed with the latter disease.

Dr. William H. Byford,* in a résumé of 101 cases of fibrous tumors treated by ergot and reported by various observers, reports twenty-two cured, thirty-nine diminished in size with removal of disagreeable symptoms and hæmorrhage, nineteen benefited without diminution in size, and twenty-one unaffected. In twenty-one of these cases the treatment was suspended. He presents the following general conclusions:

1. Ergot may cause the tumor to be gradually disintegrated and absorbed without any disagreeable symptoms.

2. Ergot may so interrupt nutrition as to produce rapid destruction, with consequent decomposition within the capsule, and later expulsion of the semi-putrid mass, accompanied by inflammation of the uterus and toxæmia more or less grave.

3. It may cause the tumor inclosed in its capsule to be totally or partially expelled from the cavity of the uterus, with more or less inversion of the organ.

He calls attention to the fact that ergot may have a cumulative action in certain cases, and recites how in one case, after two months' persistent use of the drug without any observed effect, "terrific uterine contractions" set in with "explosive suddenness."

Dr. Byford concludes that "ergot, in the treatment of fibrous tumors of the uterus, is a prompt and powerful agent, not to be recklessly used without great danger;" and that "the circumstances under which its administration will be safe and effective" have not yet been determined.

M. Delore made injections into the tissues of the uterus itself. He employed one part of ergotin to two of distilled water, using a speculum and piercing the cervix uteri. In these patients he observed phenomena of different kinds: chills, trembling, bilious vomiting, fainting, troubles of vision, diarrhœa, pain in the kidneys, thighs, legs, abdomen, or head. In two cases he has seen abscesses produced. The patients had all been relieved; the hæmorrhages had been arrested; in fine, the results had been encouraging.

M. Duplay has employed the method several times, and while he has

* Month. Abs. Med. Science, May, 1876; American Medical Association, 1875.

not obtained curative effects, he has obtained satisfactory results as to the relief given. He has never seen any accidents.

M. Terrier, also, has made a number of injections into the skin of the abdomen without accident. Frequently the injections were made by the husbands of the patients; in these cases the injections had been made not into the subcutaneous cellular tissue, but in the skin itself, and were followed by small foci of sloughing. These injections had given very good results in hæmorrhages, but in one case there was violent contraction of the uterus, and the metrorrhagia was augmented.

Lacerated Perinæum.—This accident, which is well known to all accoucheurs, and which often produces much misery, is occasioned either by traumatic lesion, instrumental delivery, pressure of tumors, or parturition, by far the greater number of cases being caused by the latter. If the rupture is incomplete, the inconvenience may be borne; if, however, both sphincters are torn through, there is perhaps no affection which renders life more miserable. Displacements of the uterus and vagina, incontinence of flatus and fæces, prolapsus of the rectum, and inflammation of the uterus itself are often engendered by this troublesome accident. The patient is unable to perform her usual duties, cannot go out for fear, and becomes disgusting to herself and to all around her. The operations which have been devised for the relief of this accident are sometimes successful and sometimes the reverse; the great difficulty being in bringing into apposition the torn muscular fibre. On this subject Dr. Emmet (than whom there is no better authority) says:* "In a large number of cases not a fibre of the muscle is united, although the perinæum may have been restored and the laceration through the recto-vaginal septum closed by the operation. To unravel the cause of failure, and to devise means of obviating it, has occupied my attention for years. To appreciate so simple an explanation *has cost me more thought than any other point in the whole field of the branch of surgery to which I have devoted myself.*"

Time of Operating.—A good deal has been said and written about the proper period of operating for this accident. The majority of the most experienced surgeons are of opinion that the operation should be immediate. In those cases in which I have performed the operation, which then does not require the refreshing of edges or paring the sides of the fissure, the results have been favorable. If, however, this is not done, then the interference must be deferred until the parts have cicatrized, and the patient regains her ordinary strength, that is, if she is not nursing. If she nourishes her own child, operative measures must be deferred until the offspring can be safely weaned. The welfare of the child would appear to demand such procrastination.

The operation of Baker Brown, which is often quoted, and in the performance of which he and others, as well as myself, have been successful, is not as delicate as others to be mentioned. There is too much cutting about it. In this method the patient is placed on the table and fully etherized; the fissure is rendered tense by an assistant, and with a bistoury the surgeon then removes all the cicatricial tissue on either side; after this the sphincter ani (external) is divided. The directions are to cut the muscle on both sides about a quarter of an inch in front of its attachments to the coccyx, by two incisions carried outward and backward. These are made by a blunt-pointed instrument, which is introduced into the rectum (guided by the forefinger of the left hand), and carried an inch within the gut; by

* Medical Record, March 15th, 1873, p. 121.

drawing out the knife a cut an inch or thereabouts is made, extending outward from the anus, between the coccyx and the tuberosity of the ischium.

When this amount of cutting has been accomplished, which, however, many operators consider unnecessary, the sutures are introduced as follows: With the forefinger and thumb of the left hand, the left edge of the fissure is taken up, a needle threaded with a double cord is inserted one inch from the refreshed margin, and its point being directed downwards and inward is made to emerge at the bottom of the pared margin of the fissure. It is then inserted at a point opposite on the denuded surface and brought out an inch therefrom through the integument. This suture is passed at the upper end of the fissure. A second suture is then made as before, going as deep as the septum, and a third is entered at a low angle of the cleft. The ordinary method of making the quilled suture is then practiced, pieces of bougie answering well the purpose, and the cleft is thus approximated. Several silver-wire sutures are then passed into the integument, and the operation is completed. The bowels are to be constipated with opium, a grain being given night and morning for a day or two, and after that a grain once in twenty-four hours. The patient should be then put to bed, and a light and unstimulating diet ordered, the urine carefully drawn with the catheter twice a day, and the knees tied together. The deep sutures are removed from the third to the sixth day, and on the eighth or tenth the superficial ones may be taken out.

Dr. D. Hayes Agnew in the Pennsylvania Hospital Reports* has an extended paper on this subject. He there records cases and cures. His operation is somewhat similar to Brown's, but he does not divide the sphincter ani.

Dr. Lewis† uses deep silver sutures and does not divide the orbicular muscle.

The operations which I have lately performed with considerable success are according to the directions given by Dr. Emmet, with which I was made acquainted before the appearance of the article from which I shall quote. I use such curved scissors with fine points, as are found in the "eye cases," and fine clawed forceps for raising the mucous surface. It is only necessary to denude the fissure of its mucous covering. Having placed the patient in position, and having the fissure put on the stretch on both sides, the cicatricial lines can generally be discovered marking out the triangles. Just on the outside of these, and going only through the mucous surface, I mark off the triangles. Taking up one of the angles (the upper and outer), with a pair of delicate forceps, with the curved scissors I snip away the membrane. In many instances I succeed in removing the part entire. This generally happens on the left edge of the fissure; were I ambidextrous I am quite certain that both could be easily removed entire. Taking then a round needle threaded with a long piece of silk, and having the forefinger of my left hand well in the rectum, with the ball of the finger I press up the septum, and pass the needle about an eighth of an inch above and a quarter of an inch to one side of the anus and carry it through all the tissues up to the septum (which it may have been necessary also to refresh); I then turn it and bring it down on the other side of the fissure and out at a point equidistant from the anus at which it was entered. The next suture is passed about the eighth of an inch above, its terminus being the septum; it is brought out like the first: the third and a fourth if necessary are introduced in like manner. It will be seen that when the

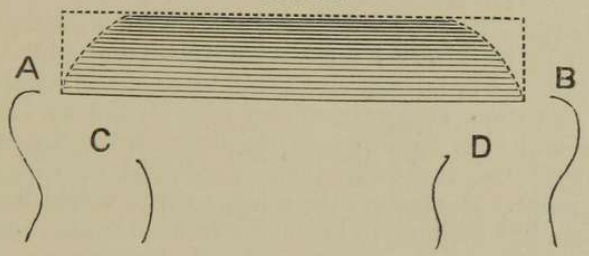
* Pennsylvania Hospital Reports, 1868, p. 36.
† New York Medical Journal, 1865.

ends of these sutures are twisted, that the raw surfaces come in contact entire, not being pierced with the sutures, the sides of the wire (as it were) holding together the cleft. The patient's bowels are to be confined with opium, as above; the catheter used twice a day, and the same after-treatment as before adopted.

The following is Dr. Emmet's description of his operation. The paper was read before the State Medical Society on February 4th, 1873. It is complete and full; it bears the impress of much thought, and I give it to the reader in detail:

"The success of the operation is due to the point at which the first suture is introduced in relation to the edges of the divided muscle. If the first suture be entered on the line and a little outside of A B, Fig. 496, at

FIG. 496.



the point which would seem most appropriate, but a small portion of the muscle could be approximated, as shown in Fig. 497, and incontinence to some extent must be the consequence.

"Introduce the suture, however, at some distance behind the muscle, toward the coccyx, at the points C D, Fig. 496, and we see at a glance, by

FIG. 497. FIG. 498.

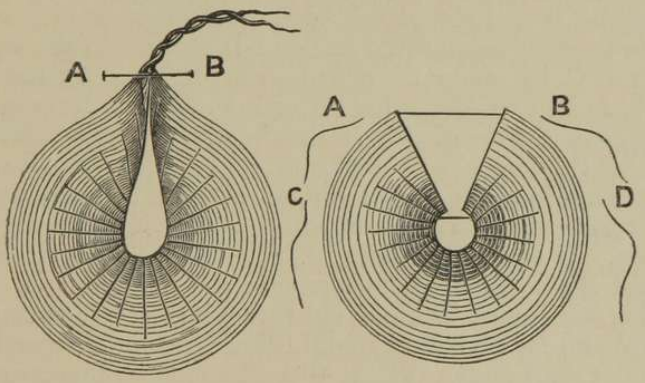


Fig. 498, that on securing the suture the divided edges of the sphincter must be turned up and brought in perfect apposition.

"I will now briefly describe the operation. The patient should be placed on the back, with the legs flexed on the abdomen, and held by an assistant on each side. The surfaces which have been lacerated, and to be denuded, are generally well mapped out by a slight cicatricial glaze, and under ordinary circumstances, although sloughing has occurred, there can be but little difficulty in determining the extent. I prefer the use of a pair of slightly curved scissors to the knife: the surface can be removed with greater dispatch and with less loss of blood. The denuding should

be commenced from the most depending point, and extended upward so as to be free from the annoyance of blood flowing over the surface to be freshened. If we examine carefully the extremities of the lacerated muscle, we will find a slight pit or depression at each end, which has been caused by the contraction of a portion of its fibres. It is necessary to freshen these surfaces, for by doing so we denude the ends of the muscle, and on that side of the depression go over to a great extent the surfaces included between the dotted angles shown in Fig. 499. At the commencement of the operation, seize with a tenaculum a portion of the tissues at one of these points, with the scissors remove a narrow strip entirely around the laceration to the opposite end of the muscle, and as close to the edge of the rectal mucous membrane as possible without wounding it. One strip after another is to be thus removed until we reach the neighborhood of the carunculæ above. If there should be a partial prolapse of the posterior wall, it will be necessary to extend backward the denudation of the vaginal wall sufficiently to turn in the excess of tissue and gain a firm support with the perinæum. I have long since exhausted my ingenuity in devising hollow needles of various curves to convey directly the wire and needles of different shapes and size. I have settled down to the use of an ordinary stout needle, about two inches in length, straight, or with but a slight curve near the point. A needle with a large curve would be best adapted for this operation, but without it be made square towards the eye it is apt to turn in the grasp of the forceps or break by bending. If a hollow needle is used, shaped as an awl, but with a larger and double curve, it is as difficult to direct its course without greatly increasing its diameter. This is objectionable, for, in such vascular tissue, the risk of thrombus, and abscess afterwards, is greatly increased if the calibre of the passage made by the needle is much larger than necessary for the reception of the silver wire. If a simple needle is used it should be armed with a double silk ligature, secured from slipping by a half-knot at the eye.

"With the index finger of the left hand in the rectum to serve as a guide, the needle is introduced behind the muscle to the left, at the point D, and made to sweep around the angle of laceration in the septum to the point of exit at C, by gradually rotating the forceps. As the point punctures the skin in its exit, the index finger is withdrawn from the rectum to aid the passage of the needle, by sliding back the tissues sufficiently for it to be seized by the forceps and drawn through. The second suture is introduced just outside of the end of the muscle, and in the same plane with the divided rectal edge. The third suture is to secure the vaginal edge of the laceration. It should be made to include the tissues liberally, and to sweep around the angle at some distance beyond the first and second suture, as this one is most liable to cut through the recto-vaginal septum.

"The third and fourth suture would bring together the portion denuded on the posterior wall of the vagina, with the view of increasing the depth of the perinæum. Should the prolapse have been more extensive, so as to need the operation for rectocele, the denuded surfaces on the septum should be secured by interrupted silver sutures extending within reach of those intended to form the perinæum. If these sutures in the vagina are properly bent flat to the surface, they may remain undisturbed twelve or fourteen days. They can then be removed while patient lies on the back, using a small-sized Sims's speculum introduced under the arch of the pubes. If the necessity does not exist for making the perinæum unusually thick and strong, the fourth and fifth sutures are merely passed through one labium and across through the other. A portion of silver wire is to be twisted to the end of each silk loop, and drawn through in turn. It is necessary to

secure first the lowest suture. This is done by seizing the ends of the wire at a proper distance, so that the index fingers may be used to slide the tissues firmly down on the suture, as moderate traction is made with the hands. The suture is then secured, without relaxing the traction, with several half turns made by reversing the position of the hands from one side to the other. Each suture is thus in turn secured from below upward. Experience can alone indicate the proper amount of tension to be made, and success to a great degree will depend upon this manœuvre. The parts should be just brought in apposition, and no more, for in a few hours there will be sufficient swelling to force the tissues in close contact. If the sutures have been twisted too tight, and especially if they have been introduced in too superficial a manner, they will cut out from behind forward, so as to leave a recto-vaginal fistula, or the tissues in front will have become sufficiently strangulated to set up some inflammatory action, resulting afterwards in a labial abscess. I am in the habit of twisting the sutures, and cutting them off some three or four inches in length. These are then secured together, as the radii of an open fan, by twisting a loop of wire around their ends. This loop is prevented from slipping off by bending over and backward a portion of one of the sutures, and the ends of the others are cut off at an equal length. This arrangement keeps the sutures stationary and guards against a common source of inflammation from violence, to which the separated and unprotected ends would be constantly exposed, when too short. The patient is placed in bed on the back, with the knees tied together and a pad between them. The after-treatment may be summed up in a few words.

"If the bowels have been thoroughly acted upon previous to the operation, they may remain undisturbed for twelve or fourteen days without discomfort. The diet should be so regulated, and opium administered when needed in sufficient quantity, to keep the bowels quiet. The chief care is in emptying the bladder, so that the urine is not allowed to drop from the catheter on the uniting surfaces below. If the urine, even in small quantity, is permitted to pass backward into the vagina, it will find its way readily between the denuded surfaces, and when the sutures are removed it will be found that but little or no union has taken place. With an inexperienced nurse, I have the bowels moved by castor oil on the sixth day, and remove the sutures a day or two afterwards. With a nurse accustomed to the operation, I withdraw the sutures in a week and have the bowels moved a few days after, for the nurses learn to support the parts with their fingers while the bowels are acting, so as to relieve the recently united surfaces from all strain. It is a good plan to have a small quantity of warm olive-oil gently thrown into the rectum just before the bowels are moved. When the sutures are to be moved, the precaution should be taken to draw them out across the buttock, on that side of the loop which has been cut, so that the parts will be kept in contact by the suture until its withdrawal. It is necessary that the knees of the patient should be kept tied together for several days after the sutures have been removed, and always at night for some time longer. A few days after the operation the position may be changed from the back to the side, provided that the sutures are protected, and the move can be made by the nurse without effort on the part of the patient. Between the second and third week the union will be firm enough to allow the patient to sit up, but she should be instructed to keep her limbs together as much as possible, for although there may now be but little fear of laceration, yet absorption will rapidly take place if a sufficient amount of traction is exerted.

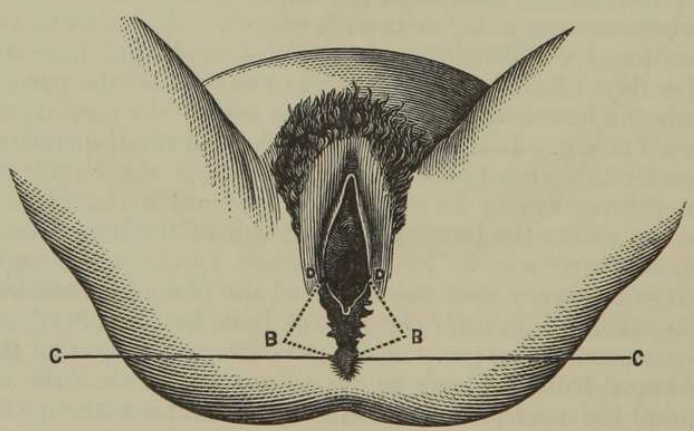
"It is important that we should consider more in detail the action of

the first suture, on which so much depends. As this suture runs backward, obliquely across the diameter of the rectal extremity, it seems impossible that it could be secured without shutting up the anus. This, however, is deceptive, for the ends of the muscle must be drawn upward on tightening the suture passed above through the recto-vaginal septum, which is a fixed point to a certain extent. The relative position of this suture is shown in Fig. 497 to be above the anus when twisted, and as the rectum turns immediately backward into the hollow of the sacrum, the outlet is in no manner encroached upon. When this suture is secured, its tendency is to roll upward and outward the tissues from the rectum towards the vagina, and to bring below the edge of the laceration a portion of undenuded mucous membrane of the rectum in contact throughout its course. This suture, therefore, along the rectal portion, acts as a safeguard in relieving the second suture from tension, and is a protection against the tendency of flatus to force a passage through into the vagina. In my former operations, this second suture, passed on a line with the edge of the laceration through the rectum, was the first and main stay. I then frequently noted as the other sutures above were secured, that the tissues were forced downward with the effect of springing apart, as it were, the loop of this the first suture, and a large portion of denuded tissue became rolled out into the rectum. The result was the frequent occurrence of a small recto-vaginal fistula at the thinnest point in the septum. This opening was generally just behind the sphincter, and difficult to close from the constant action of the muscle, so that I generally divided anew the recently united perinæum and sphincter, denuded thoroughly the edges of the opening, and closed the parts again as in the first operation."

Prof. John T. Hodgen, of St. Louis, has lately introduced "a modification of the usual operation for lacerated perinæum," which was published in *The Medical Archives* for June, 1872, and also reprinted in pamphlet form. The operation is performed in the following manner:

"An incision is carried through the centre of the lower border of the imperfect septum, between the rectum and vagina, splitting it in the

FIG. 499.



C C, transverse line through the centre of the septum. B B, first incision. B D and B D, lateral incisions carried from B B forward to D, the muco-cutaneous junction.

middle. The two ends of this incision are about one and a half inches from the median line, and about half an inch anterior to a transverse line drawn through the centre of the septum. This incision is about one-third

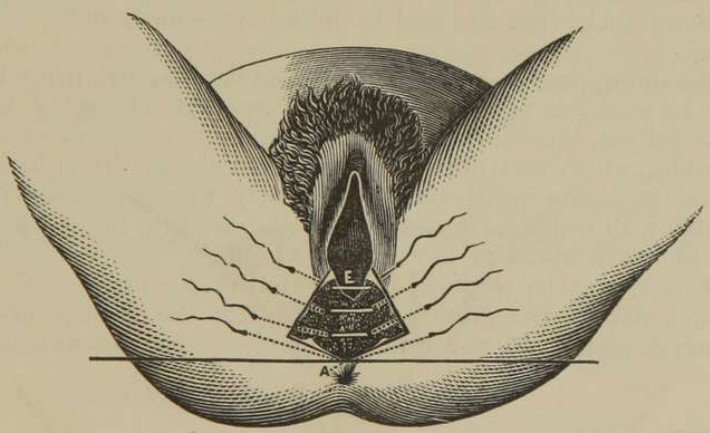
of an inch deep at its central point, with its lateral portions passing into the subcutaneous areolar tissue. Other incisions of equal depth and about an inch and a half long are carried from the ends of the first incision forward and toward the median line, until they reach the muco-cutaneous junction of the labia majora.

"These thick, triangular flaps being dissected from their posterior lateral angle, but left attached along the inner or muco-cutaneous border, are now drawn forward over the vulva by their free angles, with the cutaneous surfaces toward the vagina and the cut surface externally. The borders which correspond to the line of the posterior or first incision are thus approximated and held by interrupted sutures, beginning at the anus, made by passing a fine needle armed with silk through, first from the cutaneous to the cut surface, and then the other flap from cut to cutaneous surface, so that when tied the knot shall be on the cutaneous side of flaps. This suture should be repeated every quarter of an inch until the free angles are reached.

"The usual deep sutures of silver wire are now placed, entering for the first one at a point on the buttock about an inch beyond the cut surface, and nearly opposite the outer posterior angle, and, traversing deeply the septum between the rectum and vagina, it emerges at a point (on the opposite buttock) corresponding to that of entrance.

"The second suture is placed about half an inch anterior to the first, and enters about an inch from the margin of the cut surface, and, traversing the tissues, emerges from the cut surface near the attached line of the flap, and passing across external to the flaps re-enters at a corresponding point near the attached line of the other flap, traversing the tissues of this side

FIG. 500.



E is at the free margins of the skin flaps; E A is a line of junction, by interrupted sutures, of margins of flaps taken from incision B B. The dotted lines represent the portions of the wire which are buried in the tissues, and the black and white portions are external to the tissues.

to emerge through the skin an inch from margin of cut surface, and half an inch anterior to similar point in first suture. A third, and if necessary a fourth, suture may be used anterior to those above described, being placed about half an inch apart.

"The thighs are now brought together, pushing the flaps of loose skin forward toward the vagina, and holding them in apposition by tightening and twisting the wire. It will be seen that the flaps, which are usually cut off, are made to serve a double purpose. They double the extent of the surfaces

approximated, which increases the strength of the new perinæum, and their cutaneous surfaces are continuous with the vagina, thus furnishing an apron which prevents the vaginal discharge and urine from flowing into the cut.

"In these two points consist the advantages claimed for the modified operation.

"The margins of the flaps, which correspond to the outer borders of the denuded surfaces, are without sutures, leaving thus an opening for the discharge of pus from any part of the denuded surfaces which may not unite by first intention, and preventing the formation of openings for the discharge of pus along the line of the sutures."

Vesico-Vaginal Fistula.—By the above term is understood a communication established between the vagina and bladder or urethra in the female.

The symptoms are unmistakable. There is a constant discharge of urine through the vagina, which of course the patient is unable to control; the parts become inflamed and excoriated, the thighs also becoming much irritated. There is that constant odor of heated or hot urine which is familiar to all, and which is disgusting to the patient. The aim of life appears lost to the unfortunate woman, and she is a prey to mortification and grief.

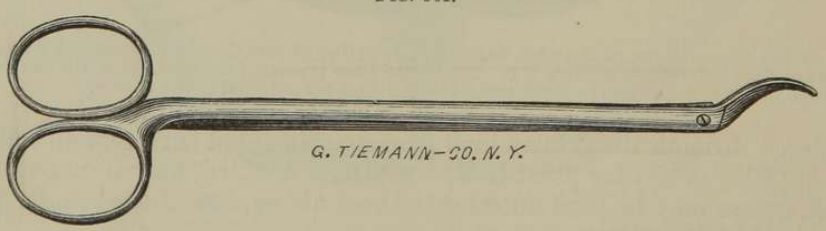
In olden times these fistulæ were considered incurable, but at the present time the majority of them are amenable to surgical aid. The causes are chiefly inflammation and sloughing of the parts occasioned by the pressure of the head of the fœtus; sometimes the forceps have made the rent, sometimes a lithotomy wound produces it. A sensitive vagina and a large hard pessary are also favorable for the formation of vesico-vaginal fistula.

It was formerly supposed that these accidents were in the majority of instances occasioned by instrumental delivery, but the reverse is found to be true. Dr. Sims says on this point, "From a careful analysis of these cases, and from my own experience, I am well satisfied that for one case thus produced their (the forceps) judicious application has prevented it fifty times."

These fistulæ appear in many parts of the vagina, and are often complicated. In a case of my own there was a complete closure of the upper part of the vagina, thus shutting up the os uteri; a complete extroversion of the bladder, which protruded like a large red cherry through the vulva. This patient in agony menstruated vicariously through the rectum. In another case, with complete destruction of the urethra, there was prolapse of the bladder, and also a recto-vaginal opening.

These fistulæ may be confined to the urethra, the neck of the bladder and the back part of the urethra, or the base of the bladder, or with the body or cervix uteri. There are many complications often existing in this

FIG. 501.



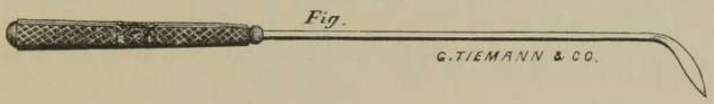
disorder, which space will not allow us to mention. The student may refer to the works of Thomas, Sims, and especially to the brochure on the subject by T. Addis Emmet. The operations described are those of Drs. Sims and Emmet, and that of Bozeman.

Sims's and Emmet's Operation.—The patient having been placed in position, as described in the first section, and which is known as Sims's position, a Sims's speculum is introduced, the perinæum drawn well back and the fistula brought into view; the edge is raised with a fine tenaculum with a long handle, and the parts either pared away with scissors bent at right angles, or those of Dr. Emmet, which are made rights and lefts

FIG. 502.

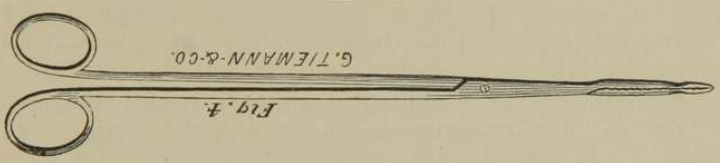
(Fig. 501), or with one of Sims's straight knives (Fig. 502), or if the parts require a knife, with a right-angled blade, as seen in Fig. 503. During this

FIG. 503.



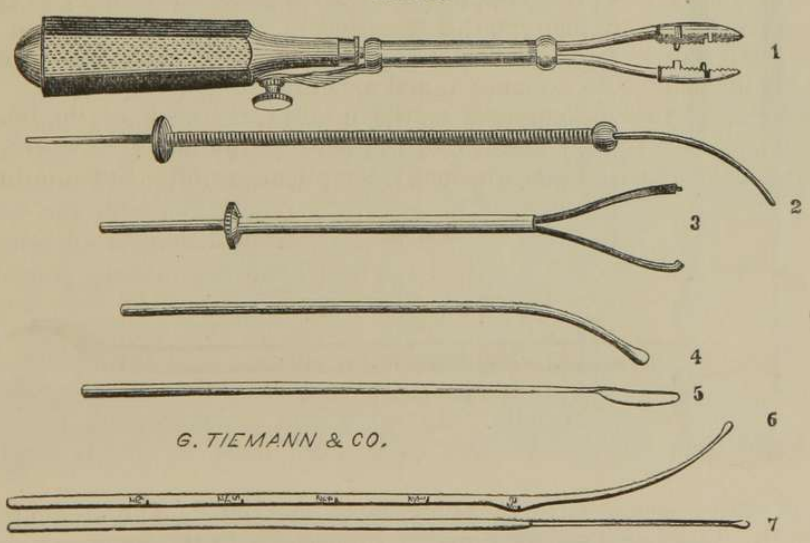
portion of the operation, the sponge, held in an applicator or sponge-holder, or with long uterine forceps (Fig. 504), should be in frequent use.

FIG. 504.



In the gynæcological operating cases are several instruments capable of being set in one handle, which serve valuable ends in this operation. In Dr. Nott's case the following are found, which are very useful (Fig. 505):

FIG. 505.



"The series is a sort of *multum in parvo* and designed particularly to economize space.

"No. 1 is a modification of Roux's needle-holder; it is an excellent needle-holder, which may be used in the operations of vesico-vaginal fistula and cleft palate, and is made to serve as a handle to the instruments accompanying it, and which are represented one-half their full length. When the handle is applied to either one it gives it its full length.

"No. 2 combines the applicator with the sponge-tent expeller.

"No. 3 is a sponge-holder and ligating forceps.

"No. 4, a lead sound, which easily follows the curve of the uterus.

"No, 5, intra-uterine scarifying knife, blunt point.

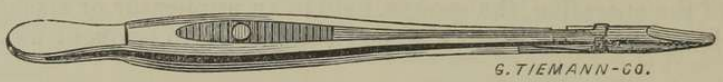
"No. 6, Simpson's sound.

"No. 7. uterine probe, of pure silver."

While this part of the operation is proceeding the surgeon must take care that the mucous vesical surface is not injured.

A good deal of time is often required to refresh the edges, and the operator must continue until he is sure that every portion of the fistula is denuded. Simpson says, "Enter the point of your knife into the vaginal mucous membrane at some distance from the fistula; then transfix with your knife the edges of the fistula to the extent you intend to remove it,

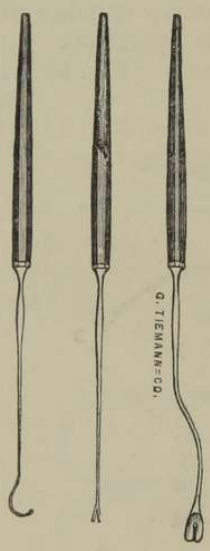
FIG. 506.



and bringing it out at the vesical border, carry it right and left fairly around the opening, so as if possible to bring out a complete circle of tissue."

The needles then threaded with silk, to which annealed silver wire may be attached, must be fixed in the forceps. The needles used are short, and are held either in long forceps, as seen in Fig. 44, page 190, or in an instrument such as is represented in Fig. 506.

FIGS.
507. 508. 509.



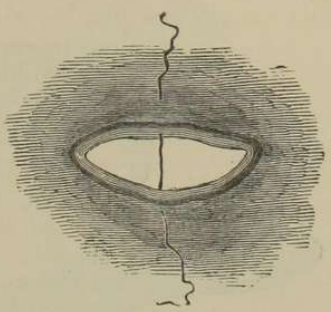
The passage of the suture is a matter of great importance. The operator should, as a rule, select that part of the fistula most difficult to reach, and should enter the needle from a quarter to half an inch from the pared edge, and bring it out just anterior to the mucous membrane of the bladder. As its point emerges it is encircled with a small blunt hook (Fig. 507), which presses the tissues around it, so that it may be caught with a seizing forceps (Fig. 510) and drawn through. The needle is then taken with the forceps, its point entered in the refreshed margin opposite that where it passed out and near the mucous vesical surface, and made to emerge about half an inch from the pared edge of the fistula on the vaginal side (Fig. 511). The tenaculum must be used during this operation, to render the parts tense for the better passage of the needle. As the thread comes through, to prevent the tissues from tearing, the fork (Fig. 508) must be gently employed.

FIG. 510.

When the silk is drawn through, the wire follows, and suture No. 1 is

ready for twisting, which, however, is not done until a sufficient number of sutures are passed. So soon as they are all entered and brought out, the ends of the wire of the first suture are seized by the forceps, the spoon (Fig. 509) is slipped up to the tissues and the wire twisted, as seen in Fig. 45, page 191. The sutures having been all twisted, their ends are clipped with the scissors, the bladder syringed out, and Sims's self-retaining catheter (Fig. 512) placed in the bladder. A small cup should be placed between the limbs to catch the urine, and the patient ordered a light and nutritious diet.

Fig. 511.



The sutures may be allowed to remain from ten to fourteen days, and in certain cases perhaps even longer.

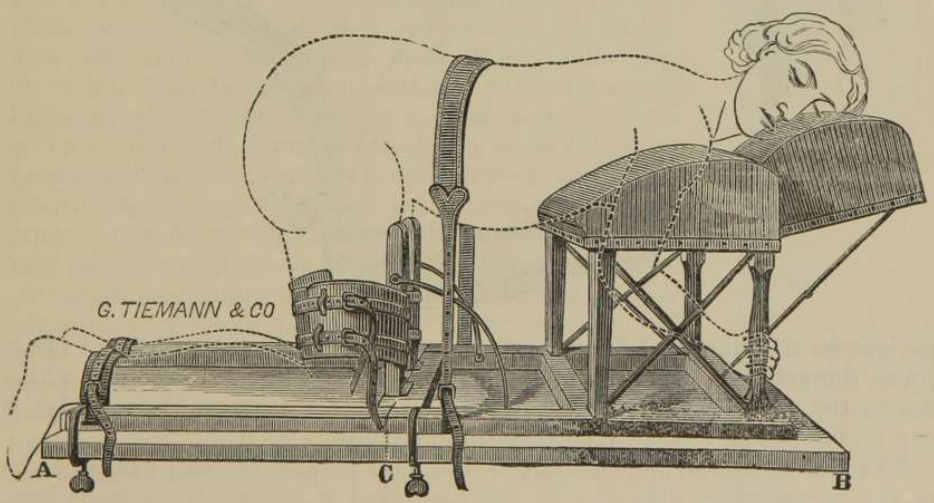
Great care is required in the removal of the sutures, as the wire has a tendency to become somewhat imbedded in the tissues. It may readily be accomplished by raising gently with the forceps the twisted ends of the sutures and inserting the sharp end of a small pair of scissors beneath the loop as it is drawn up, and severing the wire. The forceps may now be used with a slight rotary motion, which twists out the wire without traction on the parts.

Fig. 512.

In the earlier days, Dr. Sims recommended clamps and perforated shot. This I used in several cases with good results, and now am not sure whether the method of fastening by perforated shot is not accomplished with more facility than the twisting of the wires.

Dr. Bozeman's operation has met with high favor, and is thus performed. Hamilton, in his recent work, says, the "distinctive characters of Bozeman's operation are: the *button suture*, the *position of the patient*, and the *self-retaining speculum*."

Fig. 513.



Dr. Bozeman, first of all, removes all obstructions from the vagina, in the shape of bands and adhesions; this is done by division and dilatation,

and, to prevent contraction, bags made of oiled silk, and stuffed with sponge, are inserted into the vagina. So soon as this is effected, the patient

FIG. 514.

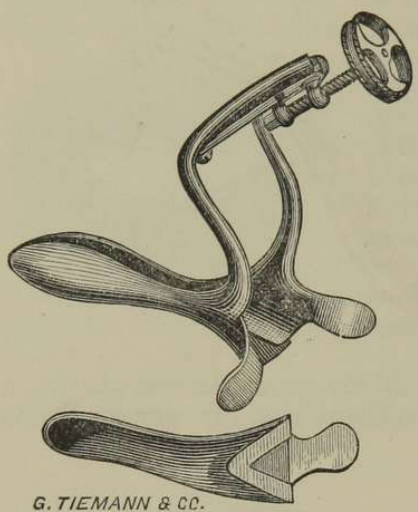
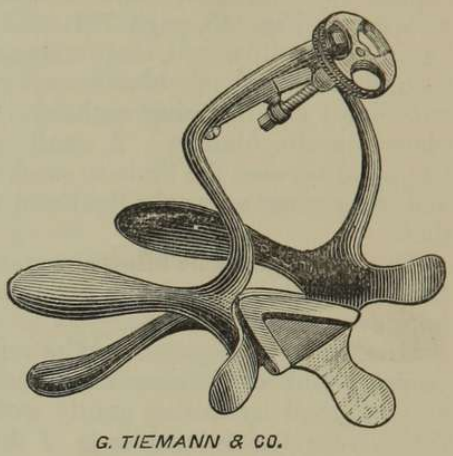
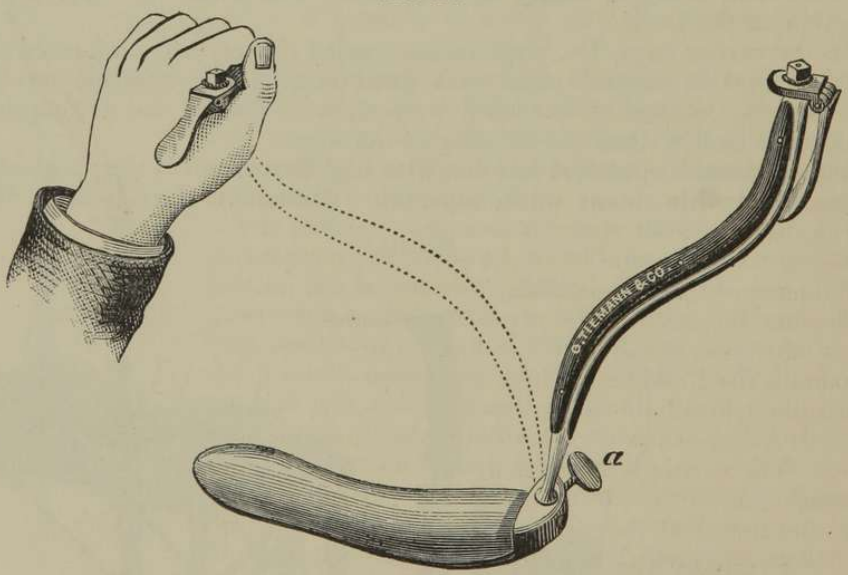


FIG. 515.



is ready for operation. The *position* of the patient is that now known as the knee-chest position. Formerly the operation was conducted with the

FIG. 516.



patient on the elbows and knees, which was often most fatiguing and sometimes dangerous. Dr. Bozeman has an operating chair (Fig. 513) which fits to the table, A B, by thumbscrews, and has a joint at C, by which it can be folded up, to look like an ordinary chair.

The patient having been arranged, the next point is the full examination of the parts. For this, Dr. B. has contrived a self-retaining speculum. Fig. 514 shows the instrument closed with the detached "perineal blade," while Fig. 515 represents the instrument with the blades expanded, and the perineal portion fixed in its position. These illustrations are about three-quarters the real size. Sometimes, instead of using the perineal blade, Dr. Bozeman uses his "perineal elevator" (Fig. 516), which, passing be-

tween the blades of the speculum, and against the posterior wall of the

FIG. 517.

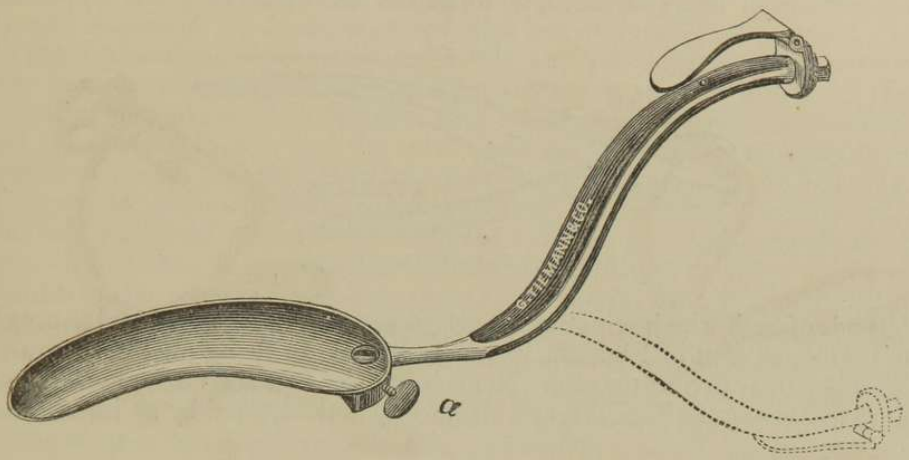


FIG. 518.

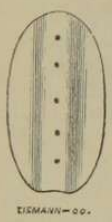


FIG. 519.

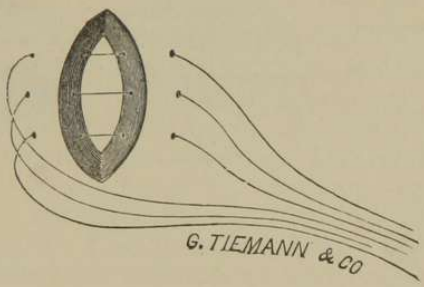
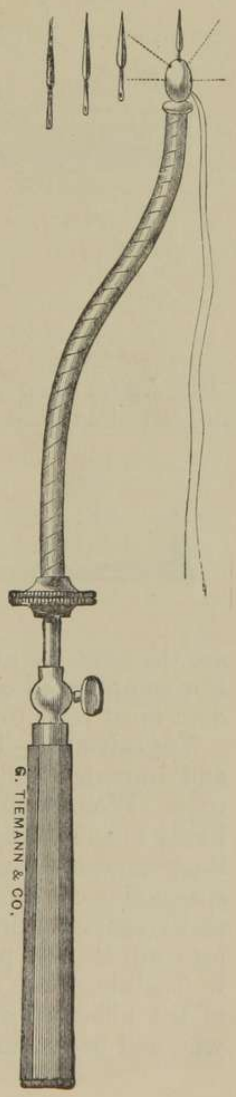


FIG. 520.

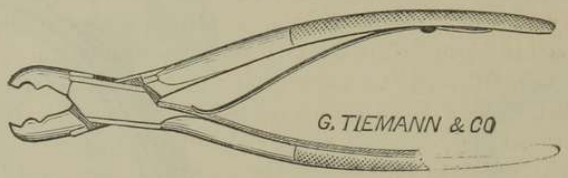


vagina, that canal can be most fully dilated. By turning the screw *a*, the blade can be set in four directions. In Fig. 517 the instrument is seen employed as a depressor of the perinæum when the patient is recumbent.

The paring of the edges of the fistula is accomplished much after the manner already described, and the next step is the insertion of the needles. Fig. 520 shows Bozeman's needle-holder, which is composed of a flexible canula, which holds the needle at the required angle. The dotted lines show angles at which the needles may be set. The needle is entered about one-third to one-quarter of an inch "from the pared surface, passed along the tissues of the septum, and is made to emerge just below the vesical mucous membrane, where it is caught upon a blunt hook, seized by the forceps and drawn through. . . . . Thus transfixing of the mucous membrane is avoided." Fig. 519 shows bevelled tissues and threads *in situ*. The wires are then adjusted by passing them through an instrument with an eye at its extremity, and the button passed up to the cut surfaces. The button is made of lead, is one-twentieth of an inch thick and five-eighths of an inch in width, and must be cut of length and width to fit the part, and perforated in order to admit the wires. The holes should be about one-third of an inch apart. Fig. 518 shows the button. It must be then moulded or arched, which is

conveniently done by the plate-bending forceps of Dr. Bozeman (Fig. 521). By this bending or arching of the button, the lips or edges of the fistula are prevented from being strained, while at the same time they are supported.

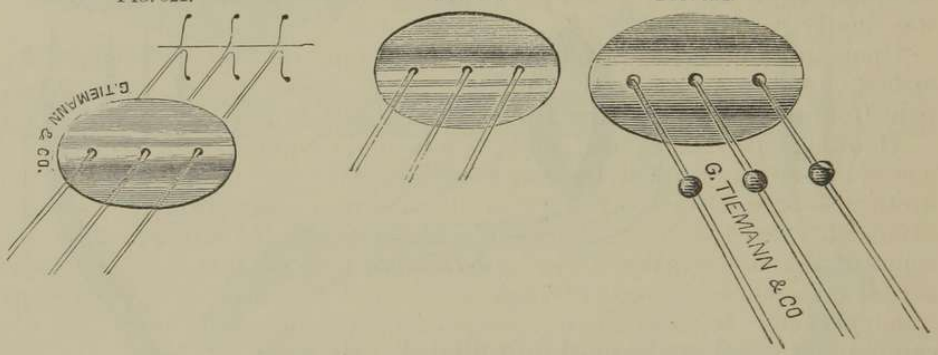
Fig. 521.



Bozeman's Plate-bending Forceps.

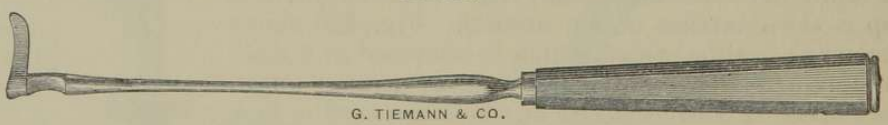
The ends of each wire having been brought together, they are passed through the button, as seen in Fig. 522, which is slipped up to its place, as seen in Fig. 523; then perforated shot (No. 3 being the best size) are placed upon the wires, as seen in Fig. 524, and slipped up and adjusted by an instrument

Fig. 522. Fig. 523. Fig. 524.



(Fig. 525); then with a pair of strong forceps, made somewhat after the fashion of bullet-moulds, the shots are compressed. The ends of the wires

Fig. 525.



are then cut off an eighth of an inch from the button and turned down. For complicated cases other forms of buttons are used. For these the student must refer to special treatises.

Vaginismus.—This disease, which a few years ago was little understood and imperfectly described, has found but small space in surgical literature. Women of nervous temperament, of an emotional nature, are most likely to suffer from this affection, and it will be generally observed that with it are associated symptoms of spinal irritation. It consists of an involuntary spasmodic contraction of the ostium vaginæ, attended with such hypersensitiveness of the vulva and outer extremity of the vagina that the slightest contact may produce great pain, and marital intercourse be rendered impossible. The following case will serve to present the characteristics of the affection, and the treatment necessary for its cure: A young lady who had been married about eight months, possessed of a naturally strong

constitution, was brought to me by her mother, who detailed the following symptoms:

Shortly after her marriage, a peevish and fretful state of the nervous system was manifested, accompanied with loss of appetite and nausea; but as these conditions were attributed to the new relations of life into which she had recently entered, no particular treatment was instituted for their relief. Constipation then followed with such complete anorexia that medical aid was summoned, and the usual routine of cathartics and tonics administered, with no effect, save an aggravation of nearly all the symptoms. Emaciation and excessive nervous irritability followed, together with anæmia and great prostration, which the exhibition of cod-liver oil, wines, and other tonics, in conjunction with travelling, failed to relieve. In the condition described I found her, and upon a careful examination of all the symptoms arising since her marriage, was led to suspect that these manifestations were due to *reflex* nervous action, arising from an irritable uterus.

But on further inquiry I learned that the menses had appeared regularly, and although somewhat less in quantity than usual, still presented, in all other respects, a natural appearance. Therefore an examination *per vaginam* was suggested, but although at first strongly opposed by the patient, was finally permitted.

Upon attempting to introduce my finger into the vagina I found the orifice closed to such a degree and the patient suffered such excruciating pain from the touch, that the attempt was abandoned.

Thinking this remarkable sensitiveness might be due to the presence of one of those painful tubercles that sometimes are found at the orifice of the urethra, I proceeded to make use of the speculum; but although no such excrescence existed, it was impossible to introduce the instrument on account of the severe pain. Her husband informed me that any attempt at sexual intercourse caused her such agony and produced in her such extreme nervous excitement that hours would elapse before she would become calm again. I was now fully satisfied that the patient before me was suffering from vaginismus, the description and treatment of which had just about that time been published in the *American Medical Times*, May 31st, 1862. Dr. J. Marion Sims, whose improvements in the surgical treatment of female diseases were then attracting the attention of the medical profession, on April 2d, 1862, presented to the New York Academy of Medicine his paper on vaginismus, in which he described five cases presenting symptoms analogous to those detailed above; also the ineffectual means which he had employed for their relief, and finally the method by which each and all were speedily and perfectly cured. In conclusion he says: "From personal observation I can confidently assert that I know of no disease capable of producing so much unhappiness to both parties to the marriage contract, and I am happy to say that I know of no serious trouble that can be so easily, so safely, and so certainly cured."

The method employed by Dr. Sims, places the patient on her back; the index and middle finger of the left hand are passed into the vagina, separating the labia laterally, opening the canal as widely as possible and drawing the fourchette very tense; then with a common scalpel make an incision through the vaginal tissue, a little to the right side, bringing it from above downward, and terminating at the perineal raphé, making one side of a V; then insert the knife on the left side and cut obliquely toward the first incision, so as to join it at the raphé; then follow the raphé itself until the incision resembles the letter Y. The amount of hæmorrhage is generally unimportant and will be readily controlled by the pressure of a glass dilator, which may be introduced immediately or twenty-four hours after

the operation, where, by an appropriate bandage, it is kept *in situ* for two hours in the morning, and two or three hours in the evening, according to the tolerance of the patient.

By this treatment I effected a perfect cure in my patient, and she has since become a mother. Since that period I have treated successfully a large number of cases.

In the *New England Medical Gazette* for August, 1873, Dr. E. Clark, of Portland, Me., one of the oldest and most valued exponents of our school in that State, relates a perfectly successful cure of a case similar to the above, by means of the same operation.

Ludlam, speaking of this subject in his *Diseases of Women* says, "Unless there is some special reason why the cure should be speedy, it is best to try the milder means," before resorting to the knife.

One of the plans recommended to overcome this spasm of the vagina is the gradual dilatation of the canal by bougies. These should be anointed with oil or a preparation of extract of belladonna, one part to six parts of lard or simple cerate. The process will be necessarily somewhat tedious, but a persistent use of these instruments, from a few minutes to an hour or two each day, with the administration of the remedy which seems indicated by the general condition of the patient, will often be rewarded by a permanent cure.

Incidental or transient attacks of vaginismus may be relieved by the application of a mixture, consisting of chloroform one drachm, and olive oil and glycerin each one ounce. If the spasm is severe, the mixture may be thrown into the rectum, and treatment instituted most likely to remove the cause on which the paroxysms depend.

Atresia Vaginæ.—This closure of the canal may be either congenital or acquired, being often of the former variety. The nurse or mother discovers the fact. In such cases there is generally sufficient space for the passage of the urine. Sometimes the entire canal is occluded from ulceration in early life, and sometimes from imperforate hymen. The great difficulty in these cases of atresia is the diagnostication of the presence of the uterus; and this is the more difficult, because sexual instinct may be present when the womb is absent. It depends more upon the ovaries than the uterus. In such cases the most careful examination must be made per rectum and over the abdomen. If a tumor be found at the latter point, it may be assumed that it is formed of menstrual accumulation.

I have had in all thirteen cases of this affection, five congenital; two I saw and operated upon with Dr. Skiles, of Brooklyn; one aggravated case, a patient of Dr. Mandeville of Newark; several other cases came under my observation in Missouri. The following, as typical, is a record of one of the latter:

Mary B——, from Illinois, entered the hospital, having been brought thither by her physician to have her condition relieved, if possible, by an operation.

She stated that, seven months previously, being taken in labor, she sent for a midwife in the vicinity, who was engaged to superintend during the accouchement, and who, during the whole course of the confinement, appeared to the patient to be constantly irritating the vagina, either with her finger-nail or with some foreign material. The child was stillborn, though large; the vulva afterwards became much tumefied, in the expectation of relieving which she was attended by a physician, until the symptoms of inflammatory action had disappeared, when she discovered that the vagina was occluded. This condition of things lasted seven months.

I placed the patient on her back, in the position for lithotomy, before a window, and endeavored to insert the index-finger of the right hand into

the vagina, but such a procedure was absolutely impossible; not only had a thick fibrous growth closed the entrance of the canal, but it appeared to have drawn together the labia minora, and to be continuous with them; it was evident, therefore, that nothing could relieve her but an operation, which I prepared immediately to perform. The only question of importance that demanded serious consideration was this: Could there have been, from the long impaction of the head of the child, a rupture of the wall of the bladder, and of the superior portion of the vagina, thus forming a vesico-vaginal fistula, which nature had in a measure remedied by closing up the vagina? And would an operation in such a case be justifiable? It is a well-known fact that these fistulæ have been closed in such a manner by operation, when the slough between the bladder and vagina has been large, and I have high and direct authority in saying that no bad results have been known to follow such operation, the menses passing through the urethra with the renal discharge. Even dysmenorrhœa is a very rare occurrence in such cases.

Taking, however, all things into consideration, I concluded that it would perhaps be better to relieve the patient by dissecting out the foreign tissue, and if a fistula did exist, to afterwards attempt to close it with the silver wire, clamps, and perforated shot. Accordingly (the patient being in the position before mentioned, and the anæsthetic agent sufficiently exhibited), I passed a catheter into the bladder through the urethra, and had it there firmly held by her physician; then with a pair of forceps, raising the fibrous inodular tissue, I made an incision about one inch in length through the centre of the growth; this cut was half an inch in depth. There appeared on one side of the vagina to be a spot that presented rather a fluctuating point, and through this another incision was made, when immediately there flowed forth about a gill of watery fluid. I was certain, from this, that there must be a communication between the bladder and the vagina; but upon inserting the finger into the wound, I discovered that there remained a portion of vagina that had not been perfectly occluded; this space was about the diameter of a quill, and extended nearly to the uterus. By carefully moving the catheter in the bladder, and the finger (now already over two inches within the vagina), not the slightest fissure either in the viscus or the canal could be discovered. The remaining part of the operation was very simple: I had the unoccluded part of the vagina to guide the knife, my finger in the rectum to prevent a laceration of that intestine, and the catheter in the bladder to protect that organ; the whole canal was then opened by frequent incisions with the bistoury. I then greased a sponge, as large as could possibly enter the cavity, with calendula cerate, and having carefully syringed the parts, inserted it into the vagina.

The patient made a rapid recovery. In other cases, however, I have been as successful with less cutting, and I am disposed to believe that mucous surfaces separate better with gently breaking up of adhesions with the finger and blunt instruments, with here and there a touch of the knife to sever a fibrous or cartilaginous band, than when the knife is employed exclusively; moreover, union by the first intention is not nearly so likely to result. A catheter in the bladder, held by an assistant; the forefinger of the left hand in the rectum, to guide and draw away the parts, and the forefinger of the right hand in the vagina, worked steadily and carefully, now and then using the knife to free strong adhesions, will be productive of better results than the use of cutting instruments.

Elephantiasis of the Labia.—The disease is classed by most authors, (Tilbury Fox,* Rayer,† and others), as one of the hypertrophies of the same

* Skin Diseases, p. 331. † Treatise on Diseases of the Skin, p. 401.

genus as ichthyosis, keloid, and fibroma, and by Paget as *cutaneous outgrowths*, which appears but another name for the same pathological state. He says: "The best examples of *cutaneous outgrowths*, of which, as I have said, a second division of the fibro-cellular outgrowths is composed, are those which occur in the scrotum, prepuce, labia, clitoris and its prepuce, and, not unfrequently, in the lower limb. These, which reach their maximum of growth in the huge *elephantiasis scroti* of tropical countries, consist mainly of overgrown fibro-cellular tissue, which, mingled with elastic tissue and more or less fat, imitate, in general structure, the outer, compact layer of the cutis. Their tissue is always closely woven and very tough and elastic; in some cases it is compressible and succulent, and it yields on section a large quantity of serous-looking fluid." He speaks also of the great enlargement of the veins, which he noticed in a specimen under examination. I have given this brief quotation from Paget, because it covers exactly the appearances of the tumor after removal, which is accomplished only after a prolonged and *very* bloody operation.

It is said that inflammation of the lymphatics constitutes the first stage in this affection. These, therefore, being arrested in their function, the lymph remains to be appropriated to the tissues, thus rendering them hypertrophic. Another of the chief peculiarities in these cases is the enlargement of all the veins and the extremely patulous condition of their mouths, together with an enlargement of both arterial and venous capillaries. The bleeding is always most profuse and often dangerous when these tumors are removed, after they have attained any magnitude, and no one can read over Allan Webb's description of the amputation of the scrotum for elephantiasis arabum without seeing at once the great danger to be apprehended from hæmorrhage.

Cases of elephantiasis scroti, and of "tropical big leg," or "Barbadoes leg," are frequently encountered, and scattered throughout the medical journals can be found the records of numerous cases. But although in many works the fact is mentioned that this form of hypertrophy can and does affect the labia, so far as I have been able to examine the varied books I have in my possession, I can find but very meagre records of such an affection.

Thomas, in his *Diseases of Women*, merely says: "Elephantiasis of the labia differs in nothing from that of other parts. The affection is very rare. Kiwisch records one case, in which both labia increased in size to equal the head of a man, and to fall nearly to the knees. The parts affected by it are the labia majora and minora and the clitoris."* I find also a case reported in an old number of *Ranking*, by Dr. O. Ferrall, to the Dublin Pathological Society, in which a species of cellular pendulous tumor, *seven* inches in circumference, was removed from the left labium. The hæmorrhage was profuse. Dr. Eve, in his *Remarkable Cases in Surgery*, records a case of "excision of the external labia pudendi for sarcoma." This, no doubt, was a case similar to those now known as elephantiasis; indeed, in some instances the disease has been called, especially by Mr. Abernethy, "vascular sarcoma." After relating the history of the patient, the surgeon (Simeon Bullen, Esq., of London), thus writes: "On removing the left labium, the discharge of blood was so rapid and profuse, and the vessels so numerous, that before I could succeed in securing them, fainting had taken place, and the effect on the system was so alarming that I was obliged to postpone for many days the operation for removing the other, which was attended with similar loss of blood. The substance of

* At the college clinic, in 1874, I removed an hypertrophied clitoris, measuring in length five and a half inches, and in breadth nearly three inches. The operation was performed with the écraseur of Chassaignac.

each tumor was composed of adipose and fleshy tissue, numerously supplied with bloodvessels."

Many of the works on Surgery do not mention this variety of hypertrophy as affecting the vulva, although they give descriptions of the disease as found in the leg and scrotum. Velpeau records the case of a girl, whose left labium was affected with an enlargement (hypertrophia). Bryant merely alludes to the fact of a case coming under his observation, and Holmes gives about a page to the consideration of the disorder. I mean as affecting the parts in question, for he has further on in the same volume an extended article on the subject of elephantiasis arabum, in which is given a table of one hundred cases, in which not one is recorded as affecting the labia. The majority of surgical writers do not mention the affection at all.

Treatment.—I do not know of any other medicines for this disease, than those noted on page 332, and with regard to the methods of operating, I shall give here a case of my own, in which the right labium measured one foot in length, and twenty inches in circumference.

On February 7th, 1875, the patient, Mrs. X., was sent to the hospital by Dr. Wetmore for operation. Continuous with the right labium, there appeared a huge, fleshy mass, dark in color, sparsely covered with hair, rugous on the surface, with here and there a deep fissure. From the elastic nature of the tissues, and the infiltration of serum in some parts, there appeared to be distinct fluctuation, which, indeed, I have even known in certain varieties of fatty outgrowths. The doctor explored the tumor with a trocar, passing the instrument into the growth "up to the handle;" a profuse stream of blood flowed through the canula. This operation was repeated a second time with like result. When she came into the hospital, aspiration was resorted to, and, as has been before remarked, about a tablespoonful of serum was withdrawn. A second puncture yielded no result. This serum, as I discovered afterward, found its bed between the meshes of the tissue, for the tumor was solid throughout, but when cut into, quite an amount of serum would immediately trickle away, though there was, apparently, no break in the substance of the tumor. Upon careful measurement, the growth was found to be twelve inches in length, and over twenty inches in circumference, globular in shape, and almost painless when handled.

The patient had been unable to move about for a long period, nor could she retain her urine, the weight of the mass keeping the meatus continually open.

After due consultation, it was deemed advisable to attempt the removal of the mass. The best method of so doing was a question. To apply properly Esmarch's bandage to a globular tumor, is no easy matter; and as it is necessary in using the elastic, to have each turn properly overlap the other, to drive *all* the blood back, I relinquished the idea, fearing the bandage might slip at a critical moment.

I did not think the écraseur safe, where such profuse hæmorrhage was to be apprehended; and although the heated wire presented some points for consideration, I finally adopted, as a preventive, Erichsen's double thread, as used for nævus. This was applied as follows: Taking a stout needle, it was threaded with a strong hempen cord, about four feet in length; one-half of this cord was blackened and allowed to dry; then, having raised the tumor, the needle was passed upward through the pedicle (which was over six inches in length), and brought out on the upper side, and the thread drawn almost through. The needle was then turned, entered on the upper side about half an inch from its place of exit, and drawn through

on the lower side of the tumor, leaving a loop. So this method of stitching was continued, until the whole pedicle was traversed. The pedicle, as I term it, was nothing more than the margin of the labium. The white loops were all cut at the top, and the black ones at the bottom; the white ends of the thread tied tightly together above, and the black ones below. Not satisfied with this, and for a more thorough protection against sudden and exhaustive hæmorrhage, a second row of similar stitching was placed half an inch lower down. Having now the tumor held up, in order to take off all strain on the threads, with a very large scalpel, I rapidly severed the growth. The bleeding, as the knife went through, and for a moment after, was terrific; the blood shot up in a stream which caused an exclamation from the bystanders. A good deal of this, however, was venous, and had been held in the tumor by the superimposed ligatures. After this a steady flow with jets and spurts kept up. Thirty-two vessels were ligated, and Dr. Burdick (who is a remarkable bandager), after having covered the wound with styptic cotton, and placed over this a wad of tenax, firmly applied a T-bandage, and the patient was put to bed. The next morning she had scarcely begun to rally from the terrible shock of the operation, when, upon examination, I found she was bleeding again. The blood had soaked through the bandages and into the bed. All the dressings were removed, and eleven more ligatures applied. This effectually checked the hæmorrhage, and from it there was no further trouble. The patient reacted very slowly indeed, had constant nausea for several days, and could retain nothing on her stomach. Nutritive enemas were given her, but she finally sank and died on the 23d day of February.

"Urethral Excrescences; Caruncles of the Urethra; Vascular Tumors of the Urethra."—Patients who suffer from this affection have various urinary troubles, such as strangury and dysuria, with hypersensitiveness of the nervous system, which are especially noticeable during the menopause. There then appear, either within or around the urethra, these so-called caruncles. Most physicians have seen these exquisitely painful growths, rendering the patient miserable and nervous *all* the time, and giving the most acute agony during micturition or coition. They are generally solitary, but I have now under treatment a case in which there are three distinct lobules to one peduncle.

These "urethral hæmorrhoids," as they are frequently called, from their resemblance to the vascular piles, are, as far as I have seen, situated on the lower border or floor of the urethra.

Treatment.—In the treatment of these very painful tumors, I have never found internal medication of any avail so far as removal was concerned; but the surgical treatment has always been followed by the very best results. I draw down the tumor, pass a fine needle, armed with a strong but fine double thread, deep down into the base of the growth (for, be it remembered, although these growths appear superficial, they often extend quite deeply into the tissues), and then having ligated the tumor, cut it off outside the ligature, and apply either chromic acid, the acid nitrate of mercury, or the actual cautery to the peduncle. J. H. Woodbury* recommends, and highly, too, a medicine for this miserable and trying affection, which medicine is the *eucalyptus globulus*. "With it," he says, "I have been able to entirely cure the patients." *Perfect cures* have been produced by the use of the *eucalyptus*, without a resort to any surgical means whatsoever. He applies a glycerole of the drug to the parts,

* New England Medical Gazette, June, 1876.

and administers internally the first decimal trituration. This medicine must be given a trial, and if it produces such effects as have been mentioned, then, as surgeons, we have added one more triumph to Homœopathic Surgery.

CHAPTER XLIII.

OVARIAN TUMORS.

TREATMENT AND OVARIOTOMY.

THE fact can scarcely be credited, yet mathematical calculation demonstrates the fact that Mr. Spencer Wells alone has, up to the year 1877, added 18,000 years to the lives of women in Europe.*

Six years ago, Dr. Peaslee† thus wrote: "It may be shown in the United States and Great Britain alone, ovariotomy has within the last thirty years directly contributed more than 30,000 years of active life to women, all of which would have been lost, had ovariotomy never been performed."

Since that period a great many additional operations have been performed, and with a most wonderful success. I think the operations of Mr. Thomas Keith, of Edinburgh, show perhaps the best rate of mortality of any published; in fact, it is marvellous to read the record of some of his cases. He says:‡ "I have now operated fourteen times in cases of acute suppurating or putrid cysts. Every one at the time looked hopelessly bad, yet twelve of them recovered. If in such a proportion bad cases do well, surely the mortality after ordinary operations of ovariotomy ought to be much lower than it is. Yet, speaking for myself, the mortality year by year diminishes. In the last 107 operations there have been 10 deaths, while of 21 performed last year, all got well save one."

With such testimony as this, I think we may regard ovariotomy as decidedly the most important operation performed upon women, requiring for its performance more skill in diagnosis and more experience in manipulation, than any surgical procedure with which I am acquainted.

In expressing these ideas, I think I but coincide with the majority of thinking professional minds in all schools of medicine. No one can look over the labors of Korberle, Nüssbaum, and Spiegelberg, in Germany; of Wells, Clay, Brown, and Keith, in England, and especially in this country (from the time of Ephraim McDowell, in 1809, until the present) of Atlee, Peaslee, Kimball, Dunlap, Thomas, Sims, Emmet, Beebe, McFarland, McRuer, and Ludlam, without being thankful for the benefits conferred upon science and humanity by the labors of these distinguished gentlemen.

The chief difficulty in cases of ovarian tumors is the diagnosis. Those conversant with the literature of the disorder know full well how many times errors in this particular have been committed by experienced specialists.

Until the third stage of the ovarian enlargement has been reached, the ordinary methods of diagnosis are perhaps sufficient; but when the question of surgical interference arises, it brings with it the necessity of most careful discrimination.

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* Two Addresses, by T. Spencer Wells, F.R.C.S., London, 1877.

† Ovarian Tumors, p. 340, New York, 1872.

‡ London Lancet, March, 1877.

When we consider the actual capacity by measurement, of that compartment of the human body bounded above by the diaphragm and below by the perinæum (properly so called), a thought that must strike us forcibly is the beauty of the packing, or the curiously compact manner in which so many organs are arranged together in so limited a space. It is indeed a wonder —not easily understood—that these same organs, in absolute contact, can perform their independent functions without interference with each other, at the same time rendering each its service to the harmonious maintenance and growth of the whole structure.

There is also another consideration that does not always receive the thoughtful attention it deserves, and which accounts for many difficulties surrounding the recognition of diseases of the abdominal organs, and that is, the capability of distension and relaxation possessed in both health and disease by the boundaries and contents of this wonderful compartition. At every respiration, at every change of position, or in the ordinary movements of every-day life, the capacity of the abdomen varies. The diaphragm is elastic; the abdominal walls are capable of great distension; the stomach is a bag, sometimes full and at other times quite collapsed; the thirty feet of intestines, as they meander from the topmost boundary to the inferior portion and outlet of the cavity, may be collapsed to a membrane or inflated like a balloon; the bladder may extend itself to the umbilicus, or sink into insignificance behind the pubes; the uterus is a marvel of mobility, expansion, and contraction, which, taken in addition to the known abnormal tendencies of the more solid organs to hypertrophies and cystic degenerations, and the varied conditions of the serous sac by which the organs are mostly enveloped, will render an obvious, nay more, a most satisfactory explanation of the difficulties which surround the diagnosis of many abdominal swellings and tumors, especially in the female.

It is a knowledge of these facts that has led the most distinguished gynæcologists to be so careful in the expression of their opinions in the more obscure cases that fall under their supervision, and to acknowledge that the more intimately they become acquainted with their specialty, the more they are impressed with the necessity of such precaution.

The very fact that exploratory incisions (themselves not by any means free from danger to life, but often fraught with it) are recommended as necessary to establish certain diagnoses, is but another sure indication of the uncertainty of those things of which we speak.

To the careful observer, even the most positive objective symptoms are often deceptive. Among these, that most apparent one, fluctuation, may mislead even those possessing the *tactus eruditus* in an extreme degree. In my own experience, it has been found in fatty tumors, in elephantiasis of the labium, in fibroma of the uterus, in cysts containing air and other pathological formations. Dr. Thomas relates a remarkable case of this kind; after having mentioned one in which "fluctuation was clear in a cystic sarcoma," he says: "On another occasion I had a patient presenting all the usual signs of fluid ovarian tumor so perfectly that Drs. Peaslee, Loomis, Budd, and myself, had no doubt as to the diagnosis. Upon incision and tapping no fluid flowed, and I removed a cystic sarcoma of fourteen pounds weight. As it lay upon the table after the operation, it was examined by a number of physicians, and nothing could convince them, even then, that its contents were not fluid, except section of the mass." But it is out of place to multiply quotations; they belong to the literature of surgery. Those who are acquainted with it know of them; those who are not might do well to become so before they attempt criticism.

Diagnosis.—I give here those characteristics of ovarian cysts which I most rely on.

1. Prominence of the abdomen, it being conical in shape; lower ribs bulging.
2. Not much change in the shape of the belly when changing position.
3. Clear sound on percussion around flanks and high up on the tumor. Often the line of the cyst may be made out by this alone.
4. No bulging of fluid between recti muscles when the patient rises from the dorsal decubitus.
5. As the patient turns from the side to the back, there is but slight flattening of the abdomen.
6. Enlargement of the abdominal veins.
7. Pulsations of the aorta generally felt through the abdominal walls.
8. Decided fluctuation all over the cyst, modified in some portions, especially in multilocular cysts.
9. Fluctuation more distinct in the recumbent position than in the erect (the contrary the case in ascites).
10. The *facies ovariana* well marked in most cases, with emaciation about neck and shoulders.
11. The fluid contains the ovarian granules. (Drysdale's corpuscles.)
12. Fluid generally contains much albumen, though it does not coagulate spontaneously.
13. The uterus is, in most cases, found behind the cyst.

Tumors presenting these symptoms will generally be found to be true ovarian, either monocystic or polycystic, the latter being generally made out by the uneven surface of the abdomen.

Dr. Willis Danforth, of Chicago, proposes* rectal exploration in difficult and obscure cases. He says: "I propose *rectal exploration* as the required and sufficient test, which will in every possible contingency enable us to determine with absolute certainty whether the uterus or ovaries are at all implicated. I mean by rectal exploration the introduction of the hand into the rectum, so far as to enable the surgeon to grasp the uterus and ovaries, and not rectal touch, which is the introduction of the finger only into the rectum."

I have not yet tried this method, but think it must be a valuable aid in those perplexing cases which must occasionally fall within the province of every gynæcologist.

There are, however, two marked exceptions to these signs, which deserve attention. I mean, first, *the serous cyst of the broad ligament*, and, second, *encysted dropsy of the peritoneum.*

Serous Cyst of the Broad Ligament is *only* diagnosed from ovarian cysts by the character of the fluid. It is peculiarly clear and limpid, like spring-water. It is, however, wrong to lay down as a rule that this fluid contains *no* albumen; in certain cases it does, and in quite large quantities. Another characteristic of this fluid is its power of resisting decomposition. I have known it remain a week or ten days without showing signs of degeneration. By referring to Dr. Atlee's work, it will be found that on several occasions an ovarian tumor was diagnosed by skilful physicians, when a serous cyst of the broad ligament was found by tapping. In most cases, a first or second tapping will be sufficient to cure these cases. They generally occur in young females, and if a pregnancy exist they may be cured by this alone. Two such cases have occurred to me.

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* United States Medical Investigator, September 1st, 1878, p. 34.

The second exception to which I allude is

"**Encysted Dropsy of the Peritoneum.**"—In the majority of cases of chronic pelvo-peritonitis, whether or not occasioned by tuberculosis, the effusion takes place in the lower space, and of this I have seen an interesting case, associated with hard cancer of the uterus. The fluid collected in the *cul-de-sac* of Douglas was evacuated readily by a very small trocar, and the next night the patient died. This is contrary to the experience of Brickell,* but I am persuaded that in pelvic effusions, unaccompanied by cancerous or tuberculous disease, the result of the withdrawal of the fluid is more satisfactory.

Peaslee† says of encysted dropsy: "This is an extremely rare pathological condition;" and by referring to his carefully prepared chapter on differential diagnosis, many of the symptoms are laid down, which I believe to be inaccurate.

Ziemssen‡ lays much stress on the "sensitiveness" that presents, although he grants that it may be "exceedingly slight, or altogether wanting." He says, also, further on, "In cancer of the peritoneum and omentum, the cancerous nodules may sometimes be felt in the exudation surrounding them, yet these very cases bear an extraordinary resemblance to irregular multilocular ovarian cysts, which lie in a copious ascites." And again he says: "If, through the diagnostic points already given, it has been ascertained that the collection of fluid in the abdomen is encysted, the presumption is in favor of its being an ovarian cyst, since other forms of encysted fluid are much less common."

Dr. Routh§ records three cases of this peculiar condition, which were diagnosed by the surgeons to the Samaritan Hospital as ovarian cystoma. In one of these, Mr. Wells diagnosed an extra-ovarian cyst. *All were tapped, and all died.*

He thus finishes his paper: "These three cases, although all unfortunate, illustrate this point in practice, that where you have adhesions of the colon, and especially if *the induration is more marked on the one side than the other* [italics ours], it is extremely difficult, if not absolutely impossible, to diagnose the pseudo-cyst from a real ovarian or extra-ovarian cyst."

Morgagni‖ also recognizes this variety of dropsy. He says: "But others (dropsies) are of a different kind, as that described by the celebrated Anhoinius; an almost incredible quantity of fluid being confined *between the peritoneum and the omentum, which had become very hard*, in a woman whose face, considering her emaciated state of body, was of a pretty good color, and whose feet were free from swelling."

Atlee's¶ 15th, 16th and 17th cases are instances of a similar character.

Dermoid Cyst of the Ovary.—The fact must be borne in mind that dermoid cysts are found in other portions of the body than the ovary, indeed I have frequently removed cysts containing fatty matters and tufts of hair and colloid substance. The dermoid cyst of the ovary, however, belongs to the ovariotomist; it is likely to be mistaken for other forms of cystoma, and presents often such peculiar symptoms, that its consideration in this place would appear proper.

The cyst-wall is very thick and consists of two layers. I have seen a cyst of this character that could be separated into six distinct laminæ, and

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* American Journal of Medical Science, April, 1877, p. 358.
† Ovarian Tumors, p. 155. ‡ Vol. x, p. 385.
§ Obstetrical Journal of Great Britain, April, 1874.
‖ Essay on Diseases of the Belly, vol. iii, book iii, p. 350.
¶ Ovarian Tumors, pp. 72–78.

I am disposed to believe that the older the cyst-wall becomes, the more are these concentric layers of deposit arranged within it.

There are fat-globules and masses of fat on this layer, which may be mistaken when opening the cavity for the *appendices epiploicæ* of the omentum.

The inner layer is *skin*, in which some observers have found not only the ordinary sebaceous glands, but also hair-follicles and sweat-glands. This skin presents the anatomical formation of the derma, and has often the papillary body and the chorium well developed. The contents of the cysts are very various. Hair, bones of various and peculiar conformation, teeth, fatty or cheesy (vernix caseosa) matters, lime and cholesterin crystals.

How is it that bone, and hair, and teeth, and nails, and lime, and all these products enter into an ovarian cyst? "That is the question." There have been half a dozen theories adduced to explain these wonderful formations, but they narrow themselves down to about three. The first dermoid cyst which was removed successfully was by Dr. McDowell, and if I am not mistaken, in four or five days the woman was up at the wash-tub. He tied the pedicle with a piece of whip-cord. Some of the physicians then and there expressed the opinion that this was an extra-uterine fœtation, the balance of the fœtus having been absorbed while other products went on to more perfect development. If this be so how is it that we find dermoid cysts occurring before puberty, which is a well-authenticated fact? How indeed could an action go on so peculiar, that would absorb one part of the fœtus and allow another to attain perfect development? The next theory advanced is that there is a *fœtus in fœtu;* for instance, in a patient's mother two ova were impregnated, one of which went on to completion, and the other was only imperfectly developed. Then the question arises, how is it that we find these abnormal formations in the stomach, the tissues of the abdomen, the lungs, etc.? and again, we find this inclosed fœtus in both sexes.

The best solution of the question is that one which gives the origin of these dermoid formations to the invagination of the blastodermic membrane of the embryo. It is the external layer of this membrane that produces the organs of animal life, the internal giving origin to the organs of vegetative life. If, therefore, by any circumstances there should be an invagination of the external layer of this membrane into any other organ, then we might reasonably expect that the developments therefrom would be those that are found in these dermoid cysts. There can be no better method of describing the symptoms and appearances of this form of ovarian disease than by giving an actual and most interesting case.

The patient, aged 27, was brought to my notice by Dr. Lozier. Her family physician, a skilful and observant surgeon, favored me with a report of the case while under his supervision. He states that the patient was delivered of a male child on August 4th, 1869, and that there was nothing unusual in the character of the labor, which was probably at its termination aided by the application of forceps. She made a rapid and apparently complete recovery, and he was not called again to treat her until eight months after delivery, when he was requested to see her on account of an enlargement of the abdomen, attended with menorrhagia and dysmenorrhœa at the menstrual epochs, which were abnormally prolonged. Examination discovered enlargement of the uterus, which was sensitive. The question then naturally arose, whether it was a case of subinvolution of the organ with congestive menorrhagia, or of fibroma. At the menstrual periods the pain was so severe that large doses of *opium* were required.

The patient was afterwards examined by an eminent professor of gynæcology, who found the longitudinal diameter of the organ over five inches, and expressed the opinion that it was a case of subinvolution with congestive menorrhagia, and advised the administration of *ergot* and *belladonna*. This treatment was persevered in for a time, and finally discontinued. After this, her physician being abroad, other professional advice was sought, and he did not see her again until August, 1871. Up to this date there was no decided indication of cystic development. Shortly after this, she rapidly increased in size; fluctuation was detected, and she came, through the influence of Dr. Lozier, into my hands. When I saw her she apparently enjoyed good health, was of a cheerful countenance, but was extremely large around the abdomen; there was an absence of that peculiar expression of face belonging to the true ovarian cyst; nor was she emaciated, although she stated that her strength had lately begun to fail. Upon placing her in a recumbent position there was a large round abdominal tumor, measuring about fifty-three inches in circumference; it was prominent, and inclined to be conical anteriorly. The surface was smooth, excepting at the left hypochondriac region, where there was a hard though movable enlargement. Upon percussing the tumor there was great dulness over the entire surface of the abdomen, and dulness also down on the flanks. Fluctuation was distinct over the whole anterior surface, but at some parts of the abdomen it was more easily detected than at others. An examination *per vaginam*, showed the uterus to be movable and apparently anterior to the swelling.

There was some fluctuation in the Douglas *cul-de-sac*, but it was not that distinct sensation that is felt in true ovarian cystoma. Then came the question of differentiation. Diagnosis is not so important in homœopathic as in allopathic *medicine*, but it is very essential in surgery, because you step from your diagnosis to your knife; if you are deceived in the former, the employment of the latter may lead to most disastrous results.

I thought at first, although there were conflicting symptoms and appearances, that this was a cyst of the broad ligament, the chief and great point against such a decision being the enormous size of the patient; but the absence of emaciation, the age of the patient, the slowness of the growth, the distinct fluctuation, the good condition of the general health, the natural expression of countenance, the moderate fluctuation in the *cul-de-sac*, and the absence of all varix, were certainly in favor of such a condition. The tumor had grown too slowly for a polycyst, or even for a monocyst, and there was, as before stated, absence of many of the symptoms pointing thereto. I thought the diagnosis rather obscure, and requested Dr. Paine and Dr. McDonald to see her with me. I had, up to this time, avoided tapping the tumor, because such operations, however simple, are often followed by fatal consequences. I have several specimens of polycystic tumors, taken from patients after death, whom I tapped; after which they never rallied.

In this case, however, I considered the question of diagnosis might be settled by an analysis of the fluid, and therefore drew off, by aspiration, through the finest needle, about an ounce of the fluid, and sent it to Dr. McDonald for his examination.

(I may say here that the examination of this fluid had to be made in a very hasty manner, as it was removed only the morning before the operation.) This is the result.

Dear Doctor: Specimen from tumor separated after standing twenty-four hours into two equal parts, upper remaining turbid; the lower, thick and opaque; the

upper containing large quantities of albumen, by heat, and *acetic acid; specific gravity* 1018. Apparently this is not very reliable—probably much greater.

By microscope: plates of cholesterin, fat-granules, globules all sizes, inflammation corpuscles, ovarian corpuscles, plenty of both the last; a few pavement cells, and what seemed to be a few pus-globules.

McDONALD.

Dr. Peaslee* remarks that dermoid cysts do not contain albumen. Here is one that was full of it; and here again the diagnosis was uncertain. With reference to the difficulties which surround the diagnosis of the dermoid cyst, I find that in looking over Dr. Atlee's work,† he relates six cases. In the first, the diagnosis was "unilocular ovarian dropsy." The second was also "ovarian dropsy." The third was diagnosed as some variety of ovarian cyst, but as tapping had been frequently resorted to, no operation was performed; the autopsy revealed the true nature of the disease. In the fourth the diagnosis was that of pedunculated fibroid, which opinion was afterwards changed to that of dermoid cyst. The fifth case was supposed to be "an indefinable tumor, somewhere in the abdominal cavity;" and the sixth and last case, after careful examination, was described as "uterine fibroid tumors," the one intra-mural, the other pedunculated. At all events, in the case before us it was necessary that something be done for the patient, and she urgently desired that an operation be performed for her relief.

After cutting down to the tumor I introduced into it the ordinary ovariotomy trocar. At first the fluid, which was of a colloid and brownish substance, ran quite freely; soon, however, it became very thick, looking like boiled starch, and after a certain number of pounds of this fluid had been carried off, the flow ceased. I was obliged to withdraw the canula, and found a large bunch of twisted hairs, about three or four inches long, blocking the tube. Rather than make a larger opening in the cyst, I secured the first opening, and introduced into the cyst-wall the largest needle of an aspirator. About five pounds more of this thick colloid substance were then withdrawn. I then lifted the sac outside the abdominal walls, and made an incision into it, and turned out a handful of lime and other substances. After these were removed, the adhesions separated, and the bleeding arrested by the application of carbolized animal ligatures, I introduced my hand into the abdominal cavity and withdrew the solid cyst. This was drawn up and a second cyst lifted from the cavity. The adhesions were then broken up and divided, partly with the scissors and partly with the fingers. The pedicle was tied with animal ligature, and divided with the écraseur, and allowed to drop back into the abdomen. The wound was brought together with deep sutures of wire through the muscular fibre and through the peritoneum. On the 19th, at 9 A.M., her temperature stood at 99¾°, and her pulse was only 116. She suffered from great nausea. Prescribed *aconite* and *arnica*. At 2 P.M. her temperature was 101½°, and her pulse 144. Medicines were continued. She had taken some nourishment. She was hopeful, and talked quite freely. Her urine had to be drawn with a catheter.

My chief fear was from septicæmia, as I had handled the omentum considerably, though I had constantly used the *carbolic acid spray* during the separation of the adhesions. I therefore concluded to give her *carbolic acid* in small doses internally. On the 20th, at 8 A.M., the temperature was 100¼°, and her pulse only 100. In the morning I received a good account

* Ovarian Tumors, p. 165.

† Op. cit., pp. 171–193.

of her. *Ignatia* was given for restlessness, and I had the *carbolic acid* made into a small pill, that she could the more readily swallow it. At half past one P.M., moved her in bed, some exertion being required, and pulse then ran up to 158. At 5 P.M., her temperature was 101½°, pulse 148; she was very restless, and having passed such an uncomfortable afternoon, she received a quarter of a grain of *morphia*. On the 21st, at 8 A.M., the temperature was down to 99¾°, and pulse 120. She took beef tea according to directions at 10, 12, and 3 o'clock. At 2 P.M. of that day her temperature was 98°, and pulse 116. On the 22d I was obliged to visit Peekskill, and did not see her until 12.30 o'clock that night, when her pulse was 160, and the temperature 104½°; her extremities were cold, and she had excruciating pains in the right hypochondrium; she was also suffering intense pain in the right side. After the abdominal wound had been closed, strips of adhesive plaster were placed around the abdomen, and a bandage applied. It was the presence of these straps on the tympanitic walls, that caused the severity of the pain. Therefore I was obliged to remove all these straps, which gave great relief, but she gradually sank and died the next morning at half past ten o'clock. I made a post-mortem examination as soon as I could consistently, and found the abdominal wound had entirely healed. The uterus and the left ovary were perfectly healthy; the pedicle was already covered with fibrinous exudation; there was no sign of decay, even from its constriction, about the end of the pedicle. (When we examine the pedicles of ovarian tumors they are frequently found covered with an exuded plasma, which prevents their decomposition. This is more particularly the case when the animal ligatures are employed.)

The omentum, however, which had been lying outside the cavity, and had been necessarily much handled, was dark, strangulated and unhealthy-looking, as though mortification was about to ensue.

I am now convinced, and would advise that after such a tumor has been removed and the omentum much handled, it would be preferable to cut away that portion of the peritoneum entirely. I believe that if I had followed this course in this case, the patient would be alive to-day.

The following is a carefully prepared description of the tumor by Dr. Everett:

The tumor, when removed, weighed 43 pounds, 20 pounds, of which were fluid, contained in a large fibrous sac. Opening into this by a natural aperture, one inch in diameter, was a small cyst, 12 inches in circumference, which was nearly filled with sebaceous and calcareous material mixed with hair. There seemed to have been a tendency to the formation of cysts from the large one, as there was a still smaller and quite shallow one opening into it by an aperture 2½ inches in diameter, also the appearance of a third commencing.

By the side of these was a solid multilocular cyst, composed of about 40 or 50 small cysts, the contents of which, severally, were colloid, sebaceous material, solid fat, bits of cartilage, long dark hair, bones, and teeth. The bones were covered with periosteum. The teeth, with one exception, had crown and pulp only, without roots; the crowns covered with enamel. Loosely attached to the outer walls of this cyst was a lateral incisor, which was complete, the only one, with root, neck, and crown.

In one sac was what appeared like an attempt at formation of a superior maxilla, with a large upper middle incisor attached to the edge of one side, and on the opposite edge were crowded together, in irregular order, a small lower incisor, two bicuspids, and a molar. One small cyst had a single molar, one a bicuspid and a molar. There were nine teeth in all.

Imbedded in the walls of the multilocular cyst were several pieces of

flat bone, two resembling scapulæ, one a nondescript, possibly a manubrium and first rib, or, as some have suggested, a portion of occipital bone. Small bits of bone and of cartilage were scattered about irregularly. I observed that the hair and sebaceous material usually were together, also bones and colloid, that is, in the walls of cysts containing colloid, bones were apt to be found.

There were also small colloid cysts and tufts of hair in the walls of large cysts.

The pedicle was four inches in breadth, and about one-eighth of an inch thick.

Accumulations of fat beneath the skin of the abdomen, which are often found in women between the ages of thirty and forty years, have sometimes been mistaken for pregnancy, and also for tumors of the ovary. But as the signs of ovarian tumor are absent, such a mistake would not be readily excused.

An appearance known as *phantom tumor* sometimes is seen in hysterical women, and may simulate the form of an ovarian tumor. This is dependent on a peculiar contraction of the abdominal muscles; and the administration of an anæsthetic generally settles the question.

When the abdomen is œdematous, the pitting of the walls on pressure determines the cause of this enlargement.

It may seem incredible that *tympanites* should have been mistaken for ovarian tumor, but several cases are on record where the abdominal cavity has been laid open, and the enlargement found to be simply gaseous distension. However, in such a case the equal tension of the abdomen, the clear resonance on percussion, the absence of fluctuation, and also the great derangements in digestion which usually accompany tympanites, should make the diagnosis easy. Setting aside the foregoing condition, if on examination there is no apparent fluctuation in the enlarged abdomen, it may be presumed to contain a solid tumor.

To make the diagnosis more complete, I give here from Peaslee the differential diagnosis between ascites and ovarian cysts, and also between the latter and normal pregnancy at five and a half months. As cases of both these are likely to occur in practice, the student cannot too carefully study them:

(From Peaslee.)

ASCITES.	OVARIAN CYST.
History shows previous ill health, as disease of the liver, lungs, heart, or kidneys.	The patient has previously enjoyed good health.
Enlargement comparatively rapid.	Gradual enlargement.
Face full, puffy, leaden hue.	Peculiar emaciation of face.
Patient lying on the back, the abdomen is flattened in front, but symmetrical.	The tumor is not generally symmetrical, is prominent in front.
Patient on side, the sides are flattened.	Patient on side, no change.
Patient rising suddenly from the back, the fluid bulges between and to the sides of the recti muscles.	Patient rising in same manner, may cause some bulging, if not adherent.
In sitting posture, lower part of abdomen bulges.	In sitting, there is little if any change in abdomen.
Skin of abdomen smooth, tense, and shining.	Skin of abdomen appears natural or only thinned.
Œdema of extremities in all cases, and at last of abdomen also.	Œdema only in exceptional cases.
There is no bulging of the floating ribs.	The chest is conical from bulging of the false ribs.

ASCITES.	OVARIAN CYST.
Navel prominent and thinned.	Navel not thinned.
Fluctuation decided and clear; diffused through the abdomen, but avoids highest parts in all positions, and always has a hydrostatic level.	Fluctuation less clear and decided; limited by the cyst, and may remain at the highest points; has no hydrostatic level.
More distinct in erect position.	More distinct in recumbent position.
Percussion gives a clear sound at highest portions of abdomen in all positions; is dull elsewhere, and changes with the position.	Clearness on percussion only at parts not corresponding to the cyst, and in both flanks. Dulness over cyst in all positions.
Aortic pulsation not felt through abdominal walls.	Aortic pulsations transmitted through the cyst to abdominal walls.
Fluctuation immediately felt through vagina or rectum.	Fluctuation not so clear, or may not exist in case of polycyst.
Uterus normal in size, mobility, and position; sometimes prolapsed.	Uterus generally displaced behind the cyst.
Fluid, light-straw color, contains albumen and amœboid corpuscles; coagulates spontaneously.	Fluid, darker shade; abounds in albumen or colloid matter, but contains no amœboid corpuscles; never coagulates spontaneously.
Anæmia comes on early.	Anæmia appears late.
Hydragogues and diuretics produce temporary relief.	This treatment produces little, if any, effect.
Exceptions to the above rules are rare; but occasionally, if there be a very large deposit of fluid, even the highest point of the abdominal cavity will present dulness when the patient lies on the back. Or the intestines may be glued down by adhesions, in which case deep percussion may bring tympanitic sounds.	*Exceptions.*—There may be a tympanitic resonance if the cyst communicates with the intestine.
One or both flanks may give a clear sound, from gas in the colon.	One or both flanks may be dull from fæces in the colon.

Whenever we find a tumor arising from the pelvis, it will always be advisable to first inquire if it may not be a gravid uterus, and by assuming that such is the case until it is fully proved to the contrary, we shall avoid the mistake that has been several times made, of attempting ovariotomy on a pregnant woman, where no tumor existed.

(From Peaslee.)

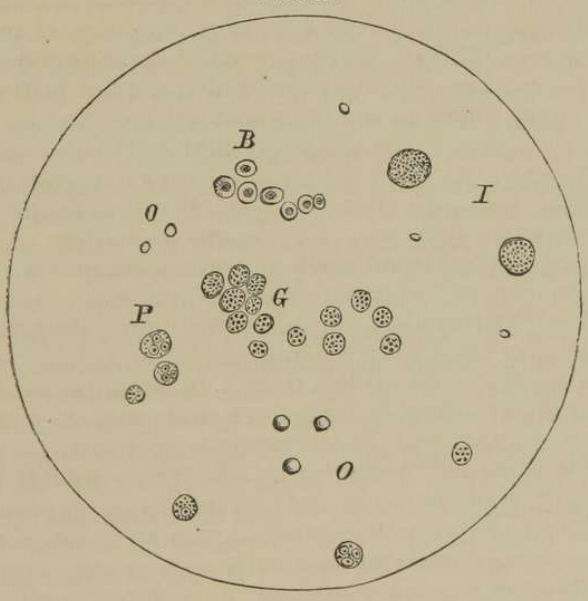
NORMAL PREGNANCY, FIVE AND A HALF MONTHS OR MORE.	OVARIAN CYST, SECOND OR THIRD STAGE.
Enlargement sudden and rapid; symmetrical or slightly inclined to the right side.	Enlargement gradual; not symmetrical till the third stage.
Features natural, healthy.	Features emaciated, anxious.
Superficial veins of abdomen not enlarged. Œdema in ankles not uncommon after seven months.	Veins are enlarged; œdema in late stages; in exceptional cases one to two years after commencement.
Chest not conical.	Chest conical, when there is great distension.
Fluctuation indistinct, unless there is much liquor amnii.	Fluctuation very distinct, especially in monocysts.
Menstruation arrested.	Menstruation does not cease till third stage.
Vaginal touch detects softening and apparent shortening of the cervix and enlargement of the uterus.	No such change apparent, but uterus generally displaced behind the cyst.
Ballottement feels impulse of fœtus.	*Ballottement* reveals nothing.
Fœtal heart-sounds heard.	No sound of fœtal heart.
Fœtal movements felt.	No motion of fœtus.
Enlargement of mammæ.	Occurs but exceptionally.

NORMAL PREGNANCY, FIVE AND A HALF MONTHS OR MORE.	OVARIAN CYST, SECOND OR THIRD STAGE.
Umbilical areola in first pregnancy.	No areola.
Has developed in from six to nine months.	Has developed within one to three years.
Follicles about the nipple, equally developed on both sides; become white on stretching the skin.	Follicles unequally developed and remain of same color as areola on stretching the skin.
Exceptions.—If fœtus be dead, of course the movements and heart-sounds are absent.	

Examination of the Fluid.—In another portion of this volume I have given my views regarding the microscope as a means of *primary* diagnosis of tumors, or to speak more plainly, of tumors while yet within the body. After their removal the classification may be made, and in so far as the natural history of that variety of growth may be ascertained, may the diagnosis in future cases be assisted. This even is a matter of much uncertainty on account of the lapping of the different varieties of neoplasms. If there be, however, an exception to this rule, it is in the case of cystic tumors and especially ovarian cystoma, and indeed in this instance it appears to me that the exception proves the rule. From the peculiarity of cystic tumors we are enabled to get during life, a part of the tumor, viz., its contents, which aids materially in diagnosis.

I think I can affirm that the granular bodies found in ovarian fluids, described so accurately by Drysdale and receiving his name, are pathognomonic of ovarian disease. My first experience with these corpuscles was very unsatisfactory, because I was not accurately acquainted with them, nor were those microscopists to whom the fluid was subjected. At present, however, I think that when these granular bodies are found, ovarian disease is present. Figs. 526 and 527 represent specimens of fluid which

FIG. 526.

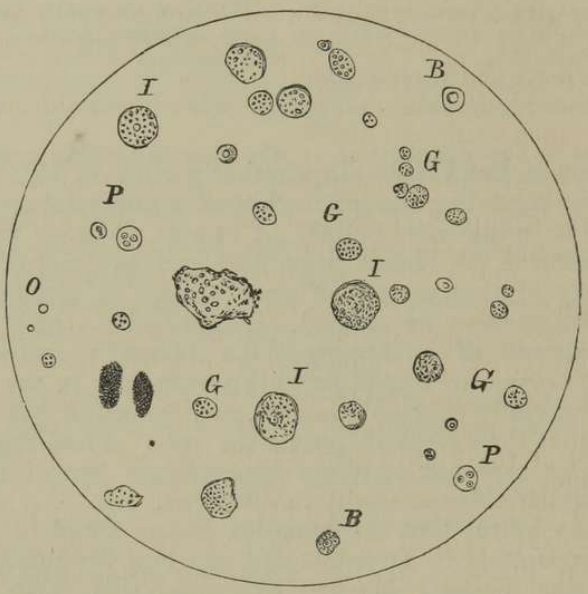


G. Ovarian granules. (Drysdale's corpuscles.) P. Pus-globules. O. Oil-globules.
I. Inflammatory corpuscles. B. Blood-globules.

were taken from patients of mine and examined by Dr. S. P. Burdick, who has very kindly made many such experiments for me. Dr. St. Clair Smith has also done me good service in this regard, and as I am not a

practical microscopist myself, and knowing how very much depends upon correct diagnosis in these disorders, I must express here my thanks to them for their kindness and patience in preparing and describing the various appear-

FIG. 527.



G. Ovarian granules. (Drysdale's corpuscles.) B. Blood-globules. O. Oil-globules.
I. Inflammatory corpuscles. P. Pus-corpuscles.

ances of fluids from abdominal and other tumors. Dr. Atlee,* in his preface, thus expresses his high regard for the discovery of Dr. Drysdale: "For many years the examination of the fluids of dropsy has been intrusted to him (Dr. Drysdale), and several hundred specimens have undergone careful investigation. *Rarely has he failed in identifying the fluid of an ovarian cyst, or in distinguishing it from every other kind of dropsical fluid.* In a few instances he has found a granular cell resembling the characteristic ovarian cell, in fluid not ovarian, but in these cases the cells were very few in number and were not affected in the same manner by tests." Dr. Drysdale describes the peculiar cell† as round or oval in shape, without a nucleus, but filled with a number of fine granules, each of which has a defined outline; their size is generally that of the pus-corpuscle, although in some instances they may be much smaller. The pus-cell, moreover, is cleared up by the addition of acetic acid, that is, the nuclei become fixed, and the cell-wall apparent, whereas, the same treatment of the ovarian corpuscles only renders the granules more distinct. The inflammation corpuscle (granule-cell of Paget) also bears some resemblance to the ovarian granular cell, but differs from it in being larger and more opaque, the granules of considerably larger size and coarser in appearance resembling minute oil-globules. If the latter be subjected to the action of ether, they may either entirely disappear or lose their granular form. Crystals of cholesterin are often found in great numbers in ovarian fluids. Again, the consistency of ovarian fluids varies; it may be either thin or thick, like molasses, or resembling starch (colloid).

Tapping the Sac.—A fact of great importance must here be borne in

* Preface to Dr. Atlee's work on General and Differential Diagnosis of Ovarian Tumors. The italics are the author's.

† Loc. cit., page 458.

mind, that apparently simple as this operation may be, the ease with which its frequent repetition is borne by some patients, and the additional light which it throws upon diagnosis in many cases, yet in some instances, especially in multilocular cysts, the puncture is dangerous. I have tapped very many patients many times, in some instances every ten days or two weeks for years without a single untoward symptom, yet in two cases of multilocular cysts, I had the most severe peritonitis follow in one case and collapse in the other. Fortunately neither died.

In the matter of tapping the cyst, Dr. Ludlam published an original idea in 1873, which reads as follows:

"Another item of importance, in this connection, is to leave a portion of the fluid in the sac. This can be done by stitching up the orifice that was filled by the canula. The reasons why I recommend and practice this procedure of leaving about one-sixth of the fluid still in the cyst, are as follows: (1) to enable us to determine the precise location and extent of any existing adhesions on the lateral and posterior surfaces of the tumor, and to treat them properly; (2) to keep the intestines from rolling down in the way, and out through the wound; (3) to maintain the normal temperature of the abdominal cavity, and especially of the bowels; and (4) to facilitate the treatment of the pedicle."*

Peculiarities of the Fluid.—The fluid from ovarian cysts varies materially from a pale straw-color to a dark, grumous, blackish, or inky-looking substance. Its consistency is also liable to as many peculiarities and shades of difference; it may be thin as water, oily, ropy, of a molasses-like substance, or resemble boiled starch which has been allowed to partially cool. I have seen all these grades of color and consistence, and when I find an absence of the peculiar "straw-like" color of ascitical fluid, I am always inclined to the diagnosis of ovarian cystoma. An analysis of the fluid gives a large amount of water, with solid matters and salts.

The following is the analysis of the fluid from a remarkable case of my own:

Water,	948.54
Albumen,	38.57
A substance insoluble in alcohol,	2.35
Urea,	2.78
Chloride of Natrum and Ammonium,	7.05
Phosphate of Magnesia and Lime,	.15
Free Soda,	.56
(An atom of fat.)	
	1000.00

To me this was a most interesting case, not only because it was my first ovariotomy, which I performed on the 17th of January, 1870, but because during the progress of the disease she became pregnant and was delivered of a living child. The labor was difficult and prolonged, but was brought to a successful termination by forceps in the hands of Dr. Walker, of St. Louis. Three days after, *while she was yet measuring fifty-four inches* in the circumference of her abdomen, she was tapped and relieved of 39 pounds of fluid. These tappings, performed by her family physician, the late Dr. John Hartmann, reached twelve in number, the aggregate weight of the fluid withdrawn being 600 pounds. A few months previous (15th of November, 1869), I performed transfusion upon her with great temporary benefit, and when finally she consented to ovariotomy, the tumor with its contents weighed 70 pounds. She died on the second day from internal hæmorrhage and shock.†

* U. S. Medical and Surgical Journal, vol. viii, p. 355.

† Western Homœopathic Observer, vol. vii, p. 152.

Exploratory Incision.—Notwithstanding all the light that experience has thrown upon the diagnosis of ovarian cysts, there are yet cases so complicated that it is necessary to make an exploratory incision in the abdominal walls to discover the real nature of the disorder. There need be no hesitation in adding thereby to our acquaintance with the case, and any conscientious practitioner who has exhausted his means of diagnosis, should perform the operation.

The incision should be cautiously made in the linea alba, and the peritoneum most carefully dealt with. Then if there be too many adhesions, without any attempt to break them up if they are very dense on the anterior face of the tumor, or if the tumor be other than ovarian, the surgeon must decide what course to take. The history of ovariotomy and my personal experience are in favor of such operations, after all other means have failed to point out the true nature of the case. In *encysted dropsy of the peritoneum* such a proceeding is, it appears to me, absolutely necessary. In certain forms of cystic disease, and often in fibro-cystic tumors accompanied with ascites, the procedure is called for. This method is, however, by no means free from danger. Wills reports four, and Baker Brown three fatal cases. I have lost two cases, and am acquainted with several others.

Treatment of Ovarian Cysts.—*Medical Treatment.*—There are cases of ovarian cysts which are amenable to internal medication, and I have no doubt from personal experience that sometimes cases may be so treated that ovariotomy may be dispensed with. I give here the record of a number of such with the authorities from which they come. I cite at least two undoubted ovarian cysts which were cured, one by apis mel. and arsen.; the second by tapping, and the after-administration of proper homœopathic medicines. Dr. Black,* in the *British Journal of Homœopathy*, gives an account of a remarkable cure with small doses of bromide of potassium.

Dr. Craig† reports a case in which tapping was performed three times, and the patient was then treated homœopathically, and lived eight years. The same gentleman mentions two other cases, treated chiefly by apis. Dr. Neidhardt reports a case in which iodine and hepar in the first, third and sixth dilution, together with a sponge saturated with iodine water introduced into the vagina, was productive of happy results. Dr. Neidhardt regards ignat., graph., apis and platina as most appropriate medicines.‡

Ignatia for spasmodic pain in both ovaries, with contracted sensation at stomach.

Graphites.—Swelling of both ovaries as if they were in motion; pain on stooping and pressure; enlargement caused by sexual excess.

Apis mel.—In the more acute form, pain increased by stooping and walking, pressure on the bladder, frequent micturition.

Platina.—Enlargement of ovaries; catamenial discharge, coagulated and thick.

Arsen., calc. carb., canth., china, iod. and **lycop.**, are other medicines.

We also find the following record:

Ovarian tumor; Apis mel.; entirely removed in a short time.§

Ovarian tumor; pulsatilla^{30}, arsenic.^{30}, lachesis^{30}, sulph.^{30}, calcarea carb.^{30}, aurum^{30}, mercur. viv.^{30}, and sepia^{30}, one at a time in accordance with the totality of the symptoms; cured in two years; tumor entirely removed within three years from beginning of treatment.||

Ovarian tumor of large size; case pronounced hopeless by allopathic physician; bellad.^{30}, mercur. viv.^{30}, arsenic.^{30}, apocynum^{30}, pulsatilla^{30}, la-

* B. J. H., January, 1869. † B. J. H., vol. xviii.
‡ North American Journal Hom., 1864, p. 17.
§ Philadelphia Journal Homœopathy, vol. iv, p. 103.
|| Dr. J. H. Payne, Hahnemannian Monthly, vol. ii, p. 50.

chesis[30] and sulph.[31], in aqua, dose every four hours at first; cured in five months; tumor gradually disappeared.*

Ovarian tumor; case pronounced beyond the help of surgery even by several consulting allopathic physicians; cannabis[30 200], pulsatilla[200], mercur. viv.[100], arsenic.[200], apis mel.[30 200], lachesis[30 200], apoc.[30] and sulph.[200]; amelioration of general symptoms in four weeks, but tumor at first seemed to grow larger; complete removal in nine months; apocynum had the most decided effect of any one remedy in removing tumor, arsenic. and apis mel. next.†

Ovarian tumor; bry., lach., sulph., apis mel.[20] two doses, with subsequent repetition; bryonia, lachesis and sulph. did no good; apis mel. removed tumor in three months.‡

Ovarian tumor; arnica[200], colocynth[200], cham.[200], lach.[200], and lach.[4000]; very small and perhaps inflammatory, perfect cure.§

Dr. Hirsh, of Prague, reports a case of extensive ovarian cyst; patient aged 50; he prescribed china[6] three times per day, a small portion of a drop in a powder of sacch. lac.; for asthmatic affection cannabis sat.[1] dil., one drop in a teaspoonful of water every four hours; constipation treated by sulph.[12] at intervals of two days; then Hall's iodine water was given; it contains: chloride of sodium, calcarea carb., magnesia, iodine and bromine; 16 ounces contains chloride of sodium 112.0412 grs.; chloride of potassium, .0499 gr.; chloride of ammonium, .0330 gr.; chloride of calcium, 2.9330 grs.; chloride of magnesium, 2.6220 grs.; iodide of sodium, .0607 gr.; iodide of magnesium, .2849 gr.; bromide of magnesium, .5176 gr.; eight days' continuance of the china produced a very advantageous change in the digestive system, spontaneous action of the bowels and normal pulse; difficulty of breathing and cough considerably diminished by cannabis; much greater activity in stools and increase of urine; size of abdomen diminished more than two inches in circumference under use of cannabis, therefore prescribed three tablespoonfuls of Hall's iodine water (about $\frac{1}{48}$ of a grain) at each dose; eight days' treatment produced livelier action in the kidneys and outer skin; the abdomen gradually and perceptibly slackened, becoming of a doughy consistency; after four weeks' treatment abdomen reduced to normal condition and size, urine increased to natural quantity.‖

He also reports a case of ovarian tumor; patient, aged 42; hydrastis can.[30], glob. iii; sacch. lac., gr. j, two powders on every third night; aconite tinct., gtt. viii, sacch. lac., gr. xxiv, dissolve in half a pint of water, a tablespoonful twice per day; rhus tox.[3], gtt. vi, iod.[3], gtt. vi, sacch. lac. gr. xx, in half a pint of water; mercur. sol.[6], mercur. iod.[1], grs. ii, nightly; cured in two months.¶

The following case, of which I have cognizance, has been furnished me by J. G. Baldwin, M.D., of Englewood, N. J.:

"I first saw Mrs. H. J. D., æt. 28, during confinement. September 18th, 1872, delivered of a healthy child without any difficulty. When I came to bandage her, found her still as large as at full term from dropsical effusion. This was the first intimation to herself or her physician that there was anything abnormal, whatever pain or discomfort she had suffered being attributed to the pregnancy. In consultation with Dr. McVickar, of New York, and Dr. Banks, here, the case was diagnosed ovarian dropsy. On October 20th following, with Dr. Banks, I removed by ordinary para-

* Ibid., p. 51.
† Loc. cit., p. 53.
‡ C. Wesselhœft, M.D., loc. cit., vol. ii, p. 184.
§ Loc. cit., Dr. Muller, vol. ii, p 406.
‖ British Journal of Homœopathy, 1862, p. 588.
¶ Loc. cit., p. 5.

centesis with trocar in median line, five and a half gallons of fluid, thicker and darker than I have commonly seen in ascites, and so highly albuminous that heat and acid rendered it semi-gelatinous. Prescribed apis, and in a short time she recovered her usual health, without immediate return of dropsy.

"About August 1st, 1873, patient again complained of *stinging burning* pains in region of right ovary, with tenderness on pressure and motion, with *cessation of menses.* Resumed apis, and afterwards gave for varying symptoms, arsenicum, conium, and platina (also phytol.). The abdomen again enlarging, examination revealed both pregnancy and dropsical effusion, which accumulated very rapidly till the size of patient was enormous. For fear of possible miscarriage I delayed operation till after the seventh month of gestation, and March 10th, 1874, drew off by aspirator four and a half gallons fluid. Six weeks later she was delivered of a large healthy boy, with an entirely normal labor.

"In the interval of last operation and confinement, water had again accumulated more rapidly than ever, and continued to do so, with constant stinging burning sore pains, until 21st of August, nearly four gallons of fluid was again removed by aspirator.

"The effusion, however, went on. In consequence of a severe cold a general peritonitis set in with great severity, and for two or three weeks the patient was in a very critical condition. Recovering from this (bell., bry., and merc., were the principal remedies used), her condition about 1st of January was as follows: An accumulation of fluid about the same as when I withdrew three and a half gallons; fully as large as pregnancy at six months; a rapid, irritable pulse; thirst; general prostration; able to sit up only part of the day; loss of appetite; pain and tenderness in right ovarian region, and the water rapidly accumulating.

"At this time I consulted with yourself with reference to ovariotomy, believing it her only chance. While awaiting your visit I made one further prescription, viz., iodine, 3d dec. sol., given three or four times a day. Decided improvement was manifest within a week. Pain much relieved, appetite and strength improved, and no increase of fluid, as shown by measurement. Under the continued use of iodine alone, the improvement was rapid and continuous. Absorption of the fluid took place, and within a few weeks not *a trace of it* remained. All treatment was discontinued, and on 1st of May the patient for first time in years, was able to resume housekeeping, and has to this day remained in perfect health.

"One marked peculiarity of my case is its complication with pregnancy, the safety of operation with aspirator during advanced pregnancy (you will remember it was by your advice I used it), and the perfectly normal delivery."

Synopsis.—September 18th, 1872. Confinement and discovery of dropsy.

October 20th, 1872. Operation and withdrawal of five and a half gallons of fluid.

August 1st, 1873. Renewal of disease with commencement of pregnancy.

March 10th, 1874. Operation and removal of four and a half gallons of fluid.

April 22d, 1874. Confinement.

August 21st, 1874. Removed by aspirator nearly four gallons.

Disappearance of disease, which continued till about 1st January, when iod. was prescribed for symptoms of recurrence, with entire removal by May 1st.

In Dr. Peaslee's scholarly work we have a notice of cures by several remedial agents; two by Mr. Craig, by the administration of a saturated

solution of chlorate of potassa, a tablespoonful three times a day; two cases by Prof. Courty, of Montpellier, with the oxide of gold, in doses varying from $\frac{1}{33}$ to $\frac{3}{4}$ of a grain; a case by Dr. J. Millar, with the bromide of potassium, five grains three times a day, increasing the dose to fifteen grains; Dr. Miller, of Chicago, three cases with bromide and iodide of potassium in alternation; a cure completed in ten months.

Dr. Peaslee employed with success the chlorate of potassa; the dose being half an ounce of the saturated solution three times a day.

Palliative Treatment consists in paracentesis abdominis. This should be effected with a large aspirating needle, and may be done often, though the operation is by no means free from danger. After the evacuation of the fluid, properly administered medicines may be of great service toward effecting a cure. The trocar may be inserted at the linea alba, or if the tumor be polycystic, the operator may select the linea semilunaris or other points in the abdominal parietes.

Other Curative Measures.—*Tapping the sac and pressure*, effected by means of compresses securely fastened with broad adhesive straps, so placed as to embrace the spine, "meeting and crossing in front and extending from the vertebral articulation of the eighth rib to the sacrum," and secured by a broad flannel band, are recommended by Dr. J. Baker Brown.

Tapping and the injection of iodine has cured certain cases, but appears only applicable to the monocystic tumor, as it would be a difficult matter to inject all the compartments of a polycyst; although several cases reported as the latter were cured. The following is the formula of Boinet:

Distilled water, 100 parts, . . .	℥iij and ʒj
Tinc. iodine, 100 parts, . . .	℥iij and ʒj
Iod. of potassium, 4 or 5 parts, . .	ʒj to ʒj½
Or tannic acid, 1 or 2 parts, . . .	grs. xv to xxx.

To perform the injection, a large trocar and canula is used, and the cyst is tapped in the ordinary manner. When most of the fluid is drawn off, a good-sized gum elastic catheter, with several holes on either side, near the end, is passed through the canula to the bottom of the sac. The above quantity is then injected and allowed to remain from five to ten minutes. The catheter may then be withdrawn.

Electrolysis.—Dr. Danforth, of Chicago, and Dr. Franklin, of Ann Arbor, and Dr. Murphey, of New Orleans, have reported cures of ovarian cysts by electrolysis. This method is simple and effective, and is rapidly gaining favor, but I must say that though I have seen it tried, in several instances, it has never been productive of permanent good, and in two cases a sharp peritonitis followed the application of the needles. In a case of cyst of the broad ligament, operated upon by Dr. Butler, the tumor almost entirely disappeared, but soon after refilled. As yet, therefore, experience has not satisfactorily demonstrated the value of this method in the treatment of ovarian tumors. For further information concerning electrolysis, the student may refer to the chapter on Electrolysis at the end of this volume.

Ovariotomy.—Since the American people threw off British subjugation, and thought and practiced for themselves, there always has been a latent feeling of dissatisfaction existing in the minds of certain Englishmen regarding any advancements in science made in this country. "Who ever reads an American book, or goes to an American play? What does the world owe to American physicians and surgeons?" is a quotation I made some years since, from a British Quarterly, in one of my lectures, as proof of this assertion.

By this time, however, I had hoped that a spirit of fairness had been

cultivated, which would acknowledge, and gracefully, too, the "*palmam qui meruit ferat.*" But the old wound rankles in some minds still, and though forced by the pressure of superior efficacy to adopt ether anæsthesia, skin grafting, resection of the lower jaw, extension and counter-extension splints in hip disease, the plaster jacket in Pott's disease, "the American method" of treating fractured femur and ovariotomy, together with hundreds of other improvements in surgery (not to speak of every other department of both science and art), it is sometimes done with so much compulsion (*ut sequiter*), and with such bad grace, that one scarcely knows whether to laugh at their intolerance, or be vexed at the bigotry of our transatlantic friends. Every surgeon knows, or ought to know, the history of ovariotomy in this country and abroad.

To Ephraim McDowell, M.D., of Danville, Kentucky, belongs the credit of performing, and successfully, too, the first ovariotomies in the world; his claims rest upon such a sure foundation that they cannot and must not be shaken. It was from a perusal of his cases, that the suggestion came to Englishmen, although the reports, when they *did* come, were ridiculed as falsehoods,* besides being treated otherwise in a most unfair manner. It is, therefore, rather surprising to hear Mr. Christopher Heath, F.R.C.S., a well-known surgeon, of the other side, in 1877, say to his class:†

"*Although* ovariotomy was first performed in 1809 by McDowell, of Kentucky, who was a pupil of John Bell, the operation in modern times *has been entirely of British cultivation. Mr. Lizars, of Edinburgh, was the first to attempt ovariotomy in this country, and by the long incision, i. e.*, from the umbilicus to the pubes; *his example was followed by a few other surgeons, and from time to time a success was recorded.*"

It is a well-known fact that Mr. Lizars (and it would have been only justice to the memory of the originator of ovariotomy for Mr. Heath to have stated the fact) received his knowledge of the operation from Dr. McDowell; at all events direct inference would lead to such a conclusion. Dr. McDowell was a pupil of the celebrated Mr. John Bell, and to him he communicated these cases of his (McDowell's) ovariotomies. Mr. Lizars had charge of Mr. Bell's papers, and *kept in his possession Dr. McDowell's report of his three successful cases of ovariotomy for seven years*, and then when he did attempt the operation, to which Mr. Heath so proudly refers, there was *no tumor, no ovarian enlargement at all*, but "*an accumulation of fat under the skin of the abdomen, and of gas in the intestines.*" That since that time the great perfection to which ovariotomy has been brought is due partly to the labors and experience of Wells, Keith, Clay, and other gentlemen, there can be no doubt that also on this side of the Atlantic, surgeons have endeavored to do their share in the same field, and to uphold and to honor Dr. Ephraim McDowell.

Among our own school we must also be proud to mention many successful ovariotomists. Drs. Ludlam, Minor, Macfarlan, Bell, Danforth, Schneider, and Jernegan, and others, have reported successful cases of ovariotomy, and we have every reason to feel satisfied with the advancement that has been made in this department of surgery by members of our school since the first edition of this book was published.

In the performance of this operation much, very much depends upon the experience of the operator. This fact is fully established by the rates of mortality published by different surgeons. It is only necessary to take the figures of Mr. Wells. Of 400 cases upon which he operated, the following is

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* Medico-Chirurgical Review, 1825, vol. ii, N. S., p. 216.

† British Medical Journal, June 16th, 1877.

the ratio of success: Of the first 100 cases 66 recovered and 34 died; of the second 100 cases 72 recovered and 28 died; of the third 100 cases 77 recovered and 23 died; and of the fourth 100 cases, 78 recovered and 22 died.

The state of the patient's health, the existence of other diseases, and the moral and physical condition, must always be taken into consideration, although it sometimes is most surprising to see how well some patients recover, in whom the operation has been performed as a forlorn hope.

Concerning the *qualifying indications* for ovariotomy, Prof. Ludlam says:*

"In so far as the heart and lung complications are concerned, my own practice has been to make the tolerance of the anæsthetic the test of its expediency. If the pulse and respiration are calmed, and the ether has a pleasant effect, I go forward. This was the case with one of my patients, who was fifty-two years old, and who suffered from valvular disease of the heart; she bore the operation without severe shock, and made a good recovery."

Dr. Ludlam's remarks on the *preliminary treatment* are sound and sensible, and agree with my own convictions.

"All the preliminary treatment that is required is to get the patient into the best possible condition of mental and physical vigor. She should have cheerful society and surroundings, and be encouraged to hope for the best; for, in an extremity like this, very much depends upon a woman's will and faith. If she is ill, give her the appropriate treatment; but, if not, then give your medicine to somebody else. It has been proposed that large doses of quinine should be taken to prevent the shock of severe surgical operations. In this case, I think, you had better reserve that remedy for the after-treatment, provided it is really called for."

There are not many instruments required for the performance of ovariotomy; the chief adjuvants being well-trained and careful assistants. The following are the steps of the operation:

The patient should be placed upon her back upon a table near by the bed on which she is to lie after the tumor has been removed. I do not think it well to operate with the patient upon the same bed that she has afterward to rest upon, although I believe the latter is Mr. Wells's preference. In general it will be found that the coverings become soiled, wet, and more or less disarranged during a tedious ovariotomy, and therefore a table of proper height, well covered with blankets, is preferable.

The atmosphere of the apartment, the clothes of the assistants, the instruments, blankets, sponges, should be thoroughly "Listered," directions for which are laid down in the chapter on Dressing of Wounds. *The sponges should be counted before and after the operation.*

The operator should stand on the right side of the patient, the assistant having charge of the anæsthetic, at the head of the table, and the first and most reliable assistant opposite the operator. Another assistant should have charge of the water and sponges, and should constantly change them both. The sponges should always be *new and soft.* Two or three new and soft flannels should be at hand lying in warm water to protect the bowels, and brandy, ammonia, and styptics, etc., should be in readiness. The instruments should be on a table near by, and should be previously arranged in the order they are likely to be required. The operator should see to this himself. They may be thus arranged:

Two strong sharp scalpels, an artery forceps and tenaculum, two directors, a flexible uterine sound, a strong hook, two trocars, one of them that

* Diseases of Women, 4th edition.

of Mr. Wells, with india-rubber tubing attached; needles to carry ligatures, of which there must be two or three varieties made of carbolized silk; silver or iron wire; two or three pairs of forceps for torsion; a couple of clamps, if the pedicle is to be so treated; the ordinary apparatus for applying silver wire sutures; stout pins for the figure-of-eight suture; a drainage-tube; a flannel bandage and compress, and a couple of female catheters, *and above all the thermometer must not be forgotten.*

Dr. Ludlam* tells his pupils that, "In the outfit for this operation, no instrument is more important than the thermometer. I mean the thermometer which is designed to regulate the temperature of the patient's apartment, both during and after the removal of the tumor. While the operation is in progress, my practice is to keep the temperature at 75° F., and not to allow it to fall below 70° F., day or night, for ten or twelve days afterwards. This matter should be insisted upon, not only because of the risk of the chill, and of the onset of inflammation from vicissitudes of temperature, but also because it has been found that tetanus sometimes arises from this cause."

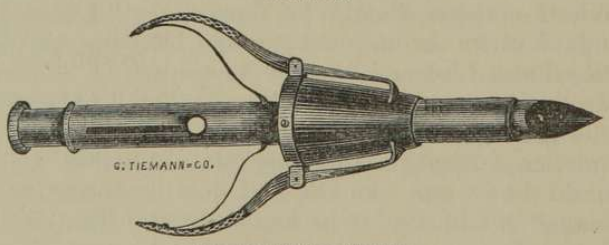
Some operators prefer the short and some the long incision. It appears to me that it is better to begin with the short one and extend it if the operation demands.

Having all things then in readiness, the operator makes an incision in the median line about three inches in length. Every vessel that springs must be twisted carefully, or tied if necessary. All bleeding having ceased, the peritoneum is raised with forceps, nicked, the director introduced, and the covering divided. Sometimes, in cases which are complicated with ascites, quite a gush of fluid may escape at this stage of the operation, and sufficient may be allowed to drain off to prevent too great obstruction, but a portion should be allowed to remain in the abdominal cavity to protect the bowels.

The cyst then usually is brought to view, and the operator passes around it in various directions the uterine sound, or a steel urethral sound, to ascertain what amount of adhesions are present. If they are not many, and the operator feels justified in proceeding, the adhesions should be broken up carefully with the hand while the cyst is yet full. The omental and intestinal adhesions can be much more easily reached if they are left until after the cyst is evacuated.

The sac may then be drawn forward and Spencer Wells's trocar (Fig.

FIG. 528.



Spencer Wells's Trocar.

528) introduced. Thomas has devised a trocar with wire flanges, which are pushed out and prevent the trocar from slipping (Fig. 529).

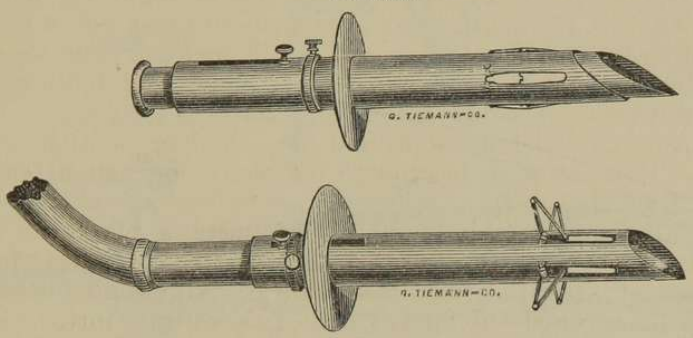
During the passage of the fluid, as the walls of the sac collapse, the abdominal parietes should be held as closely as possible, to prevent the contents of the cyst escaping into the abdomen, which is best accomplished by

* Diseases of Women, 4th edition.

passing through the upper portion of the sac a large curved needle threaded with a stout cord; the needle is cut off and the ends should be tied into a firm loop and given to a trusty assistant. If the fluid ceases to run, or is too thick to pass through the tube, it is advisable to draw the sac well out of the abdomen, roll the patient two-thirds on her face, enlarge the incision in the sac sufficiently to admit the hand, and thus rapidly and carefully evacuate the cavity. While the hand is still within the cyst, if others are found, they should be ruptured into the empty sac.

Adhesions of the intestines, mesentery and omentum are now to be sought after and carefully broken up; if too much force is required they may be dissected away with knife and scissors. Every point of tissue thus sep-

Fig. 529.



Thomas's Trocar.

arated should be immediately seized and held by the assistants, and hæmorrhage checked either by torsion or by the ligature. If the latter is used, carbolized catgut is the best. The ends of the ligature may be cut off short and left within the cavity, or they may be brought out at the lower end of the incision. The tumor, now freed from adhesions, is drawn forward and the size of the pedicle examined.

The Treatment of the Pedicle has been the subject of much discussion. Some ligate the entire pedicle in a mass and then doubly ligate it with a double cord through the centre; others have drawn the vessels out separately and ligated them; again, others cut the ends of the ligature short, while some prefer to bring them to the lower angle of the wound. Dr. Pope, of St. Louis, and the Atlees, of Pennsylvania, have used the écraseur. Simpson employed acupressure, and very many distinguished surgeons employ the clamp. Others again, among whom are Sims and Emmet, prefer silver wire, cut off and returned into the abdominal cavity, and my friend, the late Dr. Beebe, insists upon torsion, and has made very successful operations therewith. In a private letter to me he stated that he operated fourteen times, and that torsion was demonstrated to his entire satisfaction as vastly superior to the clamp. In two instances he employed enucleation.

Dr. R. Ludlam,* of Chicago, uses the clamp, and has reported successful cases in which enucleation was practiced.†

My friend, Dr. J. B. Bell, of Augusta, Maine, who has made several important ovariotomies, employed the clamp, and considering the numerous obstacles he has had to encounter in his cases, has had excellent success. My co-laborer, Dr. Macfarlan, who is a very successful ovariotomist, prefers Atlee's clamp; when the pedicle is small, using a clamp $4\frac{1}{2}$ inches long and $\frac{3}{8}$ths of an inch wide, having serrations fitting into each other, after the pattern of

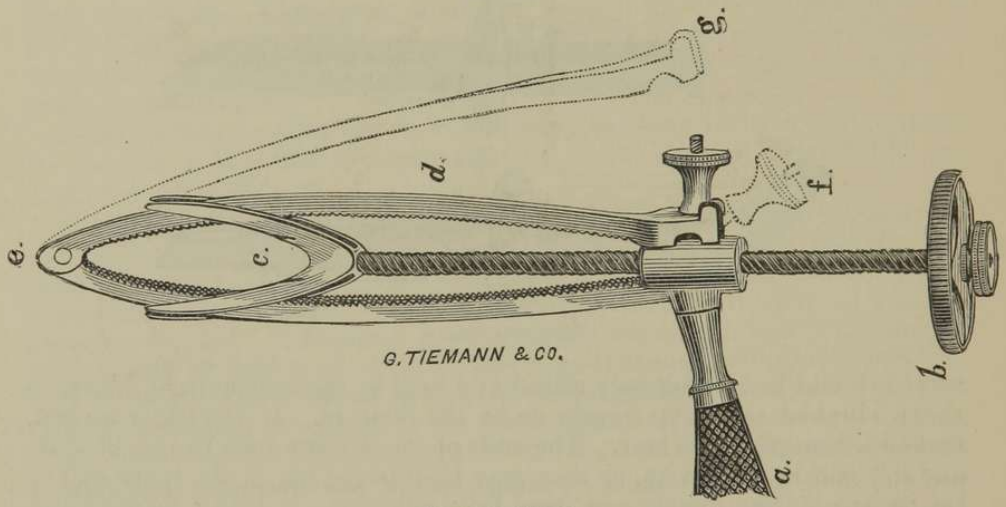
* U. S. Medical Investigator, April, 1878.

† U. S. Medical and Surgical Journal, vol. ix, p. 225.

Wells's instrument. He employs silver sutures for the abdomen, and freely employs animal ligatures to the vessels of torn omentum. The doctor continues, and, with a frankness that does him credit, says in a private letter to me: "I have not relied on torsion or used the écraseur. In one case I made a mistake as to the diagnosis; on opening the abdomen I found an enormously large uterus, from which, on tapping, several quarts of thick pus came away. She died on the ninth day. I am confident that my cases which recovered were greatly helped by arsenic as a medicine. See the similarity of the manner of death and the proving."

Formerly I employed the silver wire suture, but latterly have given preference to the carbolized catgut ligature, passing a needle armed with a

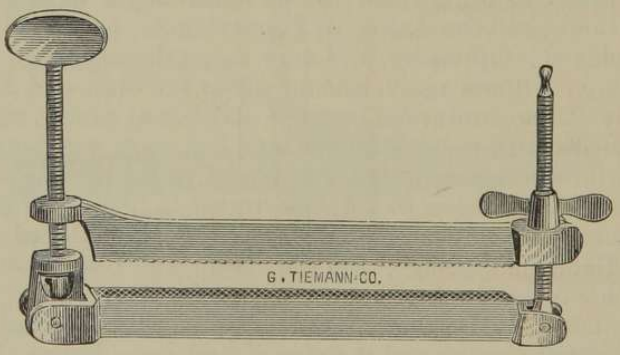
Fig. 530.



Dawson's Clamp.

good-sized twisted catgut cord through the centre of the pedicle and tying the ends firmly on each side. To make matters more secure, I have some-

Fig. 531.



Spencer Wells's Clamp.

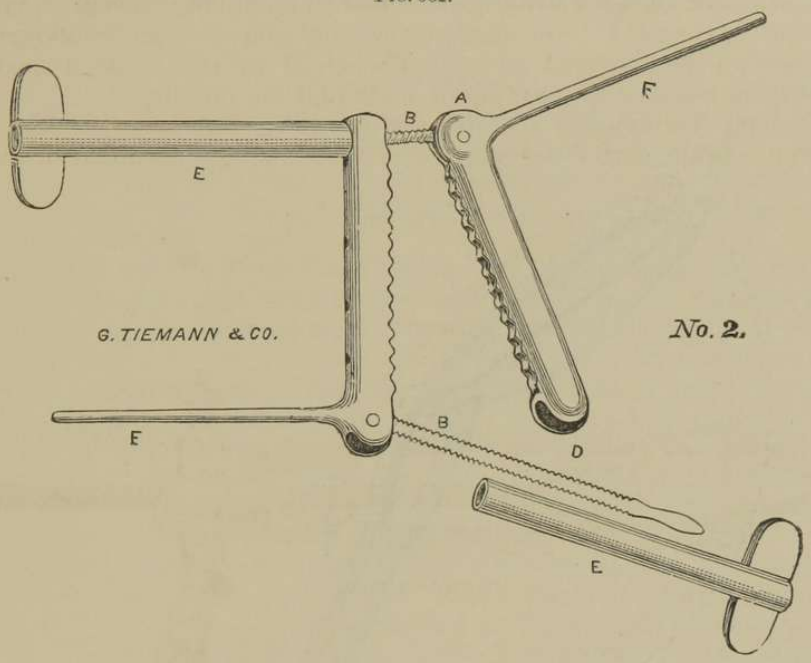
times placed a second ligature below the first. My first antiseptic ovariotomy was made May 24th, 1876.* The patient made a rapid recovery. I find also that Dr. Charles Adams, in the winter of 1871 and 1872, applied

* Homœopathic Times, November, 1876, p. 177.

the antiseptic method in all its details in two cases of ovariotomy, the operations being performed by Dr. W. Danforth.*

If clamps are to be employed either of the following may be used. Before, however, resorting to any permanent method of treatment of the

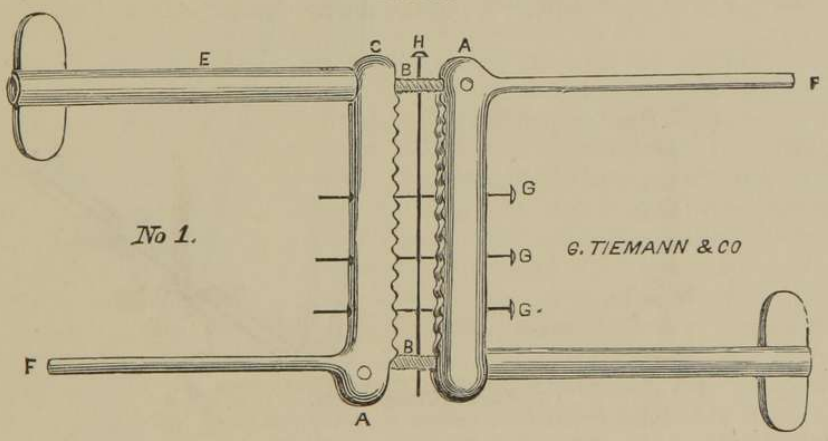
FIG. 532.



Atlee's Clamp.

pedicle, some operators place a strong piece of cord around it, and having cut off the tumor, examine the size and construction, and consider what method of treatment should be adopted. Dr. Dawson has constructed an

FIG. 533.



Atlee's Clamp Shut.

instrument for the temporary and *circular* constriction of the pedicle. The instrument will explain itself (Fig. 530).

The clamp of Spencer Wells is seen in Fig. 531. It has serrated jaws, and is supplied with a hinge, which allows it to be opened. One arm of

* The American Homœopathist, October, 1878, p. 151.

the instrument is placed on either side of the pedicle, and the tumor cut off.

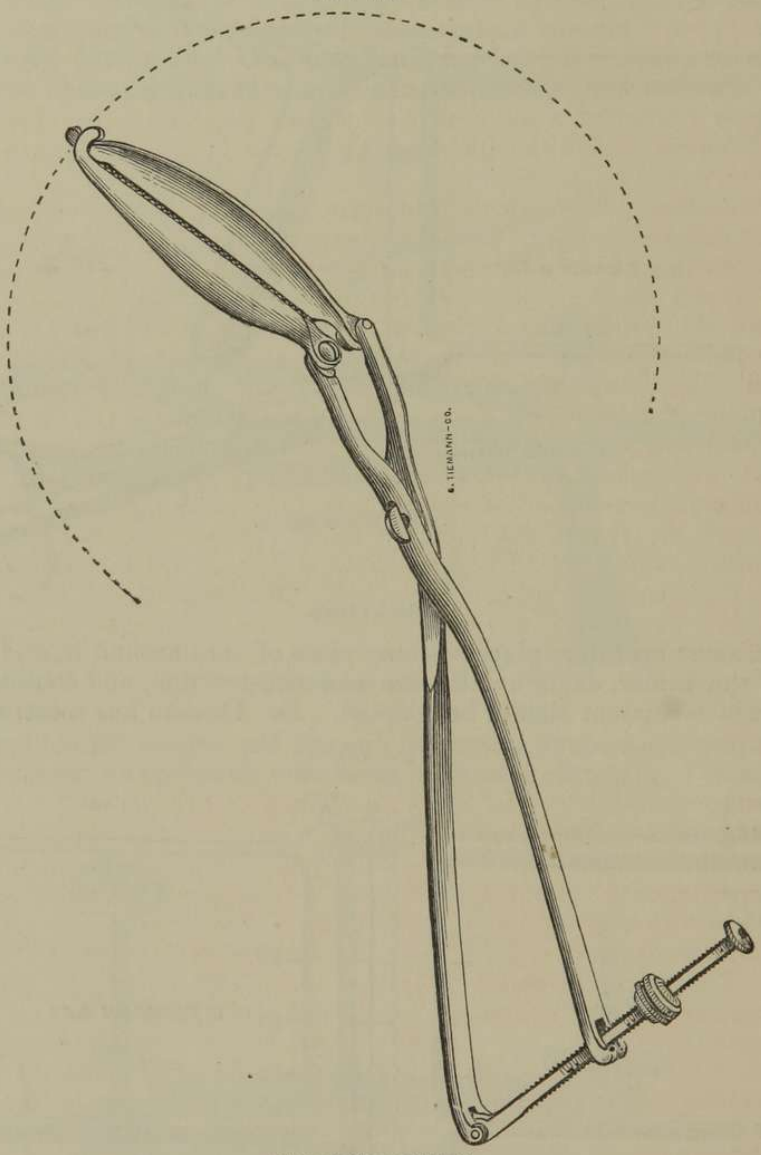
Fig. 532 shows the clamp of Dr. Atlee open.

Fig. 533 represents Atlee's clamp shut.

Fig. 534 shows Storer's clamp shield.

The surgeon must use his best judgment as to which instrument he must

FIG. 534.



Storer's Clamp Shield.

employ, and must consider all the methods and adopt that which seemeth unto him best.

After the pedicle has been constricted, the tumor is to be carefully removed, the other ovary examined, and the entire abdominal cavity carefully cleansed.

Enucleation.—I think that this method of treating the sac, when there are dense parietal and visceral adhesions, is not so much practiced as it

might be; indeed, when a careful analysis is made of the cases which have been subjected to this method of treatment, it is quite surprising how many have recovered.

By enucleation is understood the stripping off of the internal coat of the sac, leaving the external coat with the adhered peritoneum in its position. In some instances quite large portions of adherent cyst-wall have been cut off and allowed to remain in the abdominal cavity. Thus, Atlee writes of his 136th case:* "Instead of tearing through the adhesion between the bowel and cyst, I allowed a portion of the cyst-wall to remain attached to the intestines, and, in doing so, did not interfere with the integrity of the viscera. Several feet of the intestines were treated in this way." In one of my cases I allowed a large strip of the sac adherent to the transverse colon to remain, and although there were some symptoms of peritonitis, the patient recovered.

In one case, also, in which the adhesions (especially pelvic) were not only extremely numerous, but so very dense and vascular that it was impossible to separate them, I extirpated the uterus with implicated ovary, and severed the former just above its junction with the vagina. This patient went on well until the twelfth day. She was very poor, lived in badly furnished apartments, had no proper attention, and yet appeared to be doing remarkably well. There was but slight shock; no peritonitis; no hæmorrhage; no symptoms of septicæmia. The attendant, on the night of the twelfth day, a bitter cold one, worn out with watching, fell asleep; the fire was allowed to go out; the patient was taken with a chill, and died of—*tetanus*.

Dr. Ludlam† reports several cases of successful enucleation, and, as I have before noted, my friend, the late Dr. G. D. Beebe,‡ reported two cases treated in the same way. I have resorted to the method successfully.

Dr. T. F. Miner, of Buffalo, New York, first suggested enucleation of the pedicle. The directions given by Peaslee are as follows: "Detach the peritoneal coat completely around the cyst at a level two or three inches above the attachments; insert the fingers, and carefully enucleate the portion of the cyst which lies in the pelvis, so as to leave the whole of the peritoneal investment undisturbed in its acquired connections with contiguous organs." He further says, "I have succeeded by this method in a single instance, and have seen Dr. T. G. Thomas do the same."§

Washing out the Abdominal Cavity.—As soon as the sac has been removed, whether enucleation, the ligature, or the clamp have been employed, the abdomen must be carefully, though gently cleansed with soft sponges wet with a solution of thymol 1 to 1000, or of carbolic acid 5 to 100 parts of water at a temperature of 98°. Dr. Jernigen‖ also employs this peculiar method. The points he makes are: that the entire abdominal cavity be washed out, before the wound is closed, with carbolized water (1 to 100), at a temperature of 100°. Not merely "washed out," but *overflowed*. He uses a No. 10 catheter (English), fixed to the tube of a fountain syringe, and by moving the tube hither and thither, under and over the intestines the water is allowed to run in and fill the abdominal cavity. This must be continued until it *runs clear*. He then closes the wound, leaving the lower end for drainage. The irrigation is to be continued regularly until every appearance of unhealthy discharge has passed away. The cases he reports are remarkable, and by letter bearing date November 9th, 1878, he states

* Ovarian Tumors, p. 419.
† U. S. Medical Investigator, Nov. 1873.
‡ Op. cit., April 1st, 1878.
§ Ovarian Tumors, p. 430.
‖ New England Medical Gazette, September, 1878, p. 385.

that in a most unsatisfactory appearing case he has lately made an excellent success, which he attributes chiefly to this *overflowing*.

Sponges held in holders with long handles, may be pushed deep in the cavity, and, if possible, every recess reached. If there be reason to expect much effusion, the drainage-tube must be employed, as already mentioned.

In a former edition of this book I recommended the method of drainage through the Douglas cul-de-sac, as employed by Dr. Sims, and devised an instrument for the passage of the tube. Since that time I have adopted the glass drainage-tube of Dr. Thomas. It is constructed with a flange, around which I pass two strands of silver wire, No. 50, and allow about six inches of the wire to stand out on each side; these two ends are twisted together, thus making the drainage-tube resemble in shape a gimlet, the tube corresponding to the perpendicular part, and the wire to the handle. The drainage-tube is then inserted into the lower angle of the wound, the transverse part (the twisted wire) resting on each side of the cut, thus preventing the tube from slipping within the abdominal cavity. The wire is held in position by bits of plaster. The abdominal incision is then closed, the stitches passing through the parietes and peritoneum. Over this a large wad of antiseptic cotton is placed, a cork is fitted to the mouth of the drainage-tube, and a body-bandage, or, as preferred by Dr. Minor of this city, adhesive plaster placed around the abdomen.

The atmosphere of the room and every article in it should be "listered" once an hour. When the cork is removed from the tube, it should be done in an atmosphere of carbolic or thymol spray; the temperature and pulse should be taken by competent persons once in three hours; no solid food be allowed for ten days, and for the first few days the diet should consist of barley or rice-water. If symptoms of collapse should come on, then an enema of hot brandy and water should be given, and brandy with a few drops of camphor administered by the mouth. Hot bottles should be placed at the extremities, and the *tincture* of aconite given repeatedly, according to the judgment of the surgeon.

If the patient survive the shock, then about the night of the second, or morning of the third day, symptoms of peritonitis may supervene. Here we, as homœopathists, have medicines which are active in such disorders, such as acon., bell., bry., tereb., rhus, ars., chin., mur. ac., puls., and many others, which must be administered as the symptoms dictate. If, upon removing the cork from the drainage-tube, it is found filled with bloody serum, the abdominal cavity should at once be injected with a warm solution of carbolic acid (one to one hundred). This is best accomplished by the use of the fountain-syringe.

Cases are on record in which the injections have been practiced daily for two months, and one in which 135 injections were given in 78 days, the patient recovering. This treatment may be continued for a number of days, and when there is but little discharge and no odor, the washing out of the cavity may be discontinued. In spite, however, of all these precautions, death sometimes supervenes. In fact, there is no operation in which it is so difficult to form a prognosis as that of ovariotomy. If septicæmia should occur, it will be known by its symptoms, as mentioned in another part of this book, to which the reader for treatment is referred.

CHAPTER XLIV.

MINOR SURGERY.

MINOR SURGERY: INSTRUMENTS, DRESSINGS, BANDAGING, METHOD OF MAKING INCISIONS—HYPODERMIC MEDICATION.

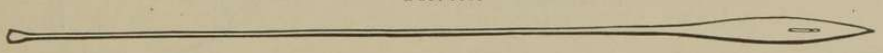
A SUCCESSFUL treatment of casualties, as well as other surgical cases, can be accomplished only by a skilful application of the varied apparatus which have been contrived and introduced within the province of surgery. Much practice is required before that degree of neatness, promptness, and carefulness are attained, which are essential components in the character of a good surgeon.

The apparatus of dressing consists of two parts, one of *instruments for*, and the other *the pieces of, dressing.*

Instruments.—Of late years the number of instruments has multiplied so largely, and they are so well adapted to the ends for which they are constructed, that but few of them can be mentioned here. In the ordinary pocket-cases of the day, we have a good variety of instruments, not only for dressing all ordinary wounds, but for performing the minor operations.

Probes.—Of all the instruments the surgeon uses, in none is the *tactus eruditus* so much needed as in handling the probe. Delicate and pliable, it should be constructed of silver or gold, a metal that will not corrode, and should have a blunt and somewhat rounded head at one extremity; at the other it should possess an eye for the introduction of threads, wires, or sutures. (*Vide* Fig. 535.) The probes used in gunshot wounds should be

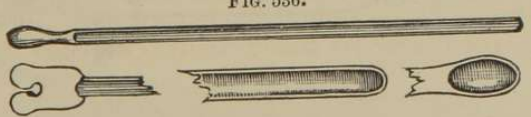
FIG. 535.



larger, heavier, and stronger than those in the ordinary pocket-cases, and may be constructed with porcelain imbedded in one end, as the celebrated probe of Nélaton, which detected the ball in Garibaldi's wound. The greatest gentleness and caution are necessary in the passage of the probe, and time and practice are required before the instrument can be skilfully used.

Directors.—These, as the name implies, are instruments which *direct* the course of the knife. They are generally constructed of steel, and are of larger calibre than a probe, having a tolerably broad groove on the one side. (Fig. 536.) In delicate operations the instrument is slid underneath

FIG. 536.

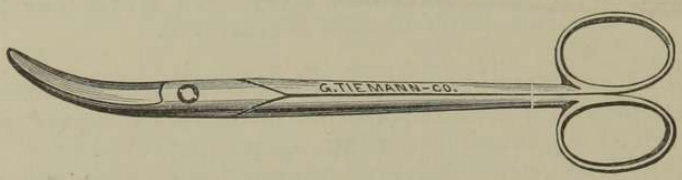


different structures, and the probe-pointed bistoury being used, the parts are divided without endangering those beneath, or taking the edge from the knife. In herniæ, in operations for the ligation of arteries, especially

about the neck; in delicate dissections of parts lying over important and vital structures, the director is a most indispensable instrument. The handle of the director is flat, and contains a slit, which, with a little manipulation, can be used as a wire-adjuster in the closing of wounds; or, as is often found in the French cases, the extremity is flattened out into a spatula containing a groove, which was introduced by Vidal, and which is useful in herniæ.

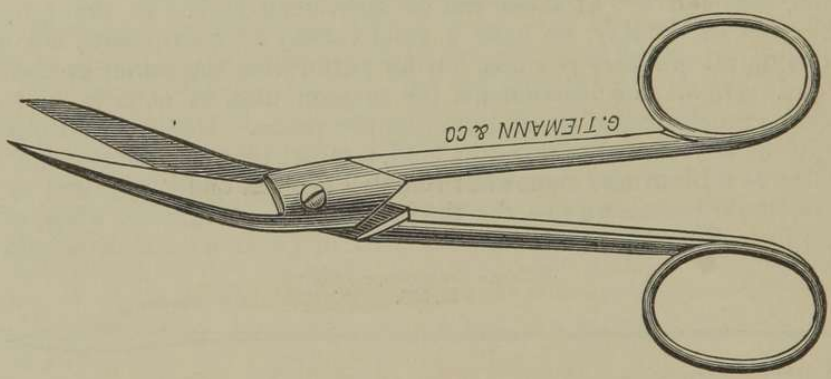
Scissors.—It is scarcely necessary to describe this instrument, it is so well known. There are several varieties: curved (Fig. 537), flat and angular

Fig. 537.



(Fig. 538), which must be used at the discretion of the operator. In operations where there is not much thickness of structure to cut through, where mucous membrane has to be pared, or removed, scissors are preferable to the knife; but if the parts are of any thickness, they are liable to be bruised

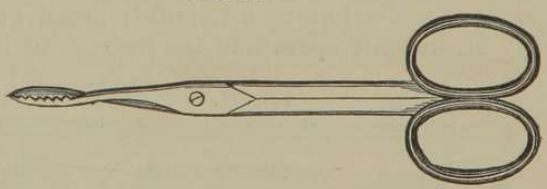
Fig. 538.



and torn by scissors; the scalpel or bistoury is, therefore, much to be preferred.

Forceps.—There are many kinds of forceps, used for different purposes. Forceps are constructed to answer the place of the forefinger and thumb of the right hand of the operator. Thus we have the *dressing forceps* (Fig. 539), which resembles an ordinary scissors, with the exception of the blades,

Fig. 539.

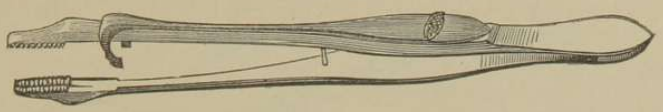


which are flat, blunt, and serrated; it is useful in removing foul or soiled bandages; in lifting the straps away from ulcers and wounds, and to draw away sloughs, thus preventing fetid and irritating discharges from contact with the surgeon's hands. Forceps should always be used in such cases.

Dissecting Forceps.—These forceps are entirely different in shape from the former, bearing more resemblance to a pair of tweezers. They are made with a spring, which holds the blades apart, except when compressed by the finger and thumb of the operator. This instrument is used in lifting skin and tissues to be dissected, in picking up minute portions of dressing, etc.

Needle Forceps (Fig. 540) are of several varieties, and are closed with a

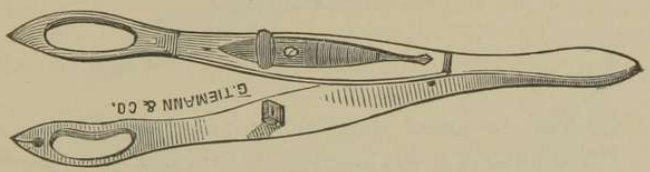
FIG. 540



slide or a spring. They mostly have a depression in which to fix the head of a pin, and when the blades are brought together and fixed, they give a greater leverage, and are very serviceable in passing the pins or needles through the tissues. *Vide* chapter on Wounds.

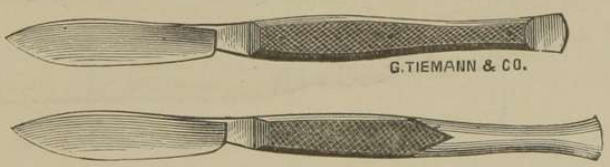
There are besides, artery forceps (Fig. 541), bull-dog forceps, tumor

FIG. 541.



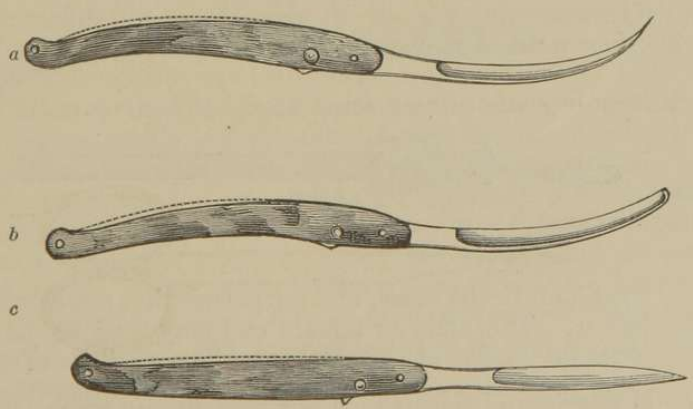
forceps, bullet forceps, and many others, all devised for catching and holding parts which are beyond the reach or manipulations of the fingers.

FIG. 542.



Knives.—These are of very many varieties and all manner of shapes. The scalpel (Fig. 542) is a short knife having a broad belly, rounded cut-

FIG. 543.



ting edge, and a straight back. A bistoury has a longer and much narrower blade than the scalpel, and is made in various shapes. Fig. 543, *c*, represents a straight bistoury. Fig. 543, *a*, a curved sharp-pointed bistoury. Fig.

543, *b*, shows a curved probe-pointed bistoury. There are also straight probe-pointed bistouries, all of which are found in the pocket-cases.

The scalpel and bistoury are, for convenience, often placed in the same handle (Fig. 545).

The Exploring Trocar (Fig. 544) is one of the most needful instruments that the surgeon holds in his possession. It may also become, in inexperienced hands, a very dangerous one. It must

Fig. 544.

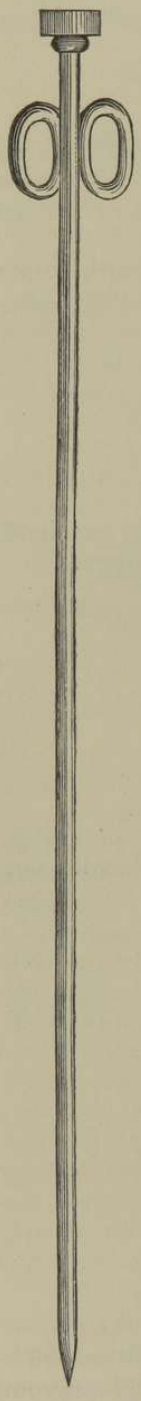
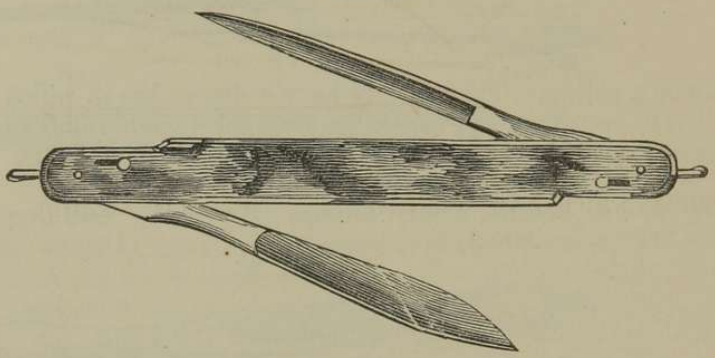


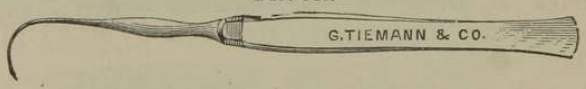
Fig. 545.



be used to assist diagnosis, to explore tumors, especially of the fluctuating kind. It consists of a long needle having a sharp point, which fits into a fine silver canula. Its insertion is easily accomplished.

The Tenaculum (Fig 546) is a sharp hook which is set in a handle, to catch bleeding vessels and draw them forward,

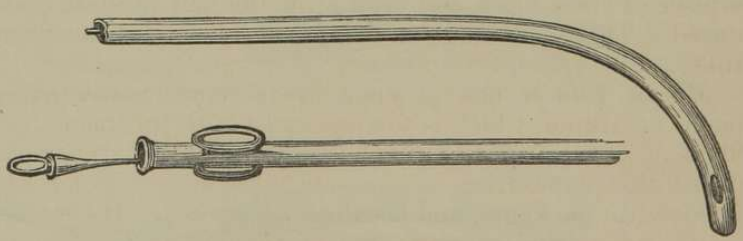
Fig. 546.



in order that the ligature may be applied. It is especially serviceable in taking up arteries of small calibre.

Catheters, both male (Fig. 547) and female, are also to

Fig. 547.

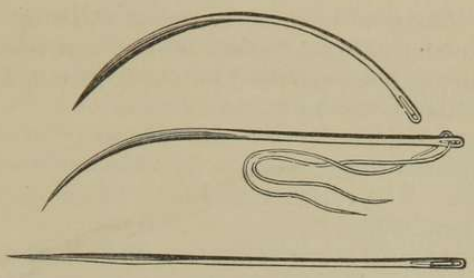


be found in the cases, and for portability, are arranged to unscrew. The male or female end may thus be joined to the straight portion of the catheter. The methods of catheterism and the construction of the instrument according to rules, has been mentioned in the chapter on that subject.

Needles.—These are made straight, curved at the points, or curved in the body, with either round or two-edged, or bayonet-shaped points (Fig. 548). They vary much in size and shape.

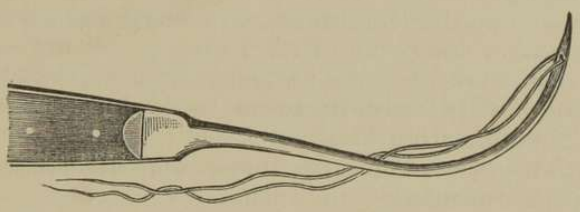
The eye is oftentimes placed in the point of the needle, which may be set in a permanent handle (Fig. 549), or used with a needle-holder.

Fig. 548.



There are very many other instruments, some of which display great ingenuity, which are mentioned in the chapters treating upon the various

Fig. 549.



surgical operations. To arrange them here would cause unnecessary repetition.

Articles for Dressing.—The articles mostly used for dressing are lint, charpie, marine lint, cotton, tow, bran, compresses, bandages, adhesive strips, etc., etc.

Lint.—There are two varieties of this substance; one made by the manufacturer—*patent lint*—and coming in packages, procurable of the pharmaceutist and instrument maker. It is a soft, delicate, pliable mass, consisting of linen, the transverse threads of which have been drawn out by machinery, leaving the longitudinal threads covered by a cottonous substance, which is extremely soft. The second, or *scraped lint*, is made by scraping a piece of linen cloth and taking off the soft substance which is thus produced. This is also known as domestic lint, and can be made in a short time.

Marine Lint is now in great favor among many surgeons. It is prepared of oakum, which is tow saturated with tar, made by picking out the fibres of old tarred ropes. The favor which this dressing has met has induced the preparation of the substance, especially for surgical purposes. It comes in packages, and is called *marine lint*. It possesses both the antiseptic and astringent properties of the tar acids which it contains, and though of rather coarse fibre, makes a good dressing. I have used it as cushions on which to place stumps after amputation, and have dressed many wounds with it. It is applied to the parts and kept *in situ* by means of the roller bandage.

Charpie.—This article is nothing more than the threads of old linen unravelled. A piece of linen should be cut about four or five inches square, and both longitudinal and transverse fibres should be drawn out. It has been asserted that this substance, when made of new linen, acts as a better

absorbent than that of the old, but the softness of the latter renders it preferable.

Charpie is made into many forms by rolling and twisting it in different ways—thus there is the roll, the tent, the pledget, tampon, pellet, and others.

A *pledget* is nothing more than a mass of charpie, which is made smooth on the surfaces, and by turning underneath or trimming the edges, is given the shape which is most desired. It can, with a little experience, be moulded by the hands into almost any form.

The *roll* is composed of a smaller mass of charpie, rolled into the form of a cylinder, the fibres all running in a longitudinal direction, and then being tied in the middle. The roll is useful for absorbing pus in deep wounds and arresting hæmorrhages.

The *tent* is a conical form of charpie, made by doubling the roll and twisting the free ends to a point; it is generally used as a dilator.

Bullets, tampons, pellets, are masses of charpie, generally circular in form, and are chiefly used for the suppression of hæmorrhage and the absorption of pus.

Cotton, from its cheapness, its softness, and its pliability, is much used in dressing, especially fractures. It is most excellent in padding splints. It has been used as a direct application to wounds and ulcers, and in some instances with great advantage. Prof. Lister, in his antiseptic treatment of wounds, makes what he terms antiseptic cotton, which is noticed elsewhere. There is also an absorbent cotton now in the market, prepared by the Dennison Manufacturing Company.

Tow comes, also, prepared for surgical use, and, when properly cleaned and sorted, makes a fair dressing.

Bran.—This cleanly article of dressing was introduced by Dr. J. Rhea Barton, of Philadelphia. In many cases of compound fracture, or after operations, where much suppuration is expected, bran applied in the fracture-box, or in junk bags, is all that can be desired. It is cheap and easily obtained.

Sawdust is sometimes used for packing in fracture-boxes.

Compresses are formed of pieces of cotton or linen cloth folded in various ways to best suit the requirements of each particular case. They are used to make and to equalize pressure; to prevent abrasion; to separate surfaces, and to fulfil other indications. They have received various names according to the shapes in which the cloth is folded.

A *perforated* compress, as its name implies, consists of a pad or many folds of cotton or linen cloth, in which one or two perforations are made. They are sometimes made of hair, or wool, or moss, and covered with muslin or linen. To relieve parts from pressure, as in the case of bed-sores, and allow a free vent for discharges, this variety of compress is very useful. It is sometimes made of india-rubber, and can, at will, be inflated with air.

A *graduated* compress is one which has a broad base and small apex, and resembles a prism. This variety of compress is useful in dressing fractures of the leg and forearm, to separate the bones before the bandage is applied.

The *pyramidal compress* "is one that is accurately formed by placing square pieces of muslin, gradually decreasing in size, on top of each other, and stitching them together so as to form a pyramid. It may also be made by folding a piece of two and a half-inch bandage on itself, to form a pyramid graduated from end to end, and then placing a piece of cotton, or other substance, in the centre of the last turns. Thus formed, it is very useful in making pressure upon certain points, as in cases of hæmorrhage from the deepseated vessels of the leg or forearm."

The following excellent rules for dressing are laid down by Dr. Smith,

and cannot be too strictly observed by the young practitioner, as they not only promote to a great degree the comfort of the patient, but also facilitate the process of the removal of the old, and the application of new dressings:

"1st. Let the surgeon make, or see made, everything that is requisite for the new dressing before removing the old one.

"2d. Let him have a sufficient number of capable aids, to whom special duties shall be assigned before commencing the dressing, as this prevents confusion. Thus, in dressing a stump, or wound, there should be one assistant to support the limb; another to furnish hot water, and change it as required, heat the adhesive strips, etc., etc., by which means the surgeon can give his attention wholly to his own duty.

"3d. Let him arrange the bed, as a general rule, *after* the dressings are changed; or, if in a case of fracture, *before* the patient is placed on it.

"4th. Let the position of the patient be such as will cause him no unnecessary fatigue.

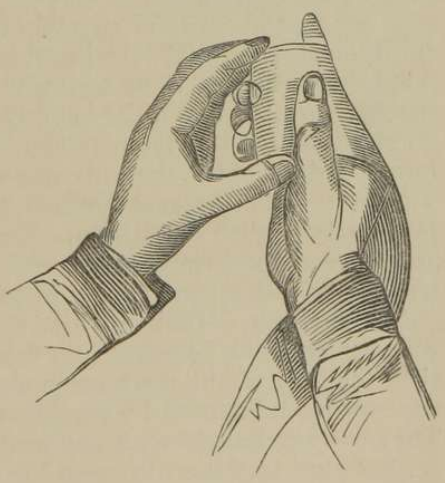
"5th. Let the surgeon, as a general rule, place himself on the outside of the limb, with his face to the patient, as this will give more freedom to his movements, and prevent accidental jars.

"6th. Let all the assistants be especially careful to guard against hasty and inconsiderate movements, in order to prevent unnecessary pain to the patient."

The Bandage.—This is generally the single-headed roller, and should be three inches in width and three or four yards in length. It is a bandage of these dimensions that fulfils most readily the indications, viz., the exertion of *uniform* pressure over the affected part, the prevention of spasmodic action, and at the same time to support other dressings. Great care should be taken to apply the roller regularly over the part, exerting about equal force on every circular and reverse turn. If the fracture be of the compound variety, then the bandage of Scultetus may be employed, as by its use the wounds may be examined and dressed without disturbing the fragments, whenever occasion may require. It may be useful here to speak of the proper method of making the roller.

Having prepared the strip of cloth,—unbleached muslin which has been washed and ironed being preferable,—fold the end of it eight or ten times firmly upon itself, in order that an axis upon which the roller is to be revolved be made; then with the left hand holding this axis, which is placed upon the right thigh, the palm of the right hand, slightly moistened, is applied, and the bondage rolled tightly; by a little practice a good firm roller may thus be made in a very short time. Or, another method is to take up the cylinder, after a few turns have been made upon the thigh, and hold it between the thumb and forefinger of the left hand, allow the strap to pass over the right forefinger, and by seizing the roller with that hand, and turning it with the left the manipulation is completed. (See Fig. 550.)

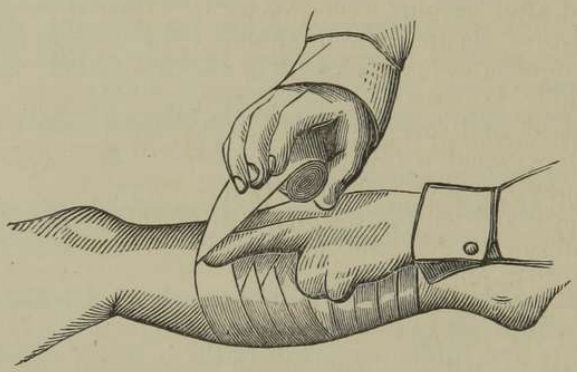
FIG. 550.



In applying the bandage, every succeeding turn should, at least, overlap the one immediately below it, and where there is the slightest inequality of surface, the *reverse* turns must be

made. There is quite a *knack* in doing this nicely, but it may be accomplished as follows: 1. Place the initial end of the bandage on the limb, and hold it there by the thumb of the left hand until, by a turn or two of the roller, there is no possibility of slipping. 2. Gradually ascend upon the limb until there is an enlargement to be covered, which is effected: 3. By placing the thumb or two fingers of the left hand on the point where the reverse turn is to be made, and holding it firmly there. 4. Loosen the long end of the bandage which is held in the right hand, and with a turn of the wrist the reverse is made. (Fig. 551.)

FIG. 551.



The *single-headed roller* is nothing more than the bandage rolled upon itself.

The *double-headed roller* is a bandage rolled from both extremities until the cylinders meet.

The *spica bandage* is made with the single-headed roller, and consists in applying it in such manner that it shall ascend or descend upon the parts to be covered. The directions for its application are the same as making *reverses*, as shown in Fig. 551. Care must be taken in applying the spica, that equal pressure be made throughout.

The many-tailed bandage, or the bandage of Scultetus, is made in the following manner: A strip of roller, of sufficient length to extend around the limb to be covered, is laid smoothly upon a table; a second strip, overlapping the first about half an inch, is laid parallel to the first; and so on a third, fourth, and fifth, until as many "tails" are made as will be required. Along the *centre* of these a longitudinal strip is laid at right angles, and stitched down. When the bandage is completed, it is applied by laying the longitudinal strip on the posterior surface of the limb, and beginning at the lowest end, bringing the tails, one over the other, on the affected part. It will be seen that by such method every tail that is laid over, holds those previously applied in position. This bandage is especially useful in wounds and in compound fractures, in which it is necessary to examine the parts frequently without materially disturbing the position of the limb.

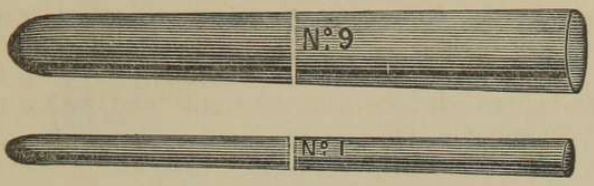
Sponge Tents.—Tents are also made of compressed sponge covered with wax, which being inserted into fistulæ, wounds, or canals requiring dilatation, the heat of the body melts the wax, and the sponge expands. These are now manufactured by machinery, and made in graded sets (Fig. 552). They can be charged with any medicinal or antiseptic substance required.

Sea-tangle tents are also used for expansion.

Paper as a surgical dressing. In the surgical wards of the Pennsylvania Hospital, Dr. Addinell Hewson has made use of paper as a surgical dress-

ing with most excellent results. He was led to its use by reading in a daily periodical that paper had been substituted for lint during the Prussian

Fig. 552.



campaign, and after various experiments in regard to strength, power of retaining moisture, elasticity, and pliability, he arrived at the conclusion that common newspaper "answers all the requirements equally well, if not *better* than lint." He says: "I have tested paper dressings in all varieties of simple, incised, and lacerated wounds; in compound fractures, on suppurating surfaces, whether inflamed, indolent or otherwise, and in all the major and minor operations which I performed, both as primary and secondary dressings, and with never any results which could lead me to consider paper inferior to the other means which I had been in the habit of employing for these purposes."

For stanching hæmorrhage, paper, especially the softer blotting-paper, has been found very useful; in fact the application of ordinary paper as a domestic remedy for trifling hæmorrhage has long been known as efficient.

Dr. Hewson, in his interesting essay, also gives his method of substituting paper for oiled silk as a covering for wet dressings. The cheapness of paper is also made apparent by exact computation. Even when we use the best quality of blotting-paper, made of purest linen fibre, the difference would be as three to thirty-three in favor of paper.

In the Hahnemann Hospital I have made use of the waxed paper, which is prepared in the house, and for its cheapness and efficacy, in those cases where oiled silk or india-rubber cloth is generally employed, it answers admirably. Lister's complete method of antiseptic dressings will be found at page 239.

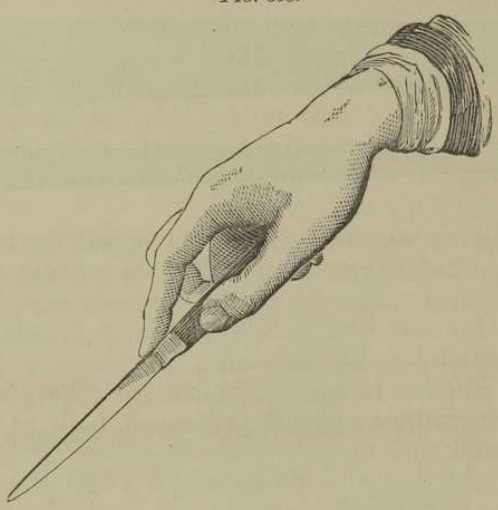
Incisions.—*The method of making incisions* varies very much in accordance with the operation to be performed and the will of the operator. The positions in which the knife is held, however, may be laid down for the benefit of the student and young practitioner. Before proceeding with any operation, the edges of the instruments should be examined by a competent assistant or by the operator himself, and having satisfied himself of their keenness and cleanliness, the cuts, when made, should be of sufficient length for the purposes required. None but those who have witnessed the embarrassing effects of small incisions can appreciate the value of fair, sweeping, and clean cuts in any operation, whether trivial or important.

Positions of the Knife.—In some instances the knife may be held as an ordinary carving-knife, the thumb upon the handle, the index finger on the back of the blade near its shoulder, the remaining fingers steadying the instrument as seen in Fig. 553. Another position of great convenience is when the scalpel is held as the violinist holds the bow; the blade of the knife should be turned a little sidewise, and it should be held lightly between the thumb and fingers, as seen in Fig. 554.

Again, the scalpel is held as a pen, especially in dissections. The extreme mobility given to the instrument with the forefinger and thumb, while the hand is steadied by the remaining ring and little fingers, and the

rapidity with which the upward and downward motions may be made, render this position a favorite one with many skilful operators. The position is seen in Fig. 555.

Fig. 553.

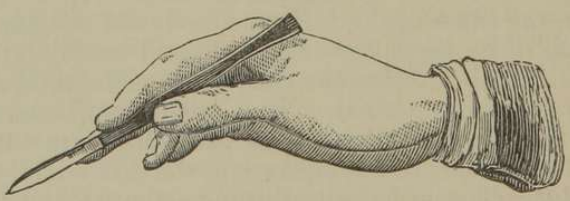


Incisions are called simple ———; crucial, X; or V-shaped, or resemble the letters H, L, T, I; or they may be in the form of an ellipse, or they may be semicircular.

Fig. 554.

No rules can be given for the shape and direction of incisions, as the surgeon must, in every presenting case, adopt such as will produce the best result with least deformity.

Fig. 555.



Hypodermic Medication.—The value of hypodermic medication in many surgical disorders forbids us to leave this portion of our subject without mention of the instruments employed, and the doses of the substances found most efficacious. The hypodermic syringe was invented by Alexander Wood, of Edinburgh; he conceiving the idea from the instrument used by Mr. Fergusson for injecting nævi. It consists of a small glass, or hard rubber syringe, with one or two movable capillary points; these are introduced beneath the integument, the cylinder having been previously charged with the dose to be administered, and the piston slowly pressed home.

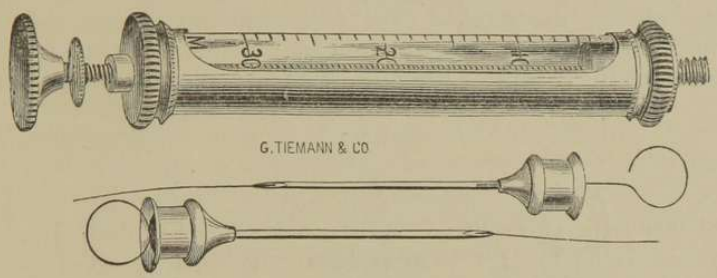
The best way to insert the points is to pinch up a portion of the integument between the thumb and forefinger of the left hand, and taking the syringe in the right, push it into the fold thus held up.

Many improvements have been devised in the construction of the hypodermic syringe, in order to save time and trouble in counting the number of drops to be employed as a dose. Thus, in some, the number of drops or minims is marked upon the piston, and the cylinder made of glass; by drawing up the piston, the liquid follows and the exact amount may be measured; in others the minims are cut into the cylinder.

The annexed cut (Fig. 556) represents the hypodermic syringe devised by Messrs. Tiemann & Co.

The glass cylinder is in reality a minim measure, which is regularly graded. This, for better preservation, is encased in a metal covering, which

Fig. 556.



is fenestrated on one side to show the marks upon the glass. The piston is longer than the cylinder, in order that it can, if necessary, be pushed through to be washed and oiled.

In making the hypodermic injection, it must be borne in mind that at least half the stomachic dose should be employed, and in many instances it is better to begin with a dose one-third or one-fourth the quantity administered by the mouth.

It is preferable, if the substances are soluble in water, to use that as a vehicle, as it is less irritable to the skin. The doses may be as follows:

Muriate of morphine,	$\frac{1}{8}$ to $\frac{3}{4}$ of a grain.
Sulphate " "	$\frac{1}{8}$ " $\frac{3}{4}$ " "
Atropine sulphate,	$\frac{1}{60}$ " $\frac{1}{30}$ " "
Strychnine,	$\frac{1}{60}$ " $\frac{1}{30}$ " "
Sulph. soda (Hewson),	grs. ij.
Sulphate quinine,	grs. ij to grs. iv.
Squibb's liquor of opium,	gtt. v " gtt. lx.
Magendie's solution,	gtt. iii " gtt. xx.
Tinct. hyoscyamus,	gtt. x to xx.
" cannabis,	gtt. x to xx.

The Aspirator.—The idea of withdrawing abnormal and other fluids from the different cavities of the body has been promulgated among surgeons and physicians from remote ages. Instruments constructed for this purpose were termed *pyulca*, because they were generally employed for the withdrawal of pus, and although variously modified, they were all constructed on the principle of the exhausting syringe.

Dieulafoy, on the 2d of November, 1859, presented, through Prof. Gubler, to the Academy of Medicine, an invention of his own, to which he gave the name "*Aspirator*," and which has become one of the most important instruments in the hands of the profession. It consists of hollow capillary needles, and a suitable air-pump to create a vacuum.

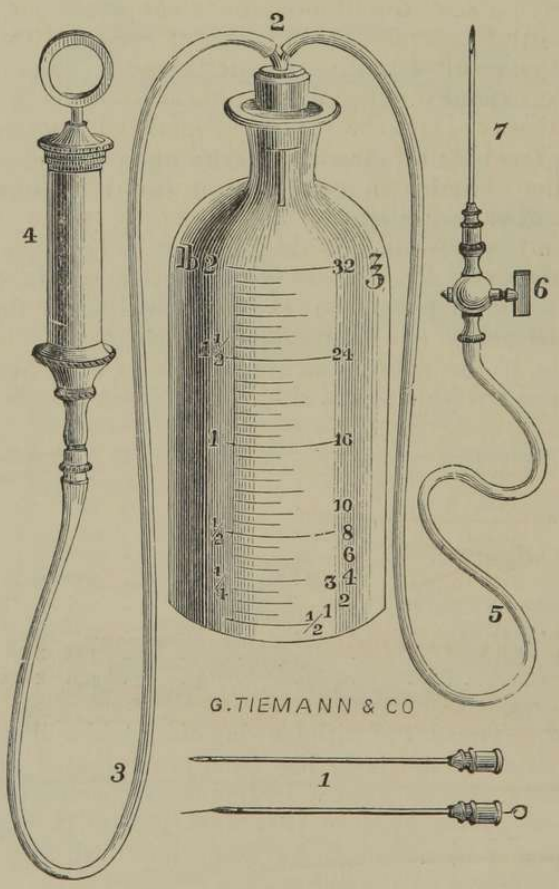
The varied forms of the aspirator are constructed on these principles, and the numerous operations which can with safety be performed, are daily proving the immense value of the apparatus.

I have employed this instrument in very many diseases, among which may be noted hydatid cysts of the liver, abscess of the liver, retention of urine, poisons in the stomach, ovarian cysts, hydrocephalus, spina bifida, strangulated hernia, effusions into the pericardium, purulent pleurisy, diseases of the joints, diseases of the tunica vaginalis and peritoneum, sanguineous effusions, acute abscesses, suppuratory buboes, and other diseases.

A glance at the above list of diseased conditions, for which the aspirator can be employed, detects the fact that a majority of them are of the most serious character; in addition, when we remember the comparative harmlessness of the punctures and the immediate relief, if not cure, which generally follows aspiration, the wonder is, that such an apparatus has not been before constructed. As a means also of diagnosis, the aspirator must hold a high place; the facility with which the operations may be performed adding much to the general usefulness of the apparatus.

The needles of the aspirator are hollow and of various sizes, the smallest

Fig. 557.



Tiemann & Co.'s Aspirator.

being about the calibre of the ordinary hypodermic syringe; to these needles is affixed a stopcock, which shuts off the air; they are also furnished with a screw, by means of which they are attached to one end of

an india-rubber tube, the other extremity of which fits into a glass cylinder, in which, by means of a piston (or air pump) a vacuum is created.

The simplicity of the contrivance, and the great suction which can be brought to bear upon even semifluid substances by means of the vacuum, will be apparent.

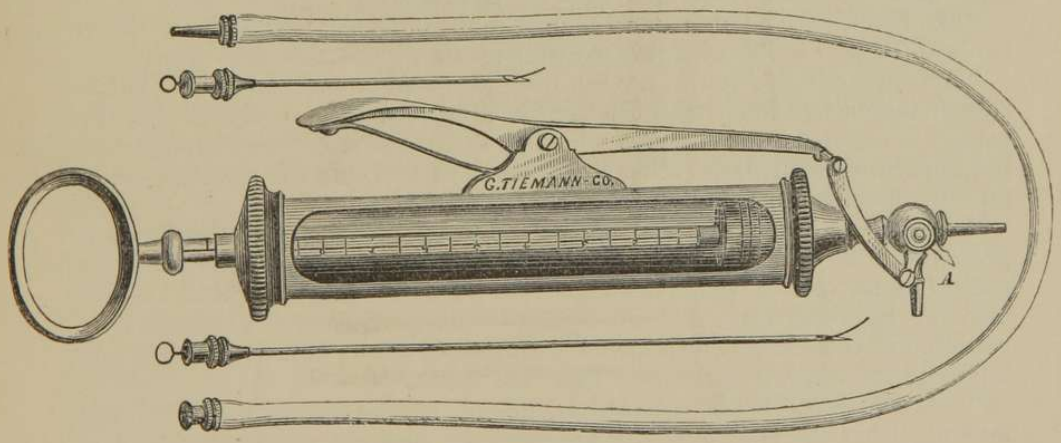
When the instrument is to be used, the vacuum is first created, the needles are then inserted into the part desired, the stopcock turned, and the fluid, whatever it may be, is drawn within the glass cylinder.

There has been, as there always is, a great deal of discussion regarding the "previous vacuum" and the "subsequent vacuum," of the danger of "too perfect a vacuum," of the difficulty of knowing "how to manage the vacuum," and such like questions, all of which will be satisfactorily explained after more extended experience has taught us the proper lessons.

Of course, the range of disorders to which the aspirator will be adapted, will, at first, be very extended; time and experimentation will bring the limit. The instrument will have its "*run*," as every fashionable medicine, every novel instrument, and every improved method of operation has had before it. Doctors have run mad over Bavarian beer and cod-liver oil; there has been carbolic acid madness and chloral frenzy; Civiale predicted the exclusive use of the lithotriptor in cases of stone; Chassaignac would amputate with the écraseur; and even at present, Prof. Dittel would accomplish the same result with the "elastic thread." Esmarch's artificial ischæmia has been extended to keeping the blood in the body during serious and prostrating diseases, and the aspirator, modified into a great variety of shapes, will be tried for all classes of disorders.

As is usual, there have been many modifications of the aspirator, and as the simplest is always the best, that represented on the preceding page is, according to my experience, to be preferred. If large quantities of fluid are to be removed, the cork may be fitted to a larger bottle. The modification of the trocar needle, by which a rounded instead of the usual sharp-pointed extremity is left within important cavities, is one much to be desired.

FIG. 558.



Emmet's Aspirator.

When smaller quantities of fluid are to be withdrawn for chemical or microscopical examination, Emmet's modification (Fig. 558) is a very excellent apparatus.

One of the best of the many modifications of the aspirator is that of Dr. Simon Fitch.* His invention consists in what he terms his "dome trocar," with the addition of "a hose-coupling attachment" for the aspirator. I can testify to the efficacy of the instrument, having used it frequently. The description of the instrument I have given in full from Mr. Tiemann's catalogue, a perusal of which will satisfy the reader of the completeness of the instrument:

"He has had the distal orifice of the inner canula closed over by a rounded or dome-shaped roof, so that, when *it* is projected beyond the cutting-point of the outer canula, the two tubes fit closely together, and the end of the combined instrument feels perfectly smooth like the end of a sound or catheter, and may be freely moved within the cavity penetrated, as the ovarian cyst, the abdomen, the thorax, the bladder, or even the pericardium, without danger of wounding any viscus or organ, puncturing any vessel, or even scratching or abrading the lining of the cavity, or of any parts contained therein. The base of this dome being of the same external circumference as the inner tube, of which it is the continuation, and fitting the outer tube accurately, when the point of the instrument enters a cavity, there can be no escape of fluid till the dome is advanced, occluding the cutting-point of the outer tube; then there is disclosed a fenestra or oval aperture on the *under side* of the inner tube, cut out of the lower wall and one-third of each side wall, of the full size of the bore of the tube, and by which the fluid may be freely evacuated.

"In the ovarian trocar, and in the trocar for paracentesis abdominis, a curved metallic tube, fitting upon the proximal end of the outer canula, serves as a handle, and directs the current downwards, and one end of an india-rubber tube may be drawn over the lower orifice of this curved hollow handle to conduct the liquid into a receiving vessel. The middle of this tube is expanded into a bulb by which the flow through the tube may be promoted or hastened, and the cavity more rapidly and perfectly exhausted, or washed out, or injected.

"The wooden ring with Wells's grapples may be slipped upon the instrument; or light, long clamp forceps, with numerous teeth in the broad distal ends, may be held in the hand, or attached to the instrument by a sliding ring, narrower than Wells's, or by a shifting ratchet.

"Dr. Fitch feels assured that the operations of *transfusion* and *aspiration* can also be performed with this instrument with great ease and safety.

"A trocar of suitable size having been attached to each end of an india-rubber tube a foot long, with the middle expanded into a bulb, one of the trocars is inserted into the vein which is to furnish the blood, and, when the apparatus is filled, the other trocar is introduced into the receiving-vein, and the operation is completed.

"As soon as the lancet-end of the outer tube is inserted, the dome is projected from the interior, and the tubes, thus guarded, may be safely pushed as far as required, downward into the furnishing-vein, and upward into the receiving-vein, and no ligature will be needed. Thus time, so valuable in this operation, is saved, disturbance of the vein is avoided, and injury to the interior of the vein need not be feared.

"*The attachment to the aspirator* is effected instantaneously, and without moving either the trocar or the aspirator, by pushing the conical end of the aspirator nozzle into the funnel-shaped proximal end of the inner tube, and tightening and fixing it by one turn of the ring-nut like a hose-coupling.

* New York Journal of Medicine, April, 1875.

"Figs. 1, 2, 3 (Fig. 559) represent the ovarian trocar; Figs. 4, 5, the aspirator-needles.

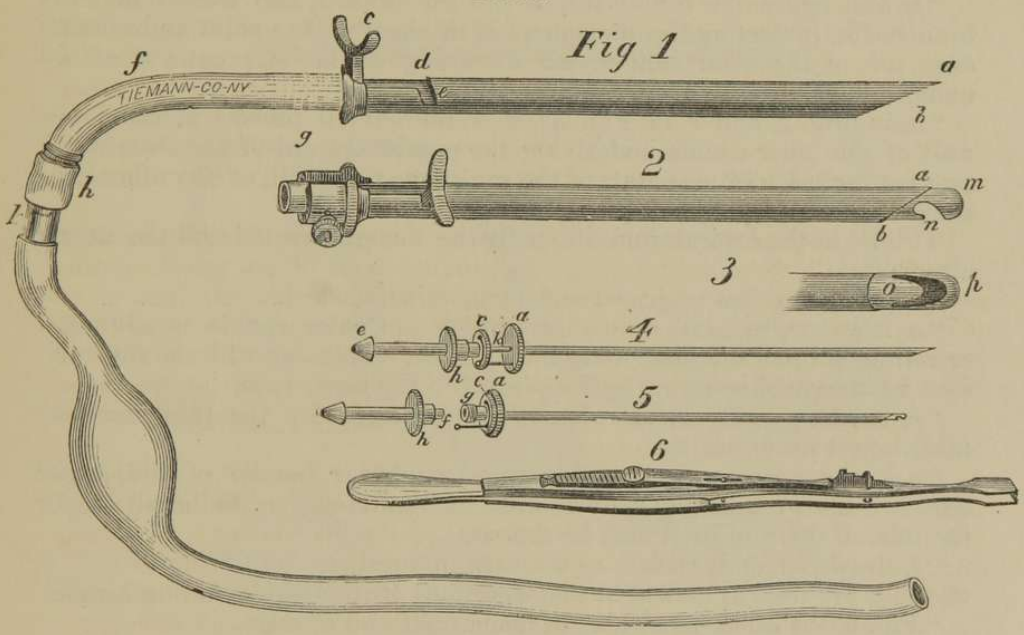
"The intermediate sizes for paracentesis abdominis, hydrocele, paracentesis thoracis, and transfusion, are sufficiently expressed by one or all of these figures.

"Fig. 1 has the dome retracted, disclosing the point and straight cutting edge, *a b*, of the outer canula, and occluding the instrument behind the point against ingress or egress of fluids.

"The thumb-rest, *c*, attached to the inner canula may be pushed forward in the slot, *d*, and turned into the branch-slot, *e*, advancing the dome, and bringing the fenestra to the under side (as in Fig. 2).

"The tubular handle, *f*, has the larger end fastened upon the outer canula by the screw, *g*. In attaching the *larger* end of the handle to the *outer* canula, push the process, projecting from this end, into the slot in the

FIG. 559.



proximal end of the canula, and then turn the loose ferrule till the mortise in its side corresponds to the screw, *g*.

"A recess in this end of the handle holds an india-rubber washer, which, fitting closely around the inner or dome canula, makes the continuity of the long india-rubber tube with the interior of the instrument virtually air-tight, and sufficient for all requirements in ovariotomy or in abdominal tapping.

"But, should absolute imperviousness be desired for perfect exhaustion, or for injection of a cavity, the *handle* may be reversed, the smaller end, *h*, screwed upon the proximal end of the *inner* canula, and the orifice of the india-rubber tube drawn over the larger end of the handle after pushing back the loose ferrule so as to expose this end of the handle.

"Or the *aspirator* may be attached to the inner tube, either directly or with the intervention of the handle. The instrument as at first made had the handle continuous with the inner canula, and the thumb-rest upon the *outer* tube; but it is not so easily worked with one hand as in the present arrangement.

"The india-rubber tube is shown in this figure with a bit of glass-tube, *k*, by which the presence and character of the fluid may be observed, or its absence noticed.

"The bulb is a *simple expansion of the tube*, so as not to interrupt the easy flow of fluid, or to whip the blood in transfusion, as might occur were the bulb connected by any sort of joint with the tubes, between which it is placed.

"This bulbous tube may be used for the ordinary emptying or washing out of cavities, or for aiding the current from vein to vein in direct transfusion, or for quickening the flow from the elevated reservoir in mediate transfusion if it seem sluggish. The *drawing on* of the india-rubber tube may be facilitated by smearing the end of the handle or nozzle with soap and water or with oil.

"Fig. 2 shows the proximal end of the inner canula, projecting, to which the smaller end of the handle may be screwed, or the aspirator attached.

"In this figure the thumb-rest is pushed forward, and turned into the branch-slot, projecting the dome, *m*, which sheathes the point and cutting edge, *a b*, of the outer canula, and disclosing the fenestra cut out of the under and side walls of the inner canula.

"*n*, in Fig. 2, and *o*, in Fig. 3, show the curved process of the lower wall of the inner canula underlying the proximal third of the fenestra, to prevent occlusion from contact of the sac or the vein-wall, or any other substance.

"Fig. 4 is the aspirator-needle, with the dome retracted and the nozzle attached.

"Fig. 5, the dome projected and the nozzle detached.

"*a*, is a circular plate or disk, by which the outer canula is advanced or retracted upon the inner canula and dome, dispensing with the slot incident to the attachment of the thumb-rest to the inner tube.

"*k*, a rod, playing in the slot, *c*, by turning which the tubes may be taken apart for cleansing.

"*e h*, the nozzle corresponding to the tubular handle of the larger sizes (*e*), the proximal end over which the india-rubber bulbous tube, or the tube of the aspirator, may be drawn.

"*f*, the distal end, *conical*, to be inserted into the *funnel*-shaped end, *g*, of the inner canula, and tightened and fixed by the hose-coupling nut, *h*.

"Fig. 6, the *clamp forceps*, to be made light and slender.

"Where the trocar is used for injection, the end of the inner tube, instead of having one fenestra, might be perforated with numerous small holes, so that the injection should issue from them in the form of spray.

"The instruments may be of any size. The largest is the *ovarian trocar*, which has a total length of twelve inches, the handle being four inches, and the inner canula, besides the portion within the handle, eight inches, with an internal diameter of half an inch. Dr. Washington L. Atlee used this in his last ovariotomy, and expresses unqualified approval of it.

"That for *paracentesis abdominis* is exactly half the size of the ovarian trocar.

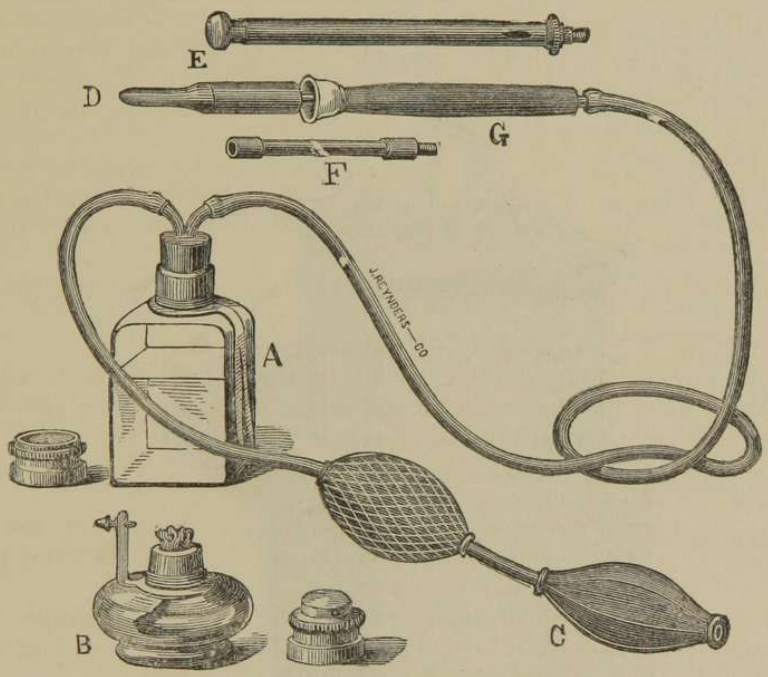
"The smallest sizes correspond in calibre with Dieulafoy's aspirator-needles, but are longer, being five and one-half to eight inches in length, for exploratory sounding, for emptying deep cavities, and for transfusion."

Thermo-Cautery.—I desire here to call attention to the thermo-cautery of Dr. Paquelin.

The neatness and efficiency of this instrument have already made it a general favorite with surgeons in those affections which require the actual cautery. Its advantages are, that it may be used steadily for any length of

time, the incandescence being kept up at the will of the operator by compressing the air-bulbs. The principle involved is simply the fact that platinum is one of the metals that when slightly heated gradually becomes incandescent by the contact with certain hydrocarbon vapors. A, represents a bottle nearly full of common (not deodorized) benzine. The cork that fits this bottle is perforated by a double tube, to one branch of which an air-blowing apparatus, C, is attached, while to the other is affixed an india-rubber tube, the distal end of which is fitted to a hollow handle, G, into which handle the cauterizing knives or buttons, D, E, are screwed. These latter are made of platina, are hollow, and are filled inside with platina-sponge. These ends are riveted into cylinders, each containing two tubes, one to conduct the vapor of benzine to the cautery (called also the combustion-chamber);

FIG. 560.



Dr. Paquelin's Thermo-Cautery.

the other, to carry off the products of combustion. Sometimes, when a greater length of the instrument is required, an additional tube, F, may be added. B, is an ordinary alcohol lamp. The bottle, A, may be hung by the hook on its side to the vest-pocket of the operator, who works the air-bulb with the left hand, while he applies the cautery with his right. The end of the cautery, D, is held in the flame of the lamp for one or two minutes to heat the platinum; the bulb is then gradually inflated, and rapid incandescence is produced, which may be maintained just so long as the air-bulb is worked, which forces the benzine vapor from the vial through the tube into the handle, and thus to the platina. With this instrument I have performed very satisfactory operations.

Galvano-Puncture.—Galvano-puncture, on account of the pain inflicted, is seldom resorted to, except in the treatment of surgical diseases, where the usual mode of application with moistened electrodes has been resorted to and failed. The procedure is the same as in electrolysis.

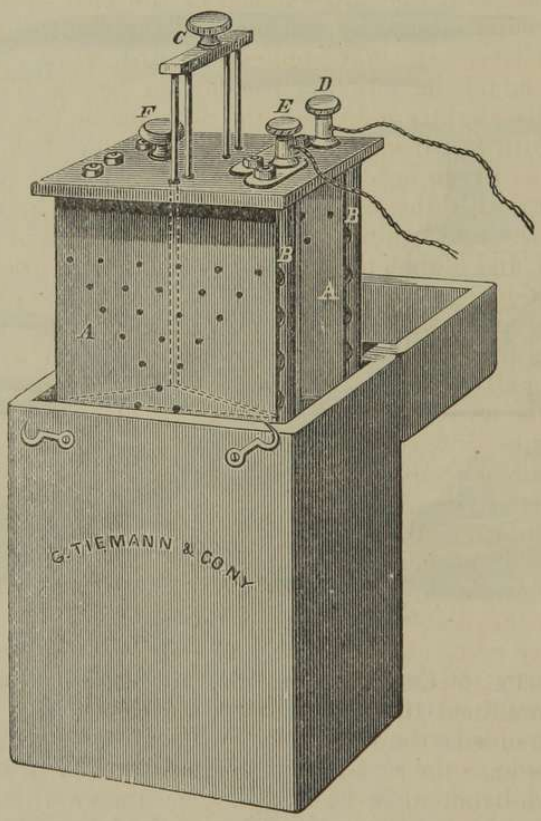
Galvanic Moxa *is employed* as follows: Denude the part to the extent desired, by means of blisters or other excitants, in two places, one above

the other, then apply zinc and silver plates as described for ulcers. Apply the zinc plate to the part from which the discharge is desired, and the silver plate to the other. Sodium is eliminated at the silver, and chlorine at the zinc plate. A poultice applied to the part will give a free discharge of pus.

Galvanic Cautery Battery.—The galvanic cautery is fast growing into favor for the removal of tumors situated in the accessible cavities, as well as for those on the surface. The instrument is seen in Fig. 561.

Dr. Moore, of Rochester, N. Y., under date of February 27th, 1872, reports the following important case: Some time since a little son of Jacob Sauer was taken ill with a disease of the glands and throat, which resulted in a tumor that endangered the life of the boy. The tumor was removed by the galvano-caustic battery in a most satisfactory manner. A platina wire, heated to a white heat by the battery, was used. The boy was not seven years old. The tumor weighed twenty ounces after removal.

FIG. 561.



Mr. Bryant reports, in the *Lancet*, a case of nævus over the chest, which he cauterized deeply with the porcelain cautery brought to a white heat. The whole growth was completely destroyed, and in two weeks the eschar separated, perfect cicatrization having taken place. The same author reports an interesting case of lupus of the face and nose cured in one month by the same means; also a case of epithelial cancer eradicated by the cautery.

To how great an extent this power may be carried we are unable to say. Some most astounding cures have been effected by its use. In the *Medical Record* for September, 1869, Dr. Neftel records a highly interesting case

of cancer, which, after two removals, was cured by electrolysis. The great importance of the case appears in the fact, that the patient possessed the cancerous cachexia. Many clinical cases will be found in the following chapter.

CHAPTER XLV.*

ELECTROLYSIS.

When two or more needles connected with the poles of an apparatus, generating a galvanic current of sufficient intensity to overcome the resistance of the circuit, are inserted into living animal tissue, the following results take place, viz., the bloodvessels of the part become dilated and engorged, producing intense hyperæmia, and the absorbents are stimulated to increased activity. In short applications with weak currents the effect ends here, but should the action of the current be continued, and the tension and quantity slightly increased, the albumen of the part becomes coagulated, and with a still stronger current the water of the tissues becomes decomposed, the oxygen becoming attracted towards the positive pole, and the hydrogen towards the negative, to find vent at which it bubbles violently through the intervening structures, tearing fibre of muscle, separating cells, nuclei, and filaments, etc., and mechanically destroying anything that may oppose its egress. The salts of the tissues are resolved into their contained acids and alkalies, the acids forming around the positive pole, and the alkalies around the negative, where both act as powerful escharotics, producing sloughing. Thus the tissue acted upon is made to destroy itself through its own contained reagents. The operation thus described may practically be divided into four stages:

1st. The dynamic or absorbent stage, corresponding to what is called by Remak electro-catalysis.

2d. The coagulating stage.

3d. The stage of mechanical disintegration, and

4th. The escharotic stage, or the stage of complete and ultimate electrolysis. We use the first stage only in the treatment of serous effusions, strictures, watery cysts, etc. The second stage in the treatment of aneurism, varicose veins, hæmorrhoids, nævus, and other diseases, where coagulation of the contained blood is desired, and where the production of a slough is not intended; the third and fourth stages in growths of a malignant nature, fibrous tumors, polypi, fatty tumors, and in any case where a total or partial destruction of the part may be necessary. In the operation the greatest amount of effect produced is in the immediate vicinity of the needles; in very mild currents the cauterizing effect is only produced in the parts directly in contact with the needles; with strong currents, the sizes of the slough depend upon the structure of the tissue, the amount of water and salts it contains, the size of the needle, and the duration of the application. The eschar produced by the positive pole differs essentially from that caused by the negative, inasmuch as the ulcer resulting from the separation of the slough of the first, leaves a cicatrix which heals by

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* This Chapter was prepared by John Butler, M.D., L.R.C.P.E., author of a Text-book on Electro-Therapeutics and Electro-Surgery.

contraction like that produced by an acid caustic. No such results take place from the action of the negative pole; on the contrary the cicatrix is soft and pliable.

It is, of course, entirely impossible to obtain purely the results of any one of these stages *per se;* for instance, in electro-puncture of an ovarian cyst, the result aimed at, is to produce absorption, and so act on the internal part of the cyst as to destroy its secreting powers and prevent refilling. Electrolysis of the watery parts of the contents must and does take place to a greater or less degree, but it forms no part of the desired effect, and so in operating upon aneurism, or nævus, though coagulation of the blood is the only thing desired. Electro-puncture as thus described, is presumed to have been performed with needles made of unoxidizable materials. Should the needle of the positive pole be made of materials capable of being acted upon by the acids set free at this point, the results are modified in a great degree. For example, suppose the positive needle should be made of iron, the needle becomes dissolved by the acids set free, and the phosphate, sulphate, and chloride of iron are formed, principally the chloride. From this fact we would infer that iron needles would be useful when coagulation of blood is the result aimed at, and there is no doubt they assist the accomplishment of such a result to a considerable extent. Suppose we use zinc needles, we have chloride of zinc formed, which is a powerful escharotic, and assists materially in hastening the destruction of morbid growths. I have used these needles with a weak galvanic current and long applications, for the destruction of malignant tumors, and believe it to be in many cases the most appropriate treatment. The diseased tissue is chemically dissolved under the action of the current, which at the same time influences the morbid nervous impulse which caused the secretion of the mistaken cells in the first place, and the electro-chemical action of the already disintegrating structure on the needle forms, molecule by molecule, one of the most powerful escharotics, which destroys, molecule by molecule, any of the diseased mass that may possibly escape the action of the current, and not only that, but it acts as a powerful antiseptic on the slough that otherwise might become offensive before separation had time to take place, and still further it certainly hastens that separation. Another advantage of the operation is that it is comparatively painless, in some cases entirely so; electrolysis of the tissue takes place so slowly that the chloride of zinc is also formed slowly, and immediately uniting with the tissue that is already half numbed by the action of the current, very little pain if any is produced. In fact the strength of the current can be so arranged that no pain is caused. In my opinion, the electro-chemical treatment far surpasses ordinary electrolysis in certain cases, where total destruction of the part in as short a time as possible, and with a minimum amount of pain, is desired; still a slight eschar around the uninsulated part of the needle is unavoidable. In such operation it behooves us to make this latter as slight as possible, which *can* be done by diminishing the amount of quantity of current used; that is to say, in any operation requiring a cauterizing effect a large quantity is required; in operations where we simply desire to produce the absorbent or electro-catalytic effect, we require tension but small quantity.

We will, for the present, dismiss this question of electro-chemical treatment, and return once more to the consideration of the effects of the current as applied with unoxidizable material.

This operation so far we have only considered as performed by the use of needles introduced into the tissues. The same effects in a lesser degree can be obtained by external application of metallic and other rheophores

to the skin, mucous membrane, or denuded tissue. And when we use the current for the sake of its lesser effects, it is frequently applied in this manner.

One of the greatest difficulties in the technics of electrolysis, so called, to the tyro electro-therapeutist is to avoid doing too much. The operator must have a battery provided with a Brenner's, or other equally accurate rheostat, constant and reliable, capable of giving every variation of quantity and intensity of current. He must be quite familiar with its action, and with the effect each variation is capable of producing on living animal tissue. He must also be able to control the electro-motive force to the exact point capable of producing the effect desired, and no more. For instance, what could be more deplorable than that sloughing of the urethra should take place when the effect intended to be produced is merely the absorption of a stricture? or in operating on a nævus on the face of a young lady, that an eschar should be caused when we merely aim at coagulation of the morbid growth? And yet the slightest overstepping of a scarcely defined boundary will cause just such a result. Better far to do too little than too much. It is impossible to state with precision the exact quantity and intensity of current to be used, as that depends upon the size of the growth, the density, and the amount of watery and saline ingredients contained. This must be learned entirely by experience. We will first take up stricture of the urethra for consideration.

STRICTURE OF THE URETHRA.

In stricture of the urethra, as before remarked, the result desired is the absorption of the stricture, and except in old, hard, cartilaginous strictures all cauterizing effects must be sedulously avoided. The *modus operandi* is to introduce into the urethra an electrode, about a size larger than the stricture will admit (insulated to the tip) down to the stricture. The electrode in this case must be soaped, not oiled (oil being a non-conductor), for the purpose of lubrication, and to facilitate its introduction. This electrode is to be then attached to the *negative* pole of the battery. The circuit is completed by the broad sponge rheophore, moistened with salt and water, and either held in the hand of the patient or placed upon some convenient part. The patient may be operated upon either standing or lying, as is most convenient. As regards the amount of current to be used, the first point is here, as elsewhere, to use as little as will produce the desired effect, and that is best judged by consulting the sensation of the patient. We must avoid all production of pain. As soon as the patient feels the current, the intensity is sufficient and should not be increased beyond this point. I prefer the use of some modification of Daniell's elements, and perhaps I may state as an average, that a current from six to twenty of these cells is all that is ever needed. Keeping the electrode pressed in contact with the stricture, but not forced, we generally have the satisfaction, in a few minutes, to find that it slips with facility through. If a second stricture is present, it may be treated in the same way. This completes the operation, which may be repeated as many times as necessary at intervals of a few days. It will be noticed here that I have laid great stress upon the use of the *negative* pole. This is quite necessary, as the use of the positive easily produces an eschar, which heals by contraction, and so instead of curing a stricture, will actually cause one, as I shall show by and by.

Case —. Mr. M. J., aged 40, a strong, robust man, consulted me relative to a stricture of the membranous portion of the urethra barely capable of admitting a No. 5 bougie. The stricture had been in existence twelve

years; it was very irritable, and bled freely on being touched. I passed a No. 5 sound, insulated to within half an inch of the tip, down to the stricture, and connected it with the negative pole of a Smee battery, completing the circuit by means of a moistened sponge placed in the groin. I allowed a current from twelve elements to flow uninterruptedly for five minutes, and then reduced the number of elements to eight, which I used for five minutes longer. After the operation I had no difficulty in introducing a No. 7 sound. The patient had some slight pain in urinating for a day or two afterwards, which gradually passed off. The size of the stream passed increased. Ten days after the operation I passed an insulated No. 9 bougie into the stricture, and used the current from twelve elements for five minutes as before, the instrument slipping through the stricture without any difficulty. I then withdrew the instrument, and passed a No. 11 electrode, using eight elements for five minutes. One week after, I passed a full-sized bougie into this patient's urethra, and continued to do so every week for five weeks, when I dismissed him cured.

Case —. Captain B., a sailor, aged 35; had gonorrhœa several times; found a stricture in the spongy portion of the urethra, capable of admitting a No. 6 sound, and one in the membranous, into which, with the greatest difficulty and after many trials, I succeeded in passing a No. 2. I operated as above, only, of course, with smaller instruments. The stricture in the spongy portion required two operations, and the one in the membranous three. No return.

A number of other cases might be given, but there is such a similarity in their history, that a perusal of them would be tedious to the general reader. There are several cases of stricture operated on in this method reported by me in the *New York Journal of Homœopathy*, August 26th, 1873, p. 277. There are also several cases fully detailed by Dr. Newman, of this city, in the *Archives of Electrology and Neurology*, vol. i, p. 18. Dr. Edmund Murphy, of New Orleans, in a private correspondence which I recently had from him, details the following case of stricture caused by the action of the positive pole and cured by the negative, which subjoined is a synopsis.

J. M. G., 33 years of age, was treated by a physician in May, 1871, for what he supposed was seminal weakness, as far as the patient knew at the time (and he had no reason to suppose otherwise). The urethra was perfectly healthy, no evidence of stricture whatever was present. This doctor treated him by the use of an electrode attached to the *positive* pole of the galvanic battery, inserted into his urethra about the orifice of the common ejaculatory duct. The current used being so unnecessarily strong, produced a slough, leaving an ulcer which healed by contraction, and the result was a stricture which almost closed the canal. Dr. M., in describing the condition of the patient when he came to him, says, " that on feeling the urethra externally, the hardness of the cicatrix was such that it actually felt as if there was a metallic sound underneath the fingers." Dr. M. treated him with a few applications from the *negative* pole of the battery, which completely removed the stricture in a short time.

The advantages of treating stricture by this method are: 1st. There is no tendency to re-formation even where the current is used so strong as to destroy the mucous membrane, as *the eschar produced by the negative pole never heals by contraction, but is soft and dilatable*, as may be seen when occurring on the skin or mucous membrane externally; 2d. There is no hæmorrhage, or very little; 3d. The pain produced is trifling; 4th. There

is no surgical shock; 5th. There is no after inconvenience to the patient; and 6th. There is only a short after treatment required.

Strictures of the œsophagus and rectum may be treated on the same principle as those of the urethra. The method of operating is fully detailed in the history and description of the following cases:

STRICTURE OF THE ŒSOPHAGUS.

Case —. On December 2d, 1877, I was sent for by my friend Dr. Helmuth, to see a young patient to whom he had just been called, and of whom he gave me the following history: On the 20th of June, 1877, at Kingston, N. Y., the young lady swallowed a teaspoonful of nitric acid and creosote, a mixture which is popularly known as Palmer's Vegetable (!) Compound, in mistake for essence of Jamaica ginger. After the acute symptoms resulting had subsided, she discovered considerable difficulty in swallowing; a certain amount of liquid would apparently be swallowed, and almost immediately return, to be ejected either through the mouth or through the nose; there was total inability to swallow anything solid. The case progressed, so that finally there was no evidence to show that any liquid whatever passed into the stomach. The girl of course became emaciated, and at the time of my visit was exceedingly prostrated, could scarcely sit up, and could make no attempt to walk without assistance. She had subsisted entirely upon injections per rectum since the time of the accident.

On examination of the œsophagus, I found that even the smallest bougie could not be inserted through the stricture, which was situated about four inches above the cardiac orifice of the stomach. Above this point the œsophagus was much dilated and pouched. Dr. Helmuth had tried the ordinary rubber bougies of different sizes, so had the other physicians who had attended her during her sickness. They concluded that nothing in medicine or surgery could possibly relieve except, as Dr. Helmuth suggested, the stricture could possibly be obliterated by electrolysis. Dr. Hammond, who had previously been called in consultation, gave as his opinion, that no power on earth could save her, and did not suggest the possibility of electrolytic treatment being likely to benefit. Being urged by Dr. Helmuth to undertake the case, and try what electrolysis would do, I reluctantly consented. I used an instrument made with a long insulated stem, having a naked metallic bulb on the tip about the size of a pea; this I introduced through the œsophagus and down to the stricture, and connected it with the negative pole of the Stöhrer battery, forming a circuit by a large sponge rheophore placed on the pit of the stomach. I allowed a circuit of about ten volts to flow, and after awhile the instrument made its way through the obstructed part. About an inch below this I met another resistance; this one was bandlike and elastic to the touch, and after a moment or two yielded to the action of the current. Almost immediately below this I encountered another stoppage; this resisted the action of the current for about fifteen minutes (40 volts), but finally the electrode passed into the stomach. On ascertaining this I withdrew the instrument and introduced a very small tube, through which I injected half a pint of milk. I then left the patient. On the next day I introduced the same bougie, and repeated the milk injection; the inflammatory symptoms from the application the day before were not serious; left the tube in for an hour and a half, at the end of which time another half pint of milk was injected. On December 6th I repeated the electrical operation, as in the first instance, only using a larger bulb, after which I was able to introduce into the stomach a large-sized tube, and through it injected liquid food,

such as beef-tea, barley-water, milk, etc. On the 10th, used electrolysis again, with a still larger instrument. Did not operate again until the 22d, when I used an electrode with cone-shaped tip, almost as large as the normal opening should be, using a very powerful current, the circuit being completed as in the first instance. The pain resulting from this operation, as well as the inflammatory symptoms afterwards, were much greater than in any of the previous instances. These, however, soon subsided, and on Christmas day the patient had the satisfaction of enjoying a good dinner, which she had not before done from the 19th of June. The stricture not being entirely removed, I operated, as before mentioned, on the 30th, making in all five electrical applications. After this the patient progressed favorably, and now suffers no inconvenience whatever. In order to prevent a tendency to recurrence, I provided the patient with a full-sized bougie, which she introduces herself occasionally. At my first visit to her, her weight was 65 pounds. On February 1st she weighed 130, and is, as far as is possible to judge, entirely free from any of the original trouble.

NÆVUS MATERNUS.

In operating upon nævus, a number of fine uninsulated needles should be inserted into the base of the growth parallel to each other, and about a quarter of an inch apart, the number of needles, of course, varying with the size of the tumor. These should be connected with the battery in such a way that every alternate needle is connected with the positive pole; the remainder with the negative. A mild current should be allowed to flow until the blood in the growth becomes coagulated. This result may be known to have taken place by the tumor becoming hard and inelastic. The needles may be then withdrawn. It is only very rarely that a drop of blood exudes. As regards the after-treatment, cold-water dressing is the best application.

It will be noticed here that these directions differ from those laid down by most authorities. We find directions in books telling us that the positive pole should be used, and the circuit completed by a moistened sponge rheophore. This method will answer the purpose; but we introduce into the circuit an unnecessary amount of resistance, and are thereby obliged to use a current of greater tension. By utilizing both poles as in the method just given, we economize our current, and operate with more precision.

Case —. May, 1873. J. W., a boy aged 12. Nævus on the lower eyelid. Operated as above indicated by means of two needles, one from each pole of the battery, transmitting a current from five Stöhrer's elements for five minutes. A coagulum formed, which dropped off six days afterwards, revealing a small portion of the nævus that had not been acted on by the current. I immediately performed a second operation, which entirely removed all trace of the growth.

Case —. February, 1874, M. J., aged 3, was brought to my clinic to be operated upon for a small nævus of the lower lip. I introduced three needles connected with sixteen cells of a Smee battery (equal in electromotive force to about five Stöhrer's), allowing a current to run steadily for three minutes, when I found the tumor had become sufficiently hard to discontinue the operation. Saw patient three days afterwards. A small dry scab had taken the place of the nævus. In two weeks afterwards there was no mark whatever, nor anything to indicate that there ever had been any abnormal growth.

Case —. An infant, aged 4 months, was brought to my clinic on October 13th, 1874, to have a nævus removed. The growth was situated on the superior and external part of the scapula, and was about two inches in diameter, more raised above the surrounding skin than the average we meet with. The child being placed under the influence of an anæsthetic, by my friend Dr. Searle, I proceeded to operate in the manner before described, a current from sixteen Smee cells being used for fifteen minutes; coagulation took place, leaving only a hardened lump in place of the nævus. Three weeks afterwards there was only a very slight mark left.

Case —. R. W., a boy aged five years. Nævus of left cheek. Operated on November 29th, 1874. Only a slight scar left, which is scarcely noticeable.

Case —. January 8th, 1878. O. S., aged six, small nævus on tip of nose. Electro-puncture, five Callaud cells, 100 ohms resistance, two needles, one from each pole. Coagulum formed in about five minutes, dropped off in a few days. Entire disappearance of growth. No scar.

Case —. February 24th, 1878. A little girl, aged 5, sent to me by Dr. Belden, of Jamaica, N. Y., on account of a small nævus on the right lower eyelid. It had been very troublesome on account of its frequently bleeding profusely after being accidentally scratched, or rubbed with a towel. This made the parents very anxious about it, otherwise, they considered the mark of no importance whatever. Operated exactly as in the case above mentioned, and with the same result.

Case —. N. S. was sent to me, on November 12th, by my friend W. S. Searle, of Brooklyn, on account of a nævus, situated below the lower eyelid, very much raised, and about the size of a cent. The greater part of it was removed by one of the operations above described. A small portion remaining was entirely removed by two slight applications, one made on the 20th of the month, and the other on December 6th. There was no eversion of the eyelid produced, nor is there now any scar left to indicate that the child ever had anything abnormal there.

As a general rule, it may be laid down that nævi require but one operation to complete a cure. As far as my experience goes, during the last few years only one case in five required a second operation. The advantages of this method of treating nævi are at once apparent. For comparison, we will mention the other means by which they are treated.

1st. By vaccination, which is only applicable to very small growths, is not always successful, and invariably leaves a cicatrix. 2d. By ligation, which always destroys more or less of the healthy tissue, leaves an absorbable slough in contact with the irritated absorbents for many days, which often gives rise to a great deal of constitutional disturbance, and always leaves a permanent scar. 3d. By the actual or galvano-cautery. This method causes an ulcer, which heals by contraction, and unless the operation is very nicely done, which is not always possible, leaves a hideous mark. 4th. By the injection of persulphate of iron, or perchloride of iron. This mode, though less objectionable than either of the three preceding, is not invariably successful except in small tumors. It always leaves absorbable decomposing matter in contact with the congested tissues. The advantages, then, of treating these cases by electrolysis may be briefly summed up as follows:

1st. In most cases there is no scar left, and even in the largest tumors

the permanent mark (if any) is very slight. 2d. There is no constitutional disturbance after the operation. 3d. It is unnecessary to destroy any of the surrounding healthy tissues. 4th. One operation is generally sufficient to remove the abnormality.

HÆMORRHOIDS.

Many authorities report favorably of the treatment of hæmorrhoids by electro-puncture; but as the result of my experience, I am of the opinion that the amount of inflammation and diffuse suppuration caused by the operation in the loose cellular tissue in the vicinity of the anus, renders it not only objectionable, but an unjustifiable mode of treatment. Consequently, I have latterly entirely abandoned it in favor of the galvano-cautery, which gives excellent results. A cut of the instrument used for this purpose is seen on page 948.

ANEURISM.

The effect the galvanic current produces in causing coagulation of blood, has been made use of in the treatment of aneurism. There are a number of cases on record, some of them successes, most of them not. With very few exceptions, the operations were performed by persons who had very little knowledge of electro-physics, as can readily be seen from the report of the cases. See Poor's work, already quoted, page 256 *et seq.* Now, I will say candidly, in advance, that clinically I know nothing of the subject; but it seems to me that a procedure like the following would certainly be more likely to cure an aneurism than any electrical operation that has yet been proposed. Soft iron needles, insulated for half their length with hard rubber (Kidder's patent), so as to protect the coats of the aneurism from the action of the current, are to be inserted into the aneurism, as many as may seem desirable, varying in number according to the size of the aneurism. These needles must be inserted in such a way that the whole of the exposed or active part of them shall be entirely within the internal coats of the aneurism, as otherwise the coverings of the tumor would be dissolved by the chemical action of the current. The needles are now to be connected with the poles of a battery generating a current of smaller quantity and very moderate intensity. The quantity must correspond with the number of needles, that is to say, the greater number of needles the larger must be the quantity of current transmitted. If two needles are used, one of course must be connected to each pole; but if several be employed, only one should be in connection with the negative and the remainder with the positive, as the negative is merely used for the sake of completing the circuit, and it is entirely to the action of the positive we trust for the effect in producing the clot by which we expect to cause obliteration of the aneurism. Now from what we have already described relative to the action of the current, we naturally would expect from a procedure like this: 1st. That the blood contained within the sac would become coagulated around the positive needles. 2d. That the salts of the tissues would be resolved into the acids and bases which go to form them. 3d. That the needle or needles attached to the positive pole becomes dissolved, and chloride of iron is formed, which assists materially in furthering coagulation. It therefore appears that if the operation was performed in this way, and the needles left in long enough to become entirely dissolved, so as not to break up the clot in withdrawing them, that such an operation ought to prove a success. It must be performed with a very weak current, and applied for certainly not less than two days. In this way a clot is slowly formed, and has a

chance to become firm and completely fill the dilatation before the action of the battery is discontinued. Knowing the strength of the current, the resistance of the circuit, the weight of the needles (that is, of the uninsulated part of them), the atomic valency of iron, and of the anions or acid radicals of the blood, it is simply a matter of arithmetical calculation to find out how long a time it will take for the needles to dissolve, and for a clot of such a size we wish to form. Now I well know the first objection that will be made to such a procedure by those who have a slight knowledge of electro-surgery. It is this. They will say: "What becomes of the gases evolved by the decomposition of the watery part of the blood?" The trouble heretofore always has been to get rid of the hydrogen. To this I would answer, that in such *very slow action* the gases are evolved at such a *very slow rate*, that the animal economy has ample time to get rid of these gases as they are formed. When we consider that it takes just one œber of actual current to dissolve .00142 of a grain of water, and we use a current which will not generate this amount of current per hour, I do not think there is much danger of sending gas-bubbles through the heart, or otherwise producing trouble by it. I regret exceedingly, in writing a chapter of this kind, that I have no cases treated by this method to offer in illustration; but I hope, that if ever I should be sufficiently honored to prepare a second treatise on the subject, to be able to show some evidence in favor of it.

VARICOSE VEINS.

It is quite possible to treat varicose veins and varicocele in a similar manner, but the cautery operation already referred to in these pages is so efficient and so much more easily performed, that it is unnecessary to more than mention this subject, as one can scarcely imagine a case in which obliteration by the cautery is not decidedly the preferable method.

FIBROUS TUMORS.

These growths, if superficial, and a total and rapid destruction be desired, may be treated by what I have termed the fourth stage of electro-puncture, or complete electrolysis, by which a slough of the entire growth is produced and left to separate. If from its position, or otherwise, such a course is objectionable, its disappearance can be caused by producing a slough within the tumor, not sufficiently large, however, to cause its entire destruction, but of such dimensions that will be too large to be readily absorbed. Such a slough will act as a foreign body, will cause inflammation, followed by suppuration, which changes the morbid growth into an abscess, and which can either be opened, or allowed to discharge itself spontaneously; and so the tumor is got rid of. But there are still a number of cases in which such a procedure is inadvisable. In such cases we may introduce small insulated needles into several parts of the growth, using a current just strong enough to cause small eschars or coagula to form around the needles, which interfere with the nutrition of the growth by acting as barriers to the blood supply, and which are not sufficiently large to cause suppuration, but after a time are absorbed; besides this, the action of the current exercises its catalytic effects, also assists in promoting absorption of the tumor. The operation first described is seldom required, except in the case of recurrent fibroids. Of the two last-mentioned operations the following cases serve as illustrations, both of the method of operating and of the results generally to be expected.

SUBMUCOUS FIBROID OF THE UTERUS.

Case —. Mrs. G., æt. 40, a thin, spare woman, sent for me, on May 28th, 1873, on account of profuse uterine hæmorrhage, from which she suffered at intervals, varying from five days to two weeks. I found her quite anæmic and prostrated, but the flow almost entirely ceased; prescribed china[12], promising to make a uterine examination next day. May 29th.—Hæmorrhage ceased. Found a large submucous fibroid, about the size of an infant's head, occupying the upper and anterior part of the uterus, causing that organ to be anteflexed. I informed the patient of the existence of the tumor, and suggested treatment by electrolysis, which was at once consented to. May 30th.—With the assistance of Dr. Pennoyer I divided the cervix as far as and including the os internum, and then introduced a large sponge-tent, to effect still further dilatation. May 31st.—Removed sponge-tent; finding the os sufficiently dilated, proceeded to operate. Passing a long, thick platina needle, insulated to within an inch of the point, along my finger into the uterus, I plunged the needle into the tumor about an inch and a half (the patient being kept under the influence of nitrous oxide), and connected it (the needle) with the negative pole of a zinc and carbon battery, using thirty cells, and completing the circuit by means of a sponge rheophore, placed over the abdomen externally. I allowed this strong current to pass for ten minutes, and then reduced the number of cells to eighteen, which I continued to use for ten minutes more, when I withdrew the needle. June 1st.—Tumor reduced in size, and very painful. Considerable abdominal tenderness and ovaritis; pulse 120. Ordered aconite every two hours. June 2d.—Less tenderness; pulse 80. Stopped aconite. June 3d.—No fever or tenderness; large offensive slough passed from vagina, with considerable fetid discharge and some slight hæmorrhage. Evening of June 3d, I introduced a fresh sponge-tent, to be left in until the following morning. June 4th.—Removed tent. Tumor smaller, the vagina being large and lax. I had no difficulty in introducing my hand into it, and my finger into the uterus. The tumor had become quite soft, with a large hole in the centre, about an inch in diameter, corresponding to the spot where I had introduced the needle. After this date I transmitted daily a current from sixteen cells through the uterus, one electrode (metallic) on the os uteri, and the other (sponge) on the abdomen externally. Tumor steadily decreased in size up to June 30th, when I discontinued treatment. October 3d, 1873.—Examined patient, and could not find a trace of the tumor; menses normal. Says she has increased ten pounds in weight. She is now, October 3d, 1877, in perfect health.

SUBPERITONEAL FIBROID OF UTERUS.

Case —. On September 30th, 1875, I was sent for by Dr. South, of Plainfield, N. J., to see a patient of his, who was suffering from uterine fibroid tumor. The patient, a woman about forty years of age, never had any children, was extremely pale and debilitated, suffered from œdema of the lower limbs, and from some general anasarca, difficulty, and excruciating pain in urinating, the pain from which lasted almost until the next urination, gradually subsiding, only to be again produced at each urinary passage. No attempt could be made to evacuate the bowels without the use of an enema. The woman suffered continual pain in the bowels. Nights were entirely sleepless; appetite bad; pulse 94; temperature 100. On making a physical examination, I found that the uterus was almost out

of reach of the finger; but after some difficulty I found the os, and managed to introduce a sound into the cavity of the uterus. I found it was much smaller than normal, as was also the bladder, both of which were drawn upward and forward from their usual position, thus lengthening the vagina and urethra to a considerable extent. I then found that the greater part of the pelvis was filled by a hard fibrous tumor, which was attached to the posterior wall of the uterus, and ascended above the fundus, descending between the vagina and rectum, upon which latter it exercised a great amount of pressure. An examination per rectum gave a fair idea of the size, weight, shape, and position of the growth, which occupied the whole basin of the pelvis.

After examining the patient thoroughly, I was informed by Dr. South, that a distinguished old-school surgeon from this city, and a well-known gynæcologist of our school from Philadelphia, had seen the patient about a week or ten days previously, and that both were of opinion that nothing could be done for her, except to mitigate her sufferings, by prescribing for symptoms as they arose, or keeping her under the influence of anodynes as long as she lived. Now as the patient's friends and family physician were unwilling to let her die without attempting something for her relief, I suggested electrolysis, explaining thoroughly the details of the operation, the risk of peritonitis, and the chances of the success of the operation, which I need not say were not at all encouraging. However, I appointed the 9th of the following month (October, 1875) to operate.

October 9th.—The patient being chloroformed by Dr. South, I dilated the sphincter ani, and succeeded in getting my left hand into the rectum as far as possible above the lower part of the tumor. I then introduced two needles, insulated about half their length and connected with the positive pole of the battery, through the rectum into the posterior part of the tumor, to a little above the centre. Having placed the needles *in situ*, I withdrew my hand from the rectum, and introduced two similar needles through the vagina into the tumor; these I connected with the negative pole of the battery, and having allowed a strong galvanic current to flow uninterruptedly for about five minutes, I partially withdrew the negative needles, and inserted them in another direction, and again changed the position of the negative needles *only*, every five minutes, for about half an hour, which was the length of time consumed in the operation. The patient was kept strictly in the recumbent position, and given aconite and arnica. October 15th.—Pulse 100; temperature 102; not much appetite. Tenderness of abdomen less than before operation. Difficulty of urination decidedly less, and urination less frequent. Ordered external faradization. I did not see the patient again until October 22d, when I found a very decided change. The temperature and pulse were normal; the tumor considerably reduced in size; micturition less frequent; bowels act naturally; gave patient permission to get out of bed. I did not again see her until the following January, when I made a very thorough examination, and found that the tumor could scarcely be reached with the finger in the rectum, and could not at all be felt in the abdominal walls. She had *no pain;* all functions normally performed, and she had resumed her household duties, and gained considerable flesh, and expressed herself as feeling quite well, and has continued so ever since, as I am informed by Dr. South. I have no doubt that since then it has undergone still further reduction, if not entirely disappeared.

CHAPTER XLVI.

DISINFECTANTS AND ANTISEPTICS.

ANTIQUITY OF DISINFECTION—CLEANLINESS—CHARCOAL—LIME—ASHES—EARTH—SMOKE—COLLINS'S DISINFECTING FLUID—THOMPSON'S DEODORIZER—HEAT—COFFEE—BROMINE—OZONE—IODINE—NITRATE OF LEAD—CHLORINE—CHLORIDE OF ZINC—CHLORIDE OF LIME—LABARRAQUE'S SOLUTION—PERMANGANATE OF POTASH—NITROUS FUMIGATION—TAR ACIDS.

THE use of disinfecting agents in surgical practice, not only in regard to the benefit that may accrue from their use to the patient, but in affording comfort to the surrounding sufferers and attendants, is certainly of much import. In many cases in which large wounds are to be dressed, and where many suppurating sores are grouped together in one apartment, the atmosphere is rendered so noxious that the health of those who, through force of circumstances, are compelled to inhale the vitiated air, is often materially impaired. Untoward accidents may occur from this cause alone. From a knowledge of these facts, and from a proper understanding of the true nature of noxious effluvia, much attention has lately been given to this subject. Within the past ten years very important disinfecting agents have been introduced to the profession. It is not proposed in this chapter to enter upon the theories of ferments, germs and sporules,* but merely to mention some of those materials which are found most reliable in surgical practice in neutralizing the poisonous exhalations from suppurating sores, large wounds, abscesses, or decaying or decomposing substances. The object of the surgeon is to find such agents as may either arrest decomposition, or finish the process entirely.

The efforts to render the atmosphere of large cities and towns as pure as possible by *drainage* is very ancient.

Justitian tells us that "the prætor took care that all sewers should be cleaned and repaired for the health of the citizens, because uncleansed and unrepaired sewers threaten a pestilential atmosphere and are dangerous." He also states, that it was forbidden to throw refuse into the roads. A perfect system of drainage in large cities is essential to the health of the inhabitants.

In 1732 Petit made some experiments with antiseptics, and in 1750 Sir John Pringle wrote his *Experiments on Septic and Antiseptic Substances, with Remarks relating to their Use in the Theory of Medicine.*

In 1767 the nitrate of potash was highly recommended.

In 1732 Guyton Morveau instituted fumigation with various acid vapors.

Dr. Carmichael Smyth employed nitrous fumes, at Winchester, in 1780.

Chlorine was introduced by Fourcroy, in 1791–2, and first employed in England by Dr. Cruikshank.

First in the catalogue of disinfectants are cleanliness and fresh air; nothing can equal them—nothing can be of more benefit to the patient.

* For an elaborate essay on Ferments, we are indebted to Dr. Roth. *Vide* British Journal of Homœopathy, No. XCI, p. 18; No. XCII, p. 215.

Free ventilation, so arranged that no absolute draft is produced, and the constant use of the bath, are the great adjuvants to surgical practice, and as these facts are becoming universally acknowledged, our hospitals are being so scientifically constructed, that these requisites are attained in the greatest perfection.

For proper disinfection, however, cause and effect must be considered. If we use substances which will prevent the former, we have what are termed antiseptics; if we employ agents which neutralize the latter, we have only deodorizers. By using substances which render the surrounding atmosphere more pleasant to our olfactories, we have no proof that the unwholesome condition is removed; and there is no reason why the admixture of the two substances may not, perhaps, be even more hurtful than the original disagreeable odor which we have been endeavoring to neutralize. A true antiseptic must possess the power, as before said, not only to prevent the disagreeable odor from being perceptible to the senses, but to destroy, as far as possible, the cause upon which the odor depends.

Strange as it may appear also, those very agents which generate decomposition and produce the emanations which are hurtful, are the same that, when their action is prolonged or intensified, do away with the process entirely.* This is well illustrated by the action of heat and moisture, the great producers of decomposition. Increase either, and the process is at once suspended. So also it may be remarked of the so-called chemical disinfectants. They either increase, in a great degree, the oxidation upon which the decomposition depends, or take away the oxygen altogether.

Disinfectants may be classed into absorbents and antiseptics. The latter, antiseptics, were known to the ancients, and the process of embalming was nothing more or less than a peculiar antiseptic treatment. In fact, the burial of bodies in the earth is another form of the same process. The conservation of meats, fruits, and vegetables of the present day is also a variety of disinfection.

The division that we have made is all that is necessary for practical purposes; the former absorbing or neutralizing the volatile or gaseous products of decomposition; the latter preventing the decomposition, or modifying it by chemical union with the substances liable to be decomposed.

In searching for materials to purify the atmosphere, it is requisite in many instances, that those be selected which are cheap and can easily be obtained. Among these we find *charcoal*, *lime*, *copperas*, *ashes*, and *earth*. In covering over cesspools, in sprinkling damp or moist surfaces, in hospital wards and privies, these substances are used with great benefit. They are classified under the head of absorbents. The charcoal and lime may advantageously be mixed together. In cases of gangrene, of the moist variety, where the stench is great, I have enveloped the parts in pulverized charcoal, with much comfort to the patient and attendants.

Earth.—Through the experiments of Dr. Addinell Hewson, of the Pennsylvania Hospital, it has been found that one of the best disinfectants known, is dry earth; it should be free from grit or other foreign material, and should be perfectly dry and finely pulverized. It can be applied to ulcers, suppurating surfaces, recent wounds in which suppuration is to be expected; in fact, to all wounded or burnt surfaces.

Smoke.—The smoke from a wood fire is known to have fair disinfecting properties, but oakum soaked in tar, and then lighted and allowed to smoulder, is preferable.

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* *Vide* an excellent article on this subject by Carroll Dunham, M.D., in the Transactions of the American Institute of Homœopathy, for 1869, p. 117.

Various compounds have been used for these purposes, among which may be noted Collins's Disinfecting Powder, which consists of two parts of fresco and dry chloride of lime, and one part of burnt alum, well mixed together; if the weather be very dry, a little water may be added. The powder may be placed on plates or pieces of glass, and should be renewed every day.*

The following compound is known as "Thompson's Deodorizer and Disinfectant:"

Gypsum,	6 parts.
Fresh-burned ground lime,	2 "
Prepared charcoal,	2 "
Wood ashes,	1 part.
Common salt,	1 "

This compound slowly develops chlorine gas, and is very cheap as well as efficacious.

Heat is a powerful disinfectant, combining the properties of both deodorization and disinfection. Burn, if possible, old clothes and the worn-out coverings of mattresses or bed tickings, or thoroughly expose them to a dry atmosphere of 280° F. *Steam* may also be used with most excellent results.

Fire was used in many ways by the ancients as a purifier, and large fires were often kindled in the streets of their cities, which, with the perfumes of flowers, renewed the air.

Coffee.—A very good deodorizer is the smoke or vapor which arises from coffee, when it is being roasted over a moderately hot fire. In the dissecting-room I have found it very serviceable, and by keeping a good-sized shallow vessel half full of coffee, and stirring the same occasionally, the atmosphere is entirely deprived (at least so far as olfaction goes) of its unhealthy odor.

Bromine is an expensive though a good disinfectant. When the stopper is removed from the vial containing it, spontaneous evaporation takes place. It is, however, somewhat difficult to manage, and from its cost, is not very much used.

Ozone.—Dr. T. Herbert Baker, in his prize essay, gives the preference to this agent for steady and continuous effect. It belongs, according to Dr. Day, to those bodies which disinfect and deodorize by resolving and decomposing into primitive and innoxious forms the deleterious matters. It does not, however, possess these qualities in so great a degree as chlorine and bromine.

Ozone can very readily be released, by placing a stick of phosphorus in a cup filled with water, and allowing an end of the phosphorus to remain uncovered. During the night less should remain exposed than during the day, and it should be removed from the apartment altogether for several hours at a time, because ozone in excess is hurtful.

Iodine is a powerful disinfectant, and can be used with benefit in the following manner: Expose to the air a teaspoonful of the crystals of iodine in a cup or on a piece of porcelain, which may be put beneath the bed, or in a convenient place, and will have a most excellent result.

During the severe cholera season of 1866, in St. Louis, I employed this substance continually, and also ordered all the vessels used by the patients to be immediately emptied and rinsed with a solution of the tincture of iodine.

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* Medical and Surgical Reporter, vol. xix, p. 76.

The nitrate of lead has been also used with success as a disinfectant. The compound known as Ledoyen's disinfecting fluid, is nothing more than this salt in solution, in the proportion of a drachm to the ounce of water. This is said to be particularly efficacious in the correction of fetid odors depending upon the presence of sulphuretted hydrogen, or hydrosulphate of ammonia, which it decomposes. It may also be sprinkled in apartments, or mixed with offensive discharges. This substance, however, does not prevent or arrest animal decomposition, nor does it render contagious or marsh miasms innoxious.

Chlorine.—One of the best antiseptics of the present day is chlorine. Its destructive powers are great, and it was discovered by Scheele in 1774. It is produced in several ways; first, by pouring on peroxide of manganese, muriatic acid; second, by adding one and a quarter alum-cake, or sulphate of alumina, to one of chloride of lime; third, by "occasionally dropping a crystal of chlorate of potash into muriatic acid." The action of this gas is twofold: "the chlorine combines with hydrogen and thus forms new compounds; with water it renders oxygen nascent, so that it is a powerful oxidizing agent, and so oxygen comes forward." There are many compounds of it used for disinfecting purposes. The formula for the United States army hospitals is as follows: eighteen parts of common salt to fifteen parts of binoxide of manganese; after having mixed them thoroughly, pour upon them a solution composed of forty-five parts of concentrated sulphuric acid and twenty-one parts of water.

Under the direction of Dr. James R. Wood, the wards of the Bellevue Hospital were thoroughly and effectually fumigated, in the spring of 1875, with chlorine. 25 sacks of salt, and 5000 pounds of manganese were employed.

The zinci chloridi liquor is much employed for disinfecting purposes, and from considerable experience in its use, I am prepared to speak highly of its properties. The disinfecting fluid of Sir William Burnett is an aqueous solution of the chloride of zinc. It contains 200 grains of zinc to each imperial fluid ounce, and has a specific gravity of .2. It was introduced in 1840; and besides its deodorizing properties, prevents the decomposition of both animal and vegetable matter. According to Sir William Burnett, it is a sure preventive of dry rot. This substance has no smell of its own, while it totally destroys offensive odors arising from various causes. For producing a good deodorizing fluid on a large scale, four gallons of water may be mixed with a pint of the original fluid. In the dissecting-room, to preserve bodies for anatomical purposes, one part of the fluid may be added to 15 or 18 parts of water.

The calcis chlorinatæ liquor is another preparation which is highly lauded, and possesses powerful disinfecting properties. The chlorinated lime, like the chloride of zinc, arrests both animal and vegetable decomposition, and has been supposed by some to have the power of destroying pestilential miasms. In exhumations for judicial or other purposes it has been used with success, as it completely destroys the disgusting odor arising from the putrefying mass. The method of applying it, is to envelop the corpse in a sheet saturated with a solution of the substance made by adding a pound of the chloride to a bucketful of water. The *chloride of lime*, perhaps, is more extensively known and used as a domestic agent for the removal of offensive smells than any other. This material acts by the purifying effects of the chlorine, which is disengaged by the acids, and as carbonic acid is known to be a product of decaying animal and vegetable matter, it may be said that the effluviæ furnish the means for their own neutralization.

Labarraque's Solution of chlorinated soda is another excellent preparation. Its efficacy consists mostly in the powers of chlorine, and is so easily obtained, being put up by the chemists in a convenient form for ready use, that it is quite a favorite disinfectant.

Permanganate of Potash.—This substance is a most excellent disinfectant, but it is not an antiseptic; it is the basis of the well-known Condy's Fluid, and is much used in practice. It is formed, according to the U. S. P., by mixing equal parts of very finely powdered deutoxide of manganese and chlorate of potash, with rather more than one part of hydrate of potassa, dissolving in a small quantity of water, and exposing the whole, after evaporation to dryness, to a temperature just that of redness. The mass is treated with hot water, the insoluble oxide separated by decantation, and the deep purple liquid concentrated by heat, until crystals begin to form upon the surface, when it is left to cool and crystallize. The crystals have a dark purple color, and can be dissolved in sixteen parts of water.

The efficacy of this preparation has rendered its use very extensive, some surgeons preferring it to carbolic acid. A little of the solution poured over the foulest bodies almost instantly disinfects them.

I have found it very useful in many ways. In fetid perspiration of the feet, a tablespoonful of a solution composed of permanganate of potash grs. viij, to the ounce of water, added to an ordinary foot-bath, is very efficacious. As a gargle, in follicular tonsillitis, it has been used by many, in the proportion of grs. iv, to water ℥viij; as an injection, to allay the fetor arising from cancers, a good formula is, permanganate of potash grs. viij, to water ℥j, add to this an equal quantity of water, and use as a lotion or injection. In ozæna it has been used in the proportion of one grain to one ounce of water.

At certain times, to purify the atmosphere of large hospitals, where pestilential or other infectious diseases are being treated, and where numbers are dying of the disorders, it has been found necessary to disinfect the air by fumigations. Of these, the *fumigatio Guytoniensis*, or oxymuriatic fumigation, is prepared by adding common salt ℥iij, to black oxide of manganese ℥j, sulphuric acid ℥j, and water ℥ij; this may be carried through an apartment or placed in a corner of a room and allowed to remain for a time.

The *nitrous fumigation* is made by placing nitrate of potash ℥iv, and sulphuric acid ℥ij, in a saucer upon hot sand. This should only be used after the patient has left the apartment, as the fumes prove irritating to the respiratory apparatus. This irritation is not so much observed at first, but after a few inhalations the lung-substance and mucous membrane of the air-passages become very much irritated, and in time even disintegration may result.

Vinegar is an agreeable and by no means a mean fumigant. It is well known to possess antiseptic properties. Its preservation of both animal and vegetable substances is well known, the pickling liquids all having this substance for a base. It was used in ancient times as a prophylactic, and it is said of Cardinal Wolsey that "he carried in his hand an orange, deprived of its contents and filled with a sponge which had been soaked in vinegar impregnated with various spices, in order to preserve himself from infection when passing through the crowds which his splendor attracted."

Antiseptics—*Tar Acids.*—We have already spoken of fumigation with tar, and come now to mention the so-called *tar acids*, some of which have been very extensively used and with great success. There are several sub-

stances given off from tar; thus from wood tar we have creasote, and from coal tar, carbolic and cresylic acids.

Creasote is a valuable antiseptic, and we fancy is not so frequently used in this country as it should be. I have applied it with as good success as carbolic acid, in the treatment of wounds, especially after amputations, and have reason to speak well of its disinfecting properties, in the proportion of fʒj of the drug to ten ounces of water, or we may use a fluid drachm to about a pint of water, thus having a preparation of about equal proportions with the *aqua creasoti* of the U. S. P. Gruelin asserts that water containing one part of creasote to ten thousand, smells of smoke. Before it was discovered by Reichenbach, it was used as a secret preparation in Italy, and called *aqua binelli*. In Silesia, also, there was a preparation much in vogue which received the name of *aqua empyreumatica*, which contained creasote.

Carbolic Acid.—This substance, now so much in vogue in surgical practice, was discovered in 1834 by Runge, but was not introduced into general practice until the method of liberating it from the other products of coal-tar was discovered by Laurent in 1841.

Carbolic acid is introduced in two forms,—the crystals, and what is termed the impure carbolic acid. Of these preparations, Dr. Squibb, the best authority on the subject, writes:

"The crystallized phenol, or miscalled 'carbolic acid crystals,' is nearly colorless when first put up, but by keeping or exposure to light and air, it acquires a red or brown tinge. For dispensing, a fluid ounce of water should be added to the contents of each one-pound bottle, and the whole warmed until it is liquid. It will then remain liquid at ordinary temperatures, and should be dispensed by minims, not drops. Each minim represents about one grain of the crystals, and may be so considered in prescription use.

"The so-called impure carbolic acid is really coal-tar creasote, or a mixture of the three or more homologous phenols of coal-tar in varying proportions. It contains from 92 to 96 per cent. of these phenols, the remainder being the more volatile tar oils, which are harmless. Cresol, or the so-called cresylic acid, is generally in largest proportion, and phenol, or the crystallized carbolic acid, in next largest proportion. This mixture is better than the crystallized carbolic acid for all known uses, whether internal or external, and may, therefore, take the place of the more costly substance with advantage. It is colorless when recently made, but changes, chiefly by the effect of light, through various tints of brownish-red to nearly black, without becoming thick or tarry, and without material change in value or effect. All the useful portions of it are soluble in about twenty-five times its volume of water by active shaking together. The insoluble residue is impurity (tar oils)."

In 1863 Dr. Jules Lemaine wrote a treatise on carbolic acid,* in which the virtues of the acid are highly extolled in very many disorders. In 1864 F. C. Calvert & Co., of Manchester, England, after numerous experiments were finally enabled to render the article pure enough and cheap enough for general use. The drug, however, became in a short period so universally popular, that many worthless articles have been thrown upon the market, and it is therefore well for us to be prepared with proper tests to ascertain the purity of the article. The following are the suggestions of

* *Vide* an exhaustive review of the work, in the British Journal of Homœopathy, vol. xxiii, p. 286.

William Crookes, F.R.S., who has given a great deal of care and attention to the subject. He says:

"Put a teaspoonful of the carbolic acid in a bottle, pour on it half a pint of warm water, shake the bottle at intervals for half an hour, when the amount of oily residue will show the impurity; or, dissolve one part of caustic soda in ten parts of warm water, and shake it up with five parts of carbolic acid. As before, the residue will show amount of impurity." Experiments have shown that very small portions, even $\frac{1}{5000}$ part, will prevent decomposition. Mr. Crookes found that meat steeped in a one per cent. solution, and then dried, preserved a fresh odor. A solution of albumen was very slowly and not completely coagulated by a one per cent. solution, and a few drops added to half a pint of fermenting sugar or yeast, stops the action. Cheese-mites, fish infusoria, caterpillars, beetles, and gnats are immediately destroyed.

So soon as carbolic acid was introduced, it became a very fashionable and favorite application by both physicians and surgeons, and the medical periodicals were filled with different prescriptions for various diseases. Prof. Lister, of the University of Glasgow, offered several preparations, which were received with general favor: 1st. A simple solution, one part of the acid being added to 50 or 100 parts of water; 2d. Carbolated oil, one part of the acid to six parts of boiled linseed oil; 3d. Carbolic putty or paste, being a mixture of carbolic acid and whiting.

Professor Andrews makes use of simpler preparations than Prof. Lister, as follows: Take one ounce of the crystals, agitate it in a bottle with ten or fifteen ounces of water, settle for a few moments, and the clear five per cent. solution will appear at the top, and the surplus acid settle in the form of a ninety-five per cent. solution. This can be readily mixed with other substances. An ounce of the crystals may be mixed with an ounce of any oil, or an eighth part of collodion mixed with one part of carbolic acid.

In our own school, besides the valuable paper already alluded to as appearing in the *British Journal of Homœopathy*, we have an exhaustive pamphlet by Backmeister, and an article of Dr. Lord in the *U. S. Medical and Surgical Journal* for January, 1869.

It has been recommended as very serviceable in cancer by Dr. Beebe, and has been used in a great variety of preparations for very many disorders. A very useful preparation in glycerin, I have used with excellent result in wounds and sloughing ulcers, gangrenous and unhealthy stumps; it is simply ten drops of carbolic acid to the ounce of glycerin. This is very easily prepared, and is a most excellent application. It is useful also as a solution in which to soak the catgut in preparing the animal antiseptic ligatures.

Carbolated alcohol is highly spoken of as a dressing for wounds.*

This drug is used for diarrhœa,† for pregnancy sickness,‡ dyspepsia, vomiting, colics, dysentery,§ constipation, gonorrhœal ophthalmia,‖ bites of venomous snakes, whooping-cough,¶ sloughing syphilitic ulcers, nævus,** eczema,†† pityriasis versicolor,‡‡ favus, burns, wounds, ulcers, and abscesses, and almost every disorder in the category. It has also been used with many

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* Medical and Surgical Reporter, Aug. 21st, 1869.
† Loc. cit., Jan. 23d, 1869, p. 78.
‡ British Medical Journal, Feb. 13th, 1869.
§ Hahnemann Monthly, vol. v, p. 219. ‖ Medical Archives, Jan. 1870, p. 51.
¶ Medical Investigator, July, 1867, p. 117. ** Medical Press and Circular.
†† Medical and Surgical Reporter, vol. xxi, No. 1.
‡‡ Ib., vol. xix, p. 426. And many other periodicals.

other substances, as iodine, cod-liver oil, lime, calendula, alcohol, potash, and glycerin.

For a *résumé* of the various carbolic acid preparations, the following, from the *Chemist and Druggist*, may offer some suggestions.

As a rule, it is better to dissolve the crystallized carbolic acid (Calvert's) in the proportion of one part by weight of the acid to six of glycerin (carbolate of glycerin). In this state it can be diluted equally indefinitely.

In general, a *dose* (according to the old school) of carbolic acid is 1 grain in an ounce of water.

As a *gargle*, 1 or 2 grains to an ounce of water.

As an *injection*, 1 grain to 4 ounces of water.

As a *lotion*, 15 grains to an ounce of water.

As an *ointment*, 30 grains to an ounce of benzoated lard.

As a *liniment*, 1 part to 20 of olive oil.

As a *plaster*, 1 part of carbolic acid to 3 of shellac.

The crystallized carbolic acid to be used as a caustic.

The carbolate of glycerin, as above, should be used in 1 or 2 drop doses.

Antiseptic oil, for abscesses, 1 part of the acid to 4 of boiled linseed oil.

Antiseptic putty, 6 spoonfuls of the antiseptic oil, mixed with common whiting.

Aqueous solution of carbolic acid is one part of acid to forty of water. (One ounce of acid to a quart of hot water well agitated and filtered.)

To disinfect sick-rooms: place a portion of the dissolved acid in a porcelain dish, and float it in a larger vessel of hot water.

Disinfecting purposes generally: 1 pound of *crystals* to 6 gallons of water. *Fluid*, 1 part to 80 of water. *Powder*, 1 ounce of crystals with 4 pounds of slaked lime.

For drains: take 1 pound of the fluid carbolic acid to 5 gallons of warm water.

Toothache is often cured with one drop of carbolate of glycerin, and diarrhœa arrested in half an hour with two drops.

In all cases of parasitic life it is advisable to commence with very dilute carbolate of glycerin.

In a somewhat extensive surgical practice I have used carbolic acid some thousands of times, but I have never used any mixture, saving the one with glycerin, of which mention has been made, and the aqueous solution, and at times a few drops of the acid with the tincture of calendula. It has proved so very efficacious in these simple mixtures, that I have never had any inclination to use it in other forms, believing that the more simple the solution, the more undivided will be the action of the medicine. In cases of compound fracture, or after resections, I have mixed the acid with the bran dressings, especially when there is great suppuration, and I cannot speak too highly of its efficacy in this particular. The disinfection is complete, and the bran which has absorbed the pus forms into cakes, which are readily moved with a spatula or spoon; fresh carbolated bran is then poured into the box, and the whole thus kept pure and clean. I have used it also to destroy maggots in wounds, with astonishing results.

To some the odor of carbolic acid is offensive. It may be removed by combining two parts of gum camphor and one of carbolic acid in crystals, and mixing with whiting; a liquid is thus formed with powerful disinfecting properties, but entirely free from the odor of carbolic acid.

Prof. Gamgee, in a late London periodical, enumerates the properties of the *chloride of aluminum* as employed for medicinal purposes. This salt in itself is not new, having been long known to chemists, and used by the manufacturers of aluminum. Its true name is the hydrated chloride of alumi-

num; this, from its length, is objectionable for ordinary use, therefore the term *chloralum* has been adopted.

This substance possesses highly antiseptic properties, and has proved useful in my hands, but I judge from the very limited experience I have with it, in preserving specimens and in keeping wet preparations. According to the *Druggist's Circular*, its chief merits consist in being inodorous and as harmless as common salt. Its power of preserving organic substances may arise both from its metallic base and the chlorine it contains.

A solution of one part of chloralum in twenty of water preserves flesh, which may be suspended in the air to dry, and afterward, if desired, cooked and eaten. A small portion of the solution added to milk, prevents its decomposition, and the beer bottlers now employ its undiluted form in preference to the bisulphite of lime.

Prof. Gamgee asserts, from his experience in its use, that it attracts to itself all moisture; and the moist particles inclosed or embodying fever germs, are absorbed if a cloth damped with it be suspended in the sick-chamber. In the Middlesex Hospital, in London, it is used by Mr. Campbell de Morgan in the antiseptic treatment of wounds. Mr. Edward Lund, of the Manchester Royal Infirmary, employs it to remove the fetor in open cancer. It has also been applied as a collyrium, and as an astringent in diarrhœa. The chloralum powder is also very useful for sprinkling the wards of hospitals, and disinfecting cow-sheds and slaughter-houses.

Chloralum is rapidly gaining favor in England; and though comparatively new, the solution is being produced by the thousand gallons daily; and a thirty per cent. odorless disinfecting powder, at the rate of four tons a day. A company is also established which manufactures chloralum.

Messrs. Tilden & Co. prepare a solution which they term *bromo-chloralum*, which is also very highly recommended. Prof. Charles A. Lee states that it is a certain, perfect, and prompt deodorizer and disinfectant, and for hospital use is very efficacious.

Speaking of chloralum, the *British Medical Journal* of October 15th, 1870, says: "Under the designation of chloralum, a new antiseptic has been introduced to the medical profession and to the public generally, which bids fair to take up an important position among those valuable substances, the antiseptics and disinfectants. The chemical activity of solutions of chloride of aluminum depends, to some extent, upon there being so much potential muriatic acid. Ammonia, both the common ammonia, and every variety of fetid and offensive organic ammonia (and it is substances of this class that produce the different varieties of stink arising from garbage) is instantly absorbed by these solutions, as it would be by so much acid. Moreover there is the high probability (amounting almost to certainty) that the chloride of aluminum forms double compounds with the organic chlorides thereby produced. Many bad smells which carbolic acid might indeed overpower in virtue of its own strong odor, but which it cannot destroy, are at once removable by chloride of aluminum. In this respect, chloralum has some advantages over even permanganate solution, which, as we all know, destroys fetor by oxidizing the fetid substance, but which is almost powerless against, or acts very slowly upon, some varieties of malodorous things that have the property of not being very easily oxidizable. The smell arising from putrid fish affords a specially favorable case for exhibiting the powers of chloralum. Even chloride of lime is hardly so potent against some kinds of fetor as is chloralum. The agent in general use to which chloralum most closely approximates is chloride of zinc, which, like it, is specially potent against offensive organic am-

monias. Suppose that chloride of zinc, instead of being poisonous, were innoxious; that, instead of being corrosive, its strong solution were incapable of damaging textile fabrics; and suppose that its cost price were diminished to one-tenth, then it might be an adequate representative of the new antiseptic and disinfectant, chloralum."

Thymol is extracted from the essential oils obtained from the common thyme, *thymus vulgaris;* the horse mint, *monarda punctata;* and an Eastern drug called *ptychotis djonan.* In commerce it consists of irregular broken crystals, nearly transparent and colorless. It has an aromatic taste. Its specific gravity when it is fused is lighter than that of water. It is a powerful antiseptic and said to be superior to carbolic acid. The advantages claimed for thymol are, first, its efficiency as an antiseptic; second, the absence of irritating effect; third, that it does not injure the instruments used; and fourth, that but a solution of one strength is required for all purposes, the proportion being, 1 part of thymol to 1000 parts of water. The formula is:

Thymol, ...	1.0	grams or	grs. xvss.
Alcohol, ...	10.0	"	ʒiij.
Glycerin, ...	20.0	"	ʒss.
Water, ...	1000.0	"	ʒxxxiv.

The proportions for making the gauze are: 1000 parts gauze, 500 parts spermaceti, 50 of resin, 16 of thymol.*

From late experience with thymol, this substance has not equalled the expectations of those who have employed it.†

Dr. Hoskin, in the *Boston Medical and Surgical Journal,* describes a new and simple apparatus, the object of which is to vaporize certain chemical substances and thus thoroughly to disinfect the air, walls, ceiling, and, in short, the entire contents of any apartment, however large. The instrument by the aid of which this is to be accomplished may be briefly described as consisting of a bottle, a wick, and a bulb of platinum-sponge attached to the free end of the wick. Into the bottle should be poured an alcoholic solution of the substance which it is desired to vaporize (for instance, carbolic acid); the wick is then to be lighted, and the flame extinguished as soon as the ball becomes red hot, which requires but two or three minutes. The ball is now fed continuously by the wick, and will continue red hot as long as any fluid remains in the bottle, and in this condition it will readily vaporize the substance in solution, minute particles of which are thus scattered throughout the atmosphere. . . . . It has been estimated that a bottle holding two ounces will throw out a constant stream of vapor for about sixteen hours, at an expense not exceeding twenty cents.

Potassa fusa is recommended by Dr. Hiller, of San Francisco, as a powerful antiseptic, and as possessing great influence over the process of granulation and cicatrization. The doctor employs a weak solution of the caustic; merely sufficient to make a "soapy" feeling when rubbed between the fingers, and grades this to the susceptibility of the patient. He records cases in which he has injected it into wounds and fistulous openings with marked success.‡

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* Thymol as an Antiseptic, by William L. Bull, M.D., Medical Record, April, 1878.

† Medical Record, Nov. 23d, 1878.

‡ *Vide* U. S. Medical and Surgical Journal, vol. v, p. 170.

CHAPTER XLVII.

ANÆSTHESIA.

ETHER—DISCOVERY OF ANÆSTHESIA—INHALERS—CHLOROFORM—SYMPTOMS OF DANGER—DEATHS—NITROUS OXIDE—BICHLORIDE OF METHYLENE—LOCAL ANÆSTHESIA—RICHARDSON'S APPARATUS—ANÆSTHETIC ETHER—HYDRATE OF AMYL—HYDRAMEL.

IN the practice of surgery there are powerful auxiliary means, which, if called to the assistance of the surgeon, will not only render the condition of the patient similar to that which is noticed immediately after the receipt of the injury, but will relax every voluntary muscle in the system as completely as in death, rendering these tissues thoroughly inert, and, at the same time, exempting the patient from pain, which would otherwise be the necessary attendant upon operations. Such a condition is effected by allowing the patient to inhale an anæsthetic agent until its full effect is produced upon the system; by such means the use of hot baths is dispensed with; antimonials, in repeated doses, that formerly were administered until the already suffering patient was nauseated to a most distressing degree, are not needed; tobacco in fume, by chewing, or in the form of enema, is either forgotten or intentionally thrust aside; and for an expenditure of the precious fluid *ad deliquium animi*, is substituted a simple and effectual means, which, if skilfully and judiciously employed, is comparatively free from danger.

Anæsthesia may be divided into *general*, in which the whole system is placed in a condition simulating death, and *local*, in which only portions of the body are rendered insensible to pain. The fluids most general in use at the present time to produce anæsthesia, are the oxide of ethyl, or ether, commonly and improperly called sulphuric ether; and chloroform, chloroformyle, or the perchloride of formyle.

Ether.—Ether belongs to America, and chloroform to Great Britain. As is well known, the priority of claim to the introduction of ether as an anæsthetic agent, has been hotly contested between Dr. Horace Wells, of Hartford, Conn., and Dr. William T. G. Morton, of Boston. Many of the profession taking opposite sides. The American Medical Association, at its meeting, held in Washington, 1870, passed the following resolution, "That Dr. Horace Wells, of Hartford, Conn., was the discoverer of *anæsthesia*."

Very distinguished gentlemen, while giving the discovery of the *nitrous oxide anæsthesia* to Dr. Wells, accord priority of the *sulphuric ether anæsthesia* to Dr. Morton. In a strenuous effort made by the citizens of Boston to rear a monument to the memory of the latter gentlemen, he is styled "the inventor *and revealer*" of anæsthesia.

From a careful study of all the facts in the case, there can be no doubt that Dr. Morton introduced the inhalation of sulphuric ether into surgical practice, and we believe that this is all that he claimed. Dr. J. Mason Warren having being personally interested in the introduction of ether, thus writes in the appendix to his *Surgical Operations;* he says: "The facts, so far as I am acquainted with them, are as follows: In the autumn of 1846, Dr. W. T. G. Morton, a dentist in Boston, a person of great in-

genuity, patience, and pertinacity of purpose, called on me several times to show some of his inventions. At that time I introduced him to Dr. John C. Warren. Shortly after this, in October, I learned from Dr. Warren that Dr. Morton had visited him, and informed him that he was in possession of, or had discovered, a means of preventing pain, which he had proved in dental operations, and wished Dr. Warren to give him an opportunity of trying it in a surgical operation. After some questions on the subject, in regard to its action, and the safety of it, Dr. Warren promised that he would do so. On the Tuesday following, October 13th, after the surgical visit at the hospital, a patient was brought into the amphitheatre for operation, this being the first opportunity which had occurred since Dr. Warren's promise to Dr. Morton. Dr. Warren said to us: 'I now remember that I have made a promise to Dr. Morton to give him an opportunity to try a new remedy for preventing pain in surgical operations,' and asked the patient if he should like to have the operation done without suffering. He naturally answered in the affirmative. The operation was therefore deferred until Friday, October 16th, when the ether was administered by Dr. Morton with his apparatus, and the operation performed by Dr. Warren. It consisted in the removal of a vascular tumor of the neck, which occupied five minutes. During a part of the time the patient showed some marks of sensibility; but subsequently said that he had no pain, although he was aware that the operation was proceeding. On the following day, a woman, requiring the removal of an adipose tumor from the arm, was rendered insensible by ether, given by Dr. Morton; and Dr. Warren requested Dr. Hayward, who was present, to perform the operation. This was successful, the ether being continued through the whole operation, which was a short one, and the patient being entirely insensible. A few days afterwards, Dr. Warren informed me that he had learned from Dr. Charles T. Jackson that he had suggested the use of ether to Dr. Morton.

"The success of this process in the prevention of pain, was now quite established. Its use, however, was suspended for a time, for reasons which Dr. Warren has already given in his first paper on ether; and the experiments were not again resumed until November 7th, when Dr. Warren declared his willingness to state the nature of the agent employed. Two important operations were now done successfully at the Massachusetts General Hospital under its agency: one an amputation of the thigh, by Dr. Hayward; and the other, a very difficult and bloody operation—removal of a portion of the upper jaw on a woman—by Dr. Warren."

Shortly after these successful operations, an application for a patent was made, which was obtained in about thirty days, and issued in the names of Dr. C. T. Jackson and Dr. Morton. For some unknown reason, the former gentleman withdrew his name from the patent in favor of the latter. On account, however, of the odium in the minds of the profession connected with patents, either in medicine or surgery, very slight effort was made to enforce it. Ether was in daily use, and but little, if any, notice taken of the infringement. On the 28th of December, 1846, an application was made to the United States Government for an appropriation of $100,000 as a national recompense, which met with decided favor. At that time, both Dr. Jackson and Dr. Wells laid claim to the discovery; this prevented the accomplishment of the design. In 1849, in 1851, and 1853, other efforts were made, but the persistency of the opposition faction rendered them futile. Dr. Morton then, having exhausted his means, and being reduced in circumstances, brought suit against the Government for infringement of his patent, but without success. Contributions were set on foot to relieve him, but from some unknown and unaccountable

cause, failed; as did also a second suit against the varied hospitals and infirmaries in which ether had been employed. Dr. Morton finally died, discouraged, disheartened and penniless. His remains rest in Mount Auburn Cemetery, near Boston, "without a stone to mark the spot." What a homily could be read on this history! What a lesson does it teach us!

It seems, however, very probable, from a vast amount of printed and other testimony that I have seen, that the operation above detailed by Dr. Warren, was not the *first* one in which ether was successfully employed. Dr. E. E. Marcy, formerly of Hartford, now of New York (in December, 1844), performed an operation prior to this operation of Dr. Warren. But there have lately arisen others, whose claims to priority must be remembered. Among these, Dr. Crawford W. Long, of Georgia, who in March, 1842, removed a tumor from the neck of Mr. Venables, while the latter was completely anæsthetized with sulphuric ether.

In the *Medical and Surgical Reporter*,* we find that one Dr. Samuel Woolsten, an aged physician of New Jersey, knows that ether, with morphine dissolved in it, was used in surgical operations, to destroy pain, as far back as 1836. He refers to the files of the *National Intelligencer* of June, 1836, for an advertisement for extracting teeth without pain "by the administration of ether."

Before closing this brief account of the discovery of the anæsthetic properties of ether, I desire to call attention to a pamphlet bearing the following title: "An Essay on the Exhilarating and Medicinal Effects of Ethereal Inhalation," by Caleb Bently Matthews, M.D., of Alexandria, Virginia, in 1824. Dr. Matthews was one of the editors of the *Medical Recorder* for 1827 and 1828, and the essay is dedicated to Thomas C. James, M.D., Professor of Midwifery in the University of Pennsylvania. After some preliminary remarks, Dr. Matthews, in regard to the manner of inhalation, says: "For this purpose it is only necessary to procure an oiled-silk bag, or a bladder of the capacity of one or two gallons, and affix to it a brass air-cock and an ivory or wooden mouthpiece; such as are usually employed for the purpose of inhaling the nitrous oxide." The doctor then details his symptoms and the great exhilaration which was produced, and the most marked appearances of face, eyes, and the condition of pulse, with all of which we, in these days, are perfectly familiar. After this, and on the 13th of January, 1824, he states that he breathed the ethereal vapor "from a quart bottle containing sixteen ounces of strong sulphuric ether." He inhaled a large quantity, until his friends, alarmed for his safety, persuaded him to relinquish his experiments, but he sank into a profound slumber. I introduce these remarks to show that an idea of ethereal inhalation was present as far back as 1824; and that, if the experiments had been carried sufficiently far, the great boon to suffering humanity would have been introduced much earlier; and, more especially, because I desire to record a tribute to the memory of Caleb Bently Matthews, who afterward became one of the most zealous followers of Hahnemann, and was my professor of *materia medica* in the first years of my student life.

Ether was used to a considerable extent in this country, but for a period of time gave place to chloroform, on account of the much more rapid anæsthesia produced by the latter, and the much less duration of the stage of excitement, and, perhaps, more especially from an imperfect knowledge of the proper method of administration. In the employment of ether, it must

* May 27th, 1870.

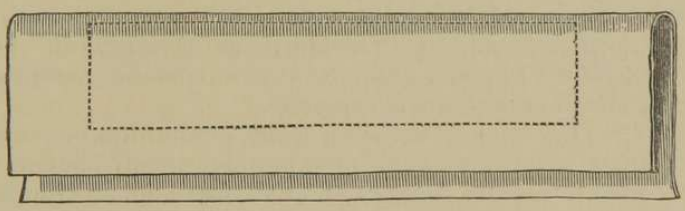
be remembered, that rapid evaporation takes place, and that by the ordinary methods of inhalation more of the fluid escapes into the apartment than is inhaled by the patient, and thus the stage of intoxication is very much lengthened.

The ordinary method of administration is as follows: Wrap a towel into the form of a cone, insert a piece of sponge in the apex of this cone, and inclose the napkin in a thick piece of wrapping-paper; pour a small quantity of Squibb's *æther fortior* upon the sponge, and hold it firmly over the mouth and nose.

I have used many inhalers, as they are called, some being much better adapted to the purpose than others, but I have now discarded them *in toto* for many reasons. They soon become soiled and look untidy; the iron or wire, if such substances be used in their construction, rust; but more especially because, when a patient is in a semiunconscious state, spitting and vomiting are very common occurrences, and may take place so suddenly that the apparatus cannot be removed in time, and a most discomforting and often disgusting state of affairs presents; besides, it is not always agreeable to the patient to know that the same inhaler is employed upon all occasions on the faces of all people.

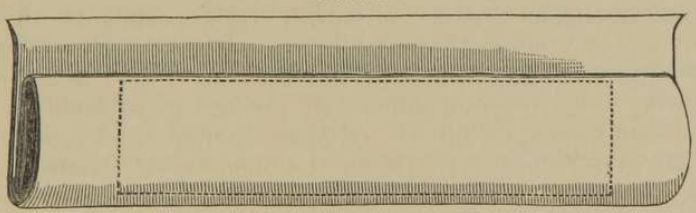
The following simple and cleanly contrivance I use always, and call it "the ether cap." Take an ordinary newspaper, and fold it lengthwise, that it may be six or seven inches in width. Then fold an ordinary towel in the same manner lengthwise, but allow it to be both larger and broader than the paper. Insert the paper into the towel, as we would place the leaves of a book within the cover, as seen in Fig. 562 (the dotted

Fig. 562.



lines representing the paper). Fold one of the projecting portions of the towel lengthwise over the paper, as seen in Fig. 563, then turn down one of

Fig. 563.

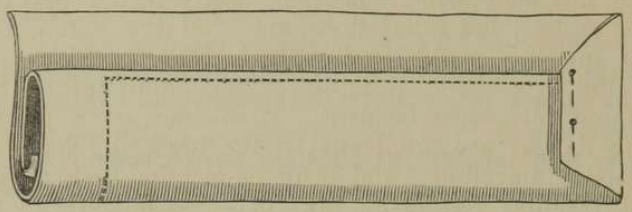


the distal ends of the towel over the paper, and neatly pin it there, *vide* Fig. 564. Then turn upon itself the towel and paper in folds of seven inches in length, or thereabouts, making the last fold to come even with the end of the paper, as seen in Fig. 565.

All that remains, is to fold over the remaining ends of the towel upon the paper and pin them securely, and we have a very serviceable and cleanly apparatus, as in Fig. 566.

Into this ether cap first place cotton, and press it firmly to the bottom; upon this lay a good-sized sponge, and the "cap" is ready for use.

FIG. 564.



Having explained to the patient the manner of breathing, viz., to inhale as *rapidly and fully* as possible, as long as he retains consciousness, and *not to be alarmed* at any unpleasant sensations which may be excited at first,

FIG. 565.

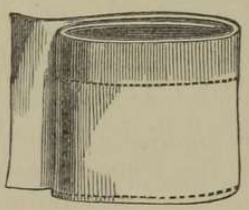
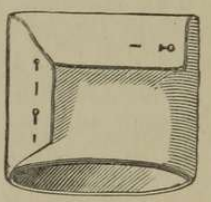


FIG. 566.



the cap is fitted as accurately as possible to the face, the towel accommodating itself to all inequalities of surface, and having been once placed, it is to be kept *closely* applied, and never once removed, excepting to pour on fresh ether, until anæsthesia is complete.

Chloroform.—The other anæsthetic agent, chloroform or perchloride of formyle, although known as a chemical product so far back as 1831, and occasionally used in minute doses as an antispasmodic, was unknown as an anæsthetic till the year 1847, when Prof. Simpson, of Edinburgh, after experimenting upon himself and some friends, announced its power of producing a state of insensibility to pain.

Chloroform, when pure, emits a pleasant and fragrant odor, has a sweetish taste, evaporates rapidly, and is dense and colorless.

The quantity required varies in different individuals; an average may be set down as from one to three drachms. The purer the article used, the more promptly will it produce the desired effect. When it becomes necessary to remove the handkerchief, for the purpose of moistening it again, its reapplication should be quick. Any effort made by the patient to push aside the handkerchief must be resisted; these efforts are made just before the period of insensibility. That the chloroform has acted favorably is known by an increased loudness of respiration.

Chloroform is the most rapid and effective anæsthetic known; but it has in the hands of many, and even distinguished surgeons, proved fatal. It is, therefore, in my opinion, not so safe as ether in its administration.

The following may be laid down as reliable data in the inhalation of chloroform. The patient should fast several hours before the inhalation, and a quarter of an hour before should take either a small dose of brandy and water, or a teaspoonful of a solution containing ten or fifteen drops of chloroform to half a tumblerful of water. The patient should *always*

be placed in a recumbent posture, and every article of clothing, either around the neck, chest, or waist, made perfectly loose. The "chloroform cone" should then be placed over the face and nose, and the first few inhalations taken with full inspirations. Then the pulse must be carefully noted, and in this connection it may be remarked, that many deaths have resulted after a very few inhalations, and that the watchful practitioner must be ever upon his guard; he must look to the movements of the chest, the color of the face, the contraction of the pupil, and if there is much struggling, more care must be used. If the face grow purple, the signs of impending danger are imminent; if the breathing become stertorous, the case becomes alarming; and if, in connection with these symptoms, gasping and irregular respiration take place, with deathlike pallor of the countenance, most active and persevering efforts will be necessary to prevent immediate death. It must not be forgotten that irregular respiratory movements may occur long after death has apparently taken place. I candidly confess that I have never experienced any more unpleasant feelings than when on several occasions I have seen patients on the very verge of death from the inhalation of chloroform. On one occasion I was operating for a simple fistula; in another on an epithelial cancer of the lid; and in a third, for perineal urethrotomy. Since the last case I have used only the ether prepared by Squibb, and I must say I can operate with much less anxiety, even if a longer period of time is consumed in producing complete anæsthesia.

In such cases as related, great coolness is required on the part of the operator. The mouth should be open and the tongue drawn forward; cold water should be dashed in the face, artificial respiration produced, either by the method of Marshall Hall, or by that more satisfactory of inserting a large flexible catheter into the trachea. During this time, the thorax and abdomen may be struck smartly with the end of a wet towel; an injection of an ounce and a half of brandy should be given *per rectum*, and the lungs inflated by means of the catheter, together with alternate pressure downwards upon the thorax made with the open palms to cause expiration. These manipulations should be long and forcibly persevered in, even if life be apparently extinct. An excellent method of restoring animation is the inhalation of pure oxygen gas. In most of our large cities it is made and rendered portable for medical and surgical purposes; if it can be procured in season, it may be of great service.

Of the two agents, there can be no doubt that chloroform is the most satisfactory to administer, but that ether is less dangerous, and with the improved apparatus for the administration of the latter, it should, in my opinion, be employed in every case. I have given chloroform in thousands of cases without a fatal result, although, as I have just stated, on several occasions I came very near losing my patients. The absence of anxiety while ether is being employed, and the constant watchfulness which is ever necessary during the administration of chloroform, are sufficient reasons for the judicious surgeon to employ the ether.

With reference to methylene, terchloride of carbon, or other preparations, I can say nothing, because I know nothing, excepting that I have lately read an account of a death at the Charing Cross Hospital, in London, from its use in the judicious hands of Mr. Edwin Canton.

Mr. Keith, in the *London Lancet* for August 23d, 1870, states, that in his earlier cases he had to deplore the effects of chloroform vomiting in ovariotomy, and that he now uses exclusively anhydrous sulphuric ether, made from methylated alcohol, administered through Dr. Richardson's apparatus. The oftener he has used it the more he has been convinced of its superior

efficacy. There is infinitely less vomiting with ether than with chloroform, and therefore he holds, and very justly too, that in cases where the adhesions are not numerous and extensive, there is not so much danger to be apprehended by the vomiting; but where the contrary is the case, the exertion of the emesis has great tendency to open the bloodvessels and immediately produce hæmorrhage.

The Sickness of Anæsthesia.—After the exhibition of chloroform or ether, there remains in some individuals a deadly sickness and great faintness. In these cases my experience tells me that brandy or stimulants *do harm*. For the first few moments after their exhibition the patient may appear relieved, but the stimulant effect disappearing, an additional nausea and prostration are added.

My usual practice is, to mix ten or fifteen drops of chloroform in about six tablespoonfuls of water, and to give a tablespoonful once in thirty minutes. This practice, in many instances, is productive of good results. As a prophylactic against the vomiting, a few doses may be given before the anæsthetic is administered.

My colleague, Dr. Burdick, uses with success *vinegar*, which he allows the patient to inhale while passing from under anæsthetic influence. He also bathes the head, and allows the patient to hold in his mouth a cloth saturated with it.

There are some cases, however, that withstand both of these methods; one of such lately came to my notice. The patient had been two hours inhaling ether, and had undergone a very serious operation, requiring long and careful dissection. The prostration and vomiting from the ether were very intense, but *ipecac.* relieved her in a short time. Veratrum, camphor, ammonia, and caust., are also very useful in the vomiting that may occur from the use of chloroform. Electricity is also of signal service. One of Garratt's electric disks placed upon the epigastrium soon allays the vomiting. The advantage of the latter is found in the fact, that the appropriate medicine may be internally administered.

There is what is called a *primary anæsthesia*, which is quite profound in some cases, and quite trivial, indeed so much so as to be unnoticeable in others. In many instances, however, the insensibility is of sufficient length to allow operations, which do not require much time in their performance. Thus, opening abscesses, introducing ligatures into sinuses, incisions for *whitlow, brisment* force for anchylosis, and similar operations, in point of time, may be performed. Dr. John H. Packard,* who has given a good deal of attention to this subject, says that the exact length of time before this early stage sets in, and the duration of the unconsciousness, probably vary in each case. The patient may be allowed to administer the ether to himself, or may be told to hold up his hand, and so soon as the hand droops the operations mentioned, or similar ones, may be performed without pain, with immediate and complete recovery of consciousness, and with no unpleasant after-effects of any kind.

Death from Anæsthesia.—There is no doubt in my mind that deaths from anæsthetics are not sufficiently understood even by the profession at large. When such unfortunate accidents have occurred, the heart and brain are the organs which are immediately supposed to be at fault, but I am persuaded that such is not the case, not only from one or two cases that have made a most forcible impression upon my mind, but upon the authority of those gentlemen who have given the matter the most thorough investigation, and whose opportunity for experiment has been exceptionally

* American Journal of Medical Science, July, 1877, p. 130.

large and varied. There can be no doubt of two facts which have an important bearing in these cases, the one being, that in very many instances both chloroform and ether are successfully administered to persons who are suffering from organic diseases of the most severe kind; the second, that deaths occur often in those who have no recognizable disease whatsoever, and in persons who, to all appearances, are in a state of health as near perfect as is generally found. Dr. Benjamin W. Richardson and Dr. Snow, both of whom have made the subject one of exact study and research, testify to this truth. The former gentleman thus writes, in one of his lectures: "When I was engaged in the practice of the administration of chloroform, I was careful to make diagnosis of disease before administration of the narcotic, and on referring to the facts I find that I administered it in the presence *of the most severe forms of organic disease.* In phthisis pulmonalis, in various stages; in cancer, in various stages and types of the malady; in chronic bronchitis, asthma, and hydrothorax, in mitral disease, hypertrophy, and dilated aorta; in epilepsy; in idiocy, with epileptic disease; in various forms of dropsical effusion; in paralysis and acute mania, etc., etc.; and *in not one* of these administrations was the danger of the administration in any way increased." Dr. Snow, in his book on *Chloroform and other Anæsthetics,* confirms these facts; and again, on the second point, this same gentleman emphatically says: "Sometimes persons die under chloroform who have no appreciable disease whatever before death, no disease, that is to say, which *the most perfect diagnostician could put his finger on, and say there was cause of anxiety from the presence of disease.*"

From the most recent researches on this subject, and from the experiments of Dr. Russell on the "influence of the vagus on the vascular system," it seems now to be a fair conclusion that the asphyxia which we often see in these deaths from anæsthetics is caused by the direct action of the anæsthetic on this nerve. Dr. Richardson further states: "In conclusion, I infer that in every case of death from chloroform, the cause of death is either of the motor or of the controlling nervous mechanism of the heart. I conceive that any primary organic changes of structure leading to death are situated in that mechanism, and must be looked for *there,* and I think that there is fair ground to assume that in some cases there may be death where there is no actual disease of structure, but simply so extreme a natural delicacy of balance between the nervous functions, that the excitation produced by the chloroform is sufficient to arrest motion and destroy life."

In the case of one of my patients who died on the table after a few inhalations of ether, the patient was in an excessively nervous condition; his heart was small and degenerate, but continued its function for some minutes *after* the arrest of breathing was complete; showing, to my mind, the fact that the vapor of the ether, in a person of most extreme nervous irritation, acted as an excitant or irritant on the nervous periphery of the respiratory surface. There was a spasmodic cessation of the organs of respiration. There was asphyxia, complete and immediate. It took some time, however, for the non-oxygenated blood to stimulate the vagus sufficiently to arrest the heart-beats, which, sooner or later, under such circumstances, must take place.

In my clinics, and in fact in my entire surgical practice, I have abjured chloroform for years. On two occasions, once in St. Louis, while I was operating for fistula in ano, and once in Buffalo, while removing the lower eyelid for an epithelioma, I was on the verge of seeing the patients pass from life to death, and from the sensations I then experienced, and the many statistics I have read, I have preferred and always administer ether. I grant it is not so pleasant an anæsthetic, its administration takes longer

and its effects may be more evanescent; perhaps, also, there is more emesis during the inhalation; but I think I express the opinion of most operating surgeons when I say that ether is gradually, even in England, superseding chloroform. According to statistics of Andrews of America, and Richardson of England, as collected by Dr. Coles, I find the following: Deaths from ether, 4 in 92,815 inhalations, or 1 in 23,204; deaths from chloroform, 53 in 152,260 inhalations, or 1 in 2872, making about eight deaths from the latter to one of the former. This subject, however, cannot be entered upon in a work like the present. Fatal cases no doubt will continue to occur from time to time, and must always be set down as belonging to those so well classified by Sir James Paget as "surgical calamities."

Nitrous Oxide—Bichloride of Methylene.—Much has been said and written concerning the use of the nitrous oxide as an anæsthetic agent. Some surgeons have become quite partial to it, and for some operations it will do very well; but, in my opinion, it will never supersede ether. In the first place, it requires a chemist, or one who is at least somewhat versed in the science, to obtain it in a pure state; for, if the temperature be raised over four hundred and eighty degrees, the fatal nitric oxide is evolved. In the second place, for very protracted operations its effects pass away too speedily. In the third place, aside from the inconvenience of keeping a large bulk of gas in vessels reversed over water, the water is constantly absorbing some of it, and returning, in place of it, carbonic acid, which the outer surface takes from the air; hence it is not well to keep it over two days. Fourthly, a cumbersome apparatus is required for its administration, as well as the paraphernalia for making and storing it. As I have said before, it may be used for the extraction of teeth, or for operations of frequent occurrence that are not protracted. I am well aware of the fact, that patients may be kept under its influence for a length of time. I have seen more than thirty gallons administered to a patient by one of the Colton Association, while I extracted a tumor of the lower jaw, of which the pedicle was lodged upon the internal maxillary artery, behind the ramus. But the surgeon will never come to rely upon nitrous oxide in every-day practice. It cannot be used by the country physician in his rounds. The nitrate of ammonia, from which it is made, must be pure. After the gas has been collected, it must stand for some hours before use. It must be obtained by the aid of a proper temperature. It must be made fresh at least twice a week. If we desire to perform a tedious operation, it would be necessary to have an extra carriage to carry the bag containing the gas. I have experimented with this gas on several occasions, and believe that in hospitals, and where it is used without transportation, it may do very well. But with ether or chloroform, the surgeon can put a bottle of either in his coat-pocket, and carry it where he pleases; he can use his handkerchief for its administration; he has no need of plugs and mouth-pieces and huge bags of india-rubber. Hence my experience leads me to the conclusion, that the nitrous oxide will never supersede the use of ether or chloroform in general practice, but that it will be extensively employed in dental surgery.

Bichloride of Methylene.—This preparation, which has been used as an anæsthetic, is made by placing a mixture of alcohol and chloroform in contact with pure zinc. Heat is then applied, and a brisk action is soon established, during which an equivalent of chlorine from the chloroform ($CHCl_3$) passes to the zinc, and, after the escape of gases, the bichloride of methylene (CH_2Cl_2) distils over. This may be carefully inhaled, and produces rapid anæsthesia.

Local Anæsthesia.—The boon conferred upon suffering humanity, and upon surgical science by the introduction of chloroform and ether is so great

that few actually and fully appreciate its value. But the improvements recently introduced into the field of anæsthesia by the *local* application of various agents, by which certain painful operations may be performed while the patient still retains his consciousness of everything save suffering, cannot but be hailed with feelings of the highest gratification, both by the profession and the community at large.

The use of a volatile fluid called rhigolene as a local anæsthetic, was introduced by Henry J. Bigelow, M.D., of Boston. It readily chills the tissues to insensibility, and is far less expensive than either chloroform or ether. Freezing by rhigolene is more speedy and certain than by ether (the use of which was suggested by Mr. Richardson), inasmuch as common ether often fails to produce an adequate degree of cold. Ether boils at about 96°, and rhigolene at 70°; hence its greater rapidity of evaporation, and consequent absorption of caloric. The rhigolene is more convenient and more easily controlled than the freezing mixtures hitherto employed. Being quick in its action, inexpensive, and comparatively odorless, it may supersede general or local anæsthesia by ether or chloroform in small operations performed at the house of the patient; but, for large operations, it is obviously less convenient than general anæsthesia. Applied to the skin, the first degree of insensibility is evanescent, but, if continued, or used upon a large scale, the danger of mortification or frostbite must be imminent.

Ether, as a local anæsthetic, was introduced by Dr. B. W. Richardson, who has given great attention to the subject. The doctor states that, at any temperature of the air, the surgeon can produce cold six degrees below zero, and, by directing the spray upon a half-inch test-tube containing water, he can freeze it in two minutes.

Many nebulizers for the atomizing of fluids have been introduced besides those of Richardson and Bigelow. The first one of these was exhibited to the Academy of Medicine, at Paris, in 1858, by Sales Girons. This instrument was very expensive, and consisted of forcing the medicated fluid through a tube with a fine aperture directly against a metallic plate; the stream thus ejected with considerable force against the plate, by means of an air-pump, was broken into spray.

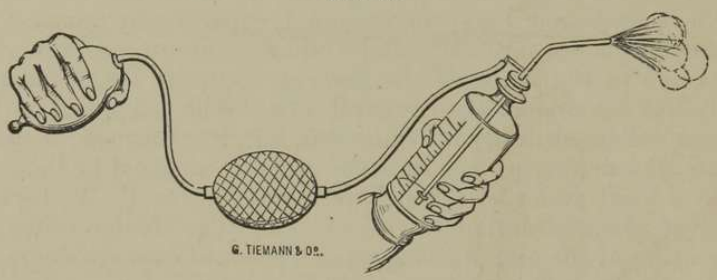
Dr. Bergson's instrument is much more simple, and consists of two tubes bent at right angles with each other, having the glass drawn to a fine extremity at the angle where the tubes meet. By immersing the perpendicular tube in the ether, or other medicated fluid, and by blowing through the horizontal one, the air in the former is exhausted, the fluid rises from the outside pressure of the atmosphere, and passing through the capillary extremity, is atomized. It is on this simple philosophical principle that the little instrument, long known, and now coming into much more general use, called the *Patent Perfume Vaporizer*, for the purification of the sick-chamber, is constructed—in fact, a very excellent nebulizer can be made by procuring one of these perfume vaporizers at the druggist's, and having the approximating ends of the tubes ground to a capillary extremity, and then applying thereto an Andrew Clark hand bag. It is somewhat after this fashion that Dr. James G. Richardson, of Union Springs, New York, has contrived a very neat little apparatus, which may be described as follows: It consists of two tubes, five inches long, and three-sixteenths of an inch in diameter, made of thick glass, and each drawn off at one end to a point, which is to be smoothly ground down till the resulting aperture is about the diameter of a horse hair; bend one of these tubes, by holding it over the flame of an alcohol lamp, at a right angle, half an inch from its small extremity, and again at its middle in an opposite direction to the same extent; then attach both tubes to a grooved cork, so that the capillary

opening of the bent or lower one shall be opposite the minute orifice of the straight tube, to the other extremity of which the nozzle of a syringe is affixed, the tubes being held in position by placing them through a large cork.

Dr. Siegle, of Stuttgart, also invented an instrument by which steam is used instead of air, and is employed to produce the vaporization.

Dr. Andrew Clark, of London, has introduced a modification of Bergson's tubes. To the horizontal limb he has attached an india-rubber tube, terminating in two hollow balls placed at a short distance from each other, the middle one being the air-reservoir, the other the air-pump. By alternately compressing and relaxing the end ball, the air-reservoir is distended, and continuous spray is produced. The instrument which I have employed is Richardson's (Fig. 567), which is used as follows:

FIG. 567.



After filling the bottle two-thirds full with the solution, operate the end ball briskly; this will extend the netted ball, and force a current of air into the cavity of the silver tube. This column of air, being disproportionately large compared with the aperture of the tube, becomes compressed, and exerts *first*, an influence upon the surface of the fluid (which is forced by it into the capillary tube); *secondly*, a pressure upwards, escaping through the orifice at its tip. This continued upward current of air divides into spray the drops collected at the extremity of the capillary tube. The force with which this spray can be thrown is surprising. The jet is steady, there being a nearly uniform pressure kept up by the regulating power of the netted bag, which, by its elasticity, compresses the air in it during the intervals of manipulation upon the hand-ball.

The great desideratum in the use of the instrument, is to employ nearly absolute and negative ether, with which local anæsthesia may be produced in two minutes. The rhigolene of Dr. Bigelow causes the same effects, and to a greater degree and in less time; but if the ether be absolute, has a specific gravity 0.720, of negative effect upon the tissues, and a boiling-point of 90° to 92° Fahr., it is very serviceable. Many disappointments may result where the ether is impure and the apparatus imperfect.

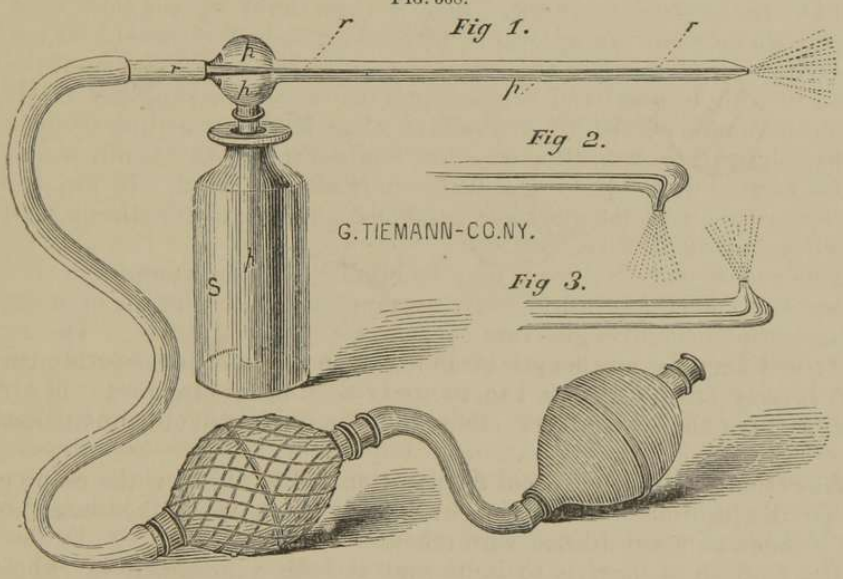
An instrument now in use is represented in Fig. 568, invented by Dr. Robert Newman, of New York. "The double air-chamber of the rubber tube presses the air through the inner tube, *r r*, and directs the spray. The same movement exhausts the air from the outer tube, *p p*. As soon as there is a vacuum in the outer tube, the fluid from the vial, S, is forced upwards into it, and surrounds the inner tube. The continued pressure forces the fluid through the small opening, and produces the spray. The fluid is carried in the outer tube; the air, which atomizes, in the inner tube. The opposite mechanism, *i. e.*, the inner tube carrying the fluid, and the outer the air, will produce the same effect. Instruments constructed according to the latter theory have been made by the same artist, and

work well. These atomizers are made to direct the spray in different ways: upwards, downwards, or straight forward. Either of these directions is produced by the end of the inner tube, which conveys the air. But in either case the instrument is only one piece of machinery. Fig. 1 represents the straight atomizer in operation: *p p p*, is the outer tube; *r r*, inner tube. S, the vial with the medicated fluid.

"Fig. 2 is the end of an atomizer downwards for the larynx, etc., and Fig. 3 the end of an atomizer which sprays upwards for the posterior nares."

The employment of *intense cold* for the purpose of producing local insensibility to pain is by no means new in surgical science. It is believed that Dr. James Arnott, of London, eighteen years since, was the first to in-

FIG. 568.



troduce it to the notice of the profession. His mixture was ice finely pulverized and mixed with salt. This is a very effective method to produce temporary local anæsthesia. I have often employed it in the removal of small encysted tumors, for the introduction of the needles of the aspirator, the insertion of a trocar, and superficial incisions.

Dr. Richardson, at the request of the Harveian Society of London, stated that the anæsthesia was produced by the rapid evaporation of the ether, although in the earlier of his experiments he in part attributed the effect produced to the well-known and peculiar powers of ether when inhaled, speaking of it as *narcotic* spray. There can be no doubt that it is the cold alone that produces the local anæsthesia, and that this freezing is attributable to the rapid evaporation of the liquid used. Now, the force of sensation is brought down by the blood, and where a part is frozen, the blood cannot supply sufficient heat to keep up the sensation of a part. Again, Dr. Richardson believes that nerve force is brought down with every stroke of the heart, and in verification of this view, he mentioned that local anæsthesia could be much more rapidly induced if, while the cold is being applied, the vessels leading to the part were compressed. There are also some other precautions necessary. When a part is to be frozen, it should be previously carefully and perfectly dried; otherwise, a film of ice is produced, and the anæsthesia is obstructed. If the ether is

not very pure, this hoar frost is likely to appear, and a good test for the purity of the article in question is to ascertain whether it will boil when poured into the palm of the hand. This can be known by pouring it into the palm of the hand, holding it near the ear, and listening. Another caution given to the members of the Harveian Society was, that the use of chloroform had occasioned a carelessness in operators; the surgeon would often laugh and talk while the anæsthesia was being produced. While local anæsthesia is being effected, it is better that perfect silence be maintained.

Dr. Richardson has invented new compounds of ether. Though the effect of the cold produced by the ether spray is directly hæmostatic, as reaction returns there is bleeding, which, if the wound be too soon closed, is a cause of trouble. The observation of the immediate effects of cold led Dr. Richardson to think, "that if they could be supplemented by a styptic which would spray evenly with ether, and which would take up the constringing action when the vessels began to relax, an important desideratum in both medical and surgical practice would be supplied." He had a solution made consisting of absolute ether, having a boiling-point of 92° Fahr., charged to saturation at a low temperature with tannin, and afterwards treated with xyloidin, a little short of saturation. It ran through the spray-tube without blocking, produced good local anæsthesia, and possessed an agreeable odor.

This *xylo-styptic ether spray* may be applied to open wounds on the skin, to arrest hæmorrhage after teeth extraction, and, by means of a uterine tube, uterine hæmorrhages from cancerous or other diseases. The styptic ether will keep for any length of time; a small quantity only is required, and it may prove of great use to army and navy surgeons. The other ether compounds are a caustic ether, an iodized ethereal oil, and an ozonized ether.

Anæsthetic Ether for Local Application.—The above is the name given by Dr. Richardson to a thin, bright liquid, which runs like water, and is the hydride of amyl diluted with ether.

The *hydride of amyl* is so light that it boils vehemently in the hand, and actively in a glass globe by merely placing the hands upon it. It is procurable in any quantity from the careful distillation of American petroleum. After many ingenious experiments, Dr. Richardson ascertained that the best preparation for local anæsthesia is one part of the hydride to four parts of ether, and this he calls the "compound anæsthetic ether for local anæsthesia." It induces perfect insensibility in from ten to twenty seconds. This material is a solvent of many medicinal substances, which may be applied by means of the atomizer. When prepared with iodine, it is a useful disinfectant.

Hydramyl can also be used as a general anæsthetic. With these substances, however, I have had no experience whatsoever; the others, so far, having fully answered all practical purposes.

Dr. Delcomante, professor at Nancy, claims that the power of *sulphuret of carbon* in producing local anæsthesia, is much greater than any other substance now in use. He reports that the refrigeration is more complete than with ether, and is obtained in less than one minute.

Like every other new invention or application in surgical science, the inquirer is liable to be led away by the success attending it in certain cases. Legs have been amputated by Chassaignac with the écraseur, but not with the good results offered by the older methods. Vision has been destroyed by the indiscriminate use of the ophthalmoscope when the eyes were af-

flicted with simple catarrhal ophthalmia, which a few doses of belladonna would have cured.

The use of the means of which we have spoken for the production of local anæsthesia must be considered as one of the greatest improvements lately introduced into surgical science. In my own experience, in opening whitlows and buboes, in operation for paraphimosis, lancing of mammary abscess in females of delicate and nervous temperament, to whom it would have been manifestly unsafe to administer chloroform, the extirpation of small tumors, and other such operations, its use has been most satisfactory; and, no doubt, for fistulæ, hare-lip, removal of cancer of the lip, and even for tracheotomy, it may be very serviceable; but when we remember that it is almost impossible to make careful and minute dissections among frozen tissues, perhaps it will not be applicable where the use of the knife is necessary. However, we have the authority of Dr. Richardson that it has been satisfactorily used in ovariotomy, amputations of the foot, operations for hernia and Cæsarian section. The advantages of the process in the latter were said to be very great. 1st. There was no bleeding; and 2d, the cold caused the uterus to contract,—two of the greatest *desiderata* in the operation. We also find records of its successful application for periosteal affections, conjunctivitis, cancerous tumors of the scalp, epithelioma of the lip, fistula in ano, fatty tumor of the side, incisions into carbuncles, applications of nitric acid to chancres, the introduction of the hypodermic syringe, and very many other operations which are recorded throughout the medical periodicals. An interesting case is reported where Dr. I. H. Douglass, of New York, exhibited medicated pulverized fluids upon the throat; and Dr. Clymer states that, "having a case of stricture with great irritability of the urethra and troublesome painful erections, I was induced to try spraying, from a Richardson, the perinæum and along the urethra with a strong solution of the bromide of potassium. After two or three applications, the unpleasant symptoms abated and ceased, and there was no subsequent difficulty in exploring the urethra, and going on with the dilatation. In another case, almost similar, the same results followed this plan."

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