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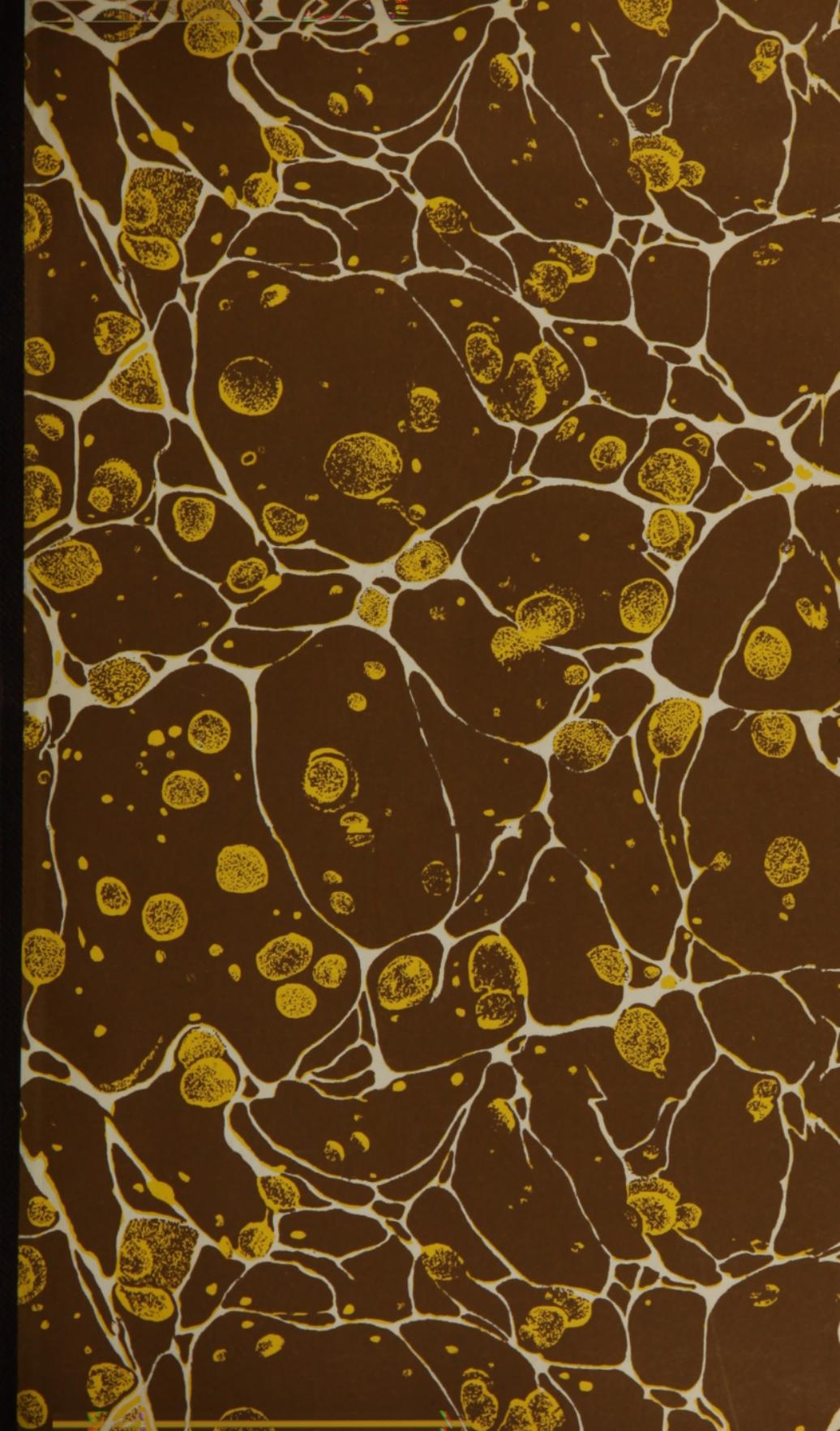
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S U R G E R Y.

BY

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IRELAND AND EDINBURGH,
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ILLUSTRATED WITH ONE HUNDRED COPPERPLATES.

VOLUME II.

THE FIRST AMERICAN EDITION, CORRECTED.



PRINTED AT BOSTON,
BY ISAIAH THOMAS AND EBENEZER T. ANDREWS,
FAUST'S STATUE, No. 45, NEWBURY STREET.

Sold by them in *Boston*, and by said THOMAS in *Worcester*.

M D C C X C I.

SYSTEM

SURGEON

BY

BENJAMIN BELL

MEMBER OF THE ROYAL COLLEGE OF SURGEONS OF IRELAND AND EDINBURGH, AND ONE OF THE SURGEONS TO THE ROYAL INFIRMARY, AND FELLOW OF THE ROYAL SOCIETY OF EDINBURGH.

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MDCCCXXI.

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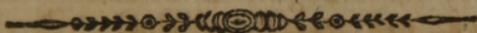
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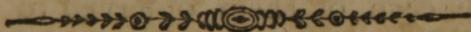


A TREATISE
ON THE
THEORY AND PRACTICE
OF
SURGERY.



C H A P. XVI.

OF THE HÆMORRHOIDS OR PILES.



THE term Hæmorrhoids or Piles was originally applied to every discharge of blood from the veins running upon and in the neighbourhood of the rectum; but a mere distention of these veins, when productive of pain, now receives the same denomination.

As long as the diseased parts of the veins remain distended, and do not evacuate any part of their contents, the piles are named Cæcæ or Blind; but when they burst or discharge blood, they are termed Apert or Open.

It frequently happens, that a discharge of blood upon going to stool is the first warning or appearance of this disorder: For although in some instances it is otherwise, yet when the parts of the veins chiefly affected lie far up the rectum, the pain or uneasiness produced by them is in general not considerable; and this we suppose to proceed from

the veins in this situation being furrounded with parts which from their softness readily yield to their distention; whereas, when the disease occurs towards the extremity of the gut, as the intestine is here surrounded with a firm muscular covering, the sphincter ani, a good deal of resistance is thereby given to the formation of hæmorrhoidal tumors, and they are accordingly in this situation almost always productive of much distress.

When the piles are so situated as to be within view, if they have begun to discharge blood, one or more small openings are observed, from whence the blood is poured out: When the parts have not been previously much distended, these openings appear to be the mouths or outlets of so many veins: And the openings from whence the blood proceeds are each of them observed to be seated upon a small protuberance arising from the internal coat of the gut.—In general, these tumors, when they discharge freely, are very small, being seldom larger than an ordinary pea; but when any obstruction occurs to the evacuation of their contents, they gradually become larger, till in some instances they arrive at the size of pigeons or even of pullets eggs, when by the pain, irritation, and tenesmus, with which in such a state they are always attended, much distress and misery are produced by them. When at last the tumors burst and discharge their contents, if they have previously arrived at any considerable magnitude, the swellings do not disappear entirely: On the contrary, they still continue of nearly the same size; they have frequently a dark livid appearance; and instead of being soft or elastic they have a firm fleshy consistence.

As long, however, as hæmorrhoidal tumors remain shut, they are found to be soft and yielding to the touch, insomuch that by pressure they can commonly be much diminished; their colour is still more livid than that of the apert kind, and they

are

are generally attended with much more pain : For although they do not usually become very large before bursting ; yet when they lie deep, and are thickly covered with firm unyielding parts, the tumors which occur are in some instances of such a size, as almost entirely to obstruct the passage of the fæces ; and as a tenesmus is a common symptom in this state of the disorder, the distress produced by the frequent inclination to go to stool, together with the great difficulty attending the evacuation, never fail to induce a great deal of misery.

The tumors which occur in this disorder, have been commonly supposed to proceed from a mere dilatation of the hæmorrhoidal veins. In the incipient state of the disease, while the swellings remain small and circumscribed, this may frequently be the case ; but whenever the tumors arrive at any considerable size, they will almost constantly be found to be attended with an effusion of blood into the contiguous cellular substance.

As long as they remain small, soft, and compressible, we may always conclude, that the blood still remains within the cavities of the veins ; but whenever they become large, and of a firm fleshy consistence, the blood, as we have just observed, will, in almost every instance, be found to be effused into the neighbouring parts.

Various ideas have prevailed respecting the nature of the hæmorrhoidal discharge : But the most prevailing opinion is, that it is almost constantly, of a critical nature ; that it is induced by the presence of some peccant or morbid matter in the system ; and that therefore it would, in general, be improper to put a stop to it.

It does not, however, require a minute investigation to show that this reasoning is ill founded : For were we even to allow, that the piles commonly appear without the intervention of any evident occasional cause, and that they are in reality con-

ned with some morbidic humour in the blood, in what manner can we suppose this diseased matter to be evacuated by the hæmorrhoidal flux? Now that the circulation of the blood is well understood, it will be difficult for the supporters of this opinion to give a satisfactory answer to this question. But, independently of this, we know well, that the piles are very commonly induced, perhaps in nineteen cases out of twenty, by an evident occasional or exciting cause; and that the removal or prevention of this cause, when effected in due time, is almost constantly attended with a cure or prevention of the disorder. Almost every case of piles is, upon a proper investigation, found to have been originally produced by compression upon the hæmorrhoidal veins; by which the blood contained in them being impeded in its progress towards the heart, dilatations of these veins, and subsequent effusions, are consequences which necessarily ensue.

The most frequent causes of this compression, are, hardened fæces collected in the rectum, a circumstance which, in constitutions liable to costiveness, is very universally met with; the pressure produced upon the neighbouring parts, in every case of pregnancy, by the gravid uterus; and lastly, tumors, of whatever nature they may be, which, from their situation, press upon the hæmorrhoidal veins.—Thus scirrhus tumors in the rectum, and similar affections of the prostate gland and bladder, are sometimes productive of this effect; and swellings of the mesenteric glands have likewise been known to compress the reflux vessels in their course from the rectum.

When tumours in the contiguous parts are found to produce the disease, the means of cure must be directed particularly to the removal of these.—When pregnancy is the cause of the disorder, gentle laxatives, and a frequent recumbent posture, will often afford relief; but nothing will effect a complete

complete cure till delivery is accomplished.—And, again, when piles have been induced by costiveness, a regular use of aperients, particularly of cream of tartar and oil of castor, will very commonly obviate every inconvenience produced by them. But when the parts inflame and become very painful, such remedies must be employed as are known to be most powerful in removing, or even in preventing, the effects which these symptoms usually induce. If much fever prevails, blood should be discharged in proportion to the strength of the patient; and it should be observed, that this evacuation never proves so effectual as when obtained by means of leeches applied to the parts as contiguous as possible to the seat of the pain: The parts chiefly affected should be frequently bathed with a mild solution of *saccharum saturni*; and the patient should be kept upon a low, cooling regimen.

We here think it proper to mention two remedies which of late we have frequently used with much advantage in various cases of piles. The one is an ointment composed of equal parts of oak-galls, finely powdered, and hogs lard or butter: This commonly gives more relief in every external hæmorrhoidal affection, than any of the sulphur ointments so frequently employed; and when the seat of the pain is internal, and cannot be reached by an ointment, injections of a strong infusion of galls are found to prove very serviceable.—The other is a remedy which I first employed on the suggestion of Dr. Cullen, the *balsamum copaibæ*. This medicine, given to the extent of fifty, sixty, or eighty drops, morning and evening, not only relieves the pain so frequently produced by piles, but very commonly answers as an easy and certain laxative.

By the use of one or other of the remedies we have mentioned, all the ordinary symptoms of piles will, in general, be removed: But there are some circumstances in this disorder which can only be

relieved by a chyrurgical operation ; and these particularly are, such frequent returns of large evacuations of blood from the hæmorrhoidal vessels, as tend to debilitate the system too much ; and the tumors which occur becoming so large as to induce much pain, irritation, and obstruction in the under part of the rectum.

The distress induced by either of these occurrences is frequently so great, as to render it necessary to employ the most effectual means for their removal ; and as we have shown that the hæmorrhoidal discharge is seldom or never to be considered as critical, or in any degree as an useful evacuation, the utmost attention ought to be given to the prevention or the removal of such causes as are known to induce it.

When frequent returns of this discharge have evidently weakened the system too much ; and when bloodletting, the use of aperients, and a proper regimen, do not effect a cure ; necessity points out the propriety of compressing the mouths of the bleeding vessels. In slight cases of piles, this may frequently be done by introducing a tube of silver, wrapped properly round with soft linen, into the rectum, so as to press upon the parts affected : Or what applies pressure in an easier and more equal manner, a piece of sheep's gut tied at one extremity being pushed into the anus, and a quantity of water or any other fluid being conveyed into that end of it which is left open, and which ought to be of a sufficient length to admit of two or three inches hanging out at the rectum, almost any degree of compression that can be needed may thus be effected merely by pushing the water into the upper portion of the gut and securing it there by a ligature : And by continuing the pressure for a sufficient length of time, every evacuation of this kind proceeding from small vessels in the under part of the rectum may be effectually prevented.*

In

* Mr. Bromfield, when treating of the extraction of the stone in women, advises the urethra to be dilated by means of water con-

In some instances, however, the vessels from which the hæmorrhagy proceeds, lie so far within the rectum, that no application of this kind can reach them; and as Surgery can be of no use in these cases, those means of cure which may be directed by medical practitioners are to be employed: And again, when it so happens, that the veins which pour out the blood are so large as not to admit of effectual compression, and when they are situated towards the extremity of the rectum, they ought undoubtedly to be secured by ligatures; and these ought by all means to be applied with the tenaculum instead of the needle. With the former, the vein may be taken up almost by itself: But when the needle is used, a considerable portion of the gut must necessarily be taken up along with it; a circumstance which must always be productive of mischief.

We have already said, that, in some instances, the tumors produced by piles become very large. As long, however, as they are not accompanied with much pain or inconvenience, they ought not to be touched; but whenever they acquire such a bulk as to obstruct the passage of the fæces, their removal, if practicable, becomes extremely necessary, and ought to be effected. When they are situated near to the verge of the anus, we have it commonly in our power to accomplish this with little difficulty; and even when they are placed an inch or more up the rectum, pressure similar to that which is employed on going to stool, frequently brings them so much into view, as to admit of their being extirpated with ease and safety.

Various methods have been in use for removing tumors of this kind, namely, ligatures, excision, and even the potential and actual cauteries. Neither of the latter, however, ought to be ever employed; so that the methods by ligature and excision are those we have to consider.

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tained in the gut of a fowl. In justice to Mr. Bromfield, we must observe, that the practice here recommended is taken from this hint.

When a tumor of this nature is attached by a small root, and when therefore a ligature is easily applied, we are commonly directed to take it off in this manner; and on the contrary, when such swellings are attached to the gut by broad extensive bases, they are in general desired to be dissected off with the scalpel. All we think necessary to say with respect to this point is, that when the tumors are small, and when therefore there is no reason to be afraid of any hæmorrhagy that may ensue from removing them by excision, the scalpel ought undoubtedly to be preferred to every other means, whether the swellings be attached to the gut by broad or by narrow bases: But whenever they are of any considerable size, and when there is reason to suspect that the arteries which supply them with blood are large, the ligature ought certainly to be employed, as the only safe means of removing them. No sufficient reason has ever been alleged for confining the use of the ligature to tumors with small necks; for although in these a ligature is more easily applied, yet with a little attention even such as have broad extensive attachments may be removed in this manner.

A needle armed with two firm waxed threads being introduced through the middle of the basis of the tumor, and the ends of one of the threads being firmly tied round one half of the swelling, whilst the other half is secured by the other thread, the whole may in this manner be removed with as much certainty as when the basis of it is narrow. If the ligatures have been properly applied, the tumor will commonly fall off in the space of three days: In some instances, they drop off in eight and forty hours, or even less; but in general three days are required. When the scalpel is employed for the removal of these tumors, the parts should be afterwards dressed with soft lint, covered with any emollient ointment; but when they are taken off by ligatures, no dressing is required.

C H A P. XVII.

OF CONDYLOMATOUS EXCRESCENCES,
AND SIMILAR AFFECTIONS OF THE ANUS.

THE parts about the anus are liable to be affected with hard excrescences, which are termed Condylomata, Fici, Cristæ, &c. The distinctions, however, which these names import are not of much consequence; for tumors of this kind are all of the same nature, and are cured by the same means.

Tumors of this nature are sometimes met with in the cavity of the gut itself; but most frequently they are confined to the parts exterior to the sphincter. They are of different degrees of hardness, bending in some instances not much firmer than the parts with which they are connected; whilst in others they are found to acquire the consistence of the firmest scirrhus. Their colour is also very various: In some cases they are of a pale white, and in others of different shades of red. In some instances, a single excrescence or two is only met with; but most frequently all the parts contiguous to the anus are at last covered with them. In many cases, they are not larger than ordinary warts; and the disease, even in its most advanced stages, is found to consist of a number of these, either adhering together, or lying quite contiguous to one another. But in others the tumors are from the beginning broad and flat, being frequently of the shape and magnitude of split garden beans.

These excrescences, on their first formation, seem all to be productions of the cuticle merely; but in consequence

consequence of the pressure produced by a long continuance of the disorder, they come at last to be connected with the skin itself, and in some instances even proceed to the depth of the subjacent muscles.

As long as tumors of this kind create no uneasiness, they ought not to be touched; and it frequently happens, that they do not arrive at such a bulk as to require much attention; but on other occasions, they are productive of so much distress as to render their removal absolutely necessary.

In the softer species of these excrescences, rubbing them frequently with a piece of crude sal ammoniac, or washing them with a strong solution of that salt will frequently remove them. The pulvis sabinæ too, when finely prepared, is sometimes found to prove effectual. But both of these remedies are always slow in their operation; and when the tumors are of the hard warty kind, they have little or no effect in removing them. When they are therefore found to fail, recourse must be had either to the scalpel, or to the lunar caustic: But of the two, when the patient will submit to it, the former is greatly preferable; and we know that no danger can occur here from excision, as the parts to be extirpated are never connected with vessels of any considerable size. When extirpation is resolved upon, all the diseased parts should be effectually removed; and dry lint, being applied to the sores, they are afterwards, to be treated in the same manner as wounds produced by any other cause.

When the fears of a patient, however, prevent him from submitting to the excision of such tumors, we are then under the necessity of having recourse to caustic: But in the use of this remedy, much attention is necessary, to prevent it from spreading to the gut; for a good deal of mischief would probably ensue from its coming into contact with the rectum.

C H A P. XVIII.

OF A PROLAPSUS ANI.



A PROTRUSION of any part of the *intestinum rectum* beyond its usual limits, is termed a *Prolapsus Ani*. In some instances, the displaced portion of the gut is very trifling, but in others it falls down to a considerable length.

The *sphincter ani* and neighbouring parts, whilst in full strength, serve as a base or support to the superior part of the gut : Whatever, therefore, tends to induce any morbid debility of these, will probably have some influence in the formation of a *prolapsus ani*.

The most common cause, however, of this disorder is, frequent and violent exertions excited in the *rectum* itself by the influence of some irritating cause about its extremity. Thus a frequent use of aloetic medicines, which commonly affect the *rectum* very remarkably, are often attended with this effect ; and the small worms termed *Ascarides*, by lodging chiefly in the under part of the *rectum*, and by thus producing a violent degree of irritation, have in different instances been known to induce this disease. Habitual costiveness, hæmorrhoidal swellings, and in short every cause that stimulates the *rectum* to over exertion, will, on different occasions, be found to produce it.

Many instances have occurred of protrusions of the *rectum* remaining unreduced for a great length
of

of time, without any thing bad ensuing from it. This renders it clear, that this portion of the bowels is capable of bearing more exposure to the effects of the external air than the other parts of them are ; but we ought not from this to be ever induced to allow any part of the gut to remain long protruded without making some attempt to reduce it. By writers in general we are desired, before reducing the gut, to foment it well with emollient and antiseptic decoctions ; and the operator is directed to cover his fingers with oiled or waxed linen before any pressure is made upon the gut. These previous steps, however, are perfectly unnecessary, and ought not to be attended to : For as soon as a surgeon is called to a patient with a portion of gut protruded, the most effectual service he can render him, is instantly to return the prolapsed parts into their natural situation, without allowing them to be longer exposed to such injuries as might probably arise from the delay occasioned by fomenting them ; and as we can handle any thing with more exactness with the fingers perfectly bare, than when they are covered with oiled or waxed gloves, these ought never to be employed ; but when any covering is found to be necessary, a piece of soft cotton cloth answers the purpose better than any other.

The patient being put into bed, and laid upon one side, or upon his face which answers better, with his buttocks elevated above the rest of his body, the surgeon should now press firmly, though equally, with the palm of his hand upon the under part of the protruded gut. By a continuance of this kind of pressure, the gut is in general easily reduced ; but when this fails, a proper application of the fingers of one hand, in order to press up the superior part of the gut, while the palm of the other is still supporting the inferior part of it, will at last be sure to effect it.—When, indeed, the prolapsed

prolapsed portion of gut has by negligence, or any other cause, become much inflamed and swelled, no attempts to reduce it will succeed till these are removed. In such circumstances therefore, before pressure is employed, it may be proper to discharge a quantity of blood in proportion to the strength of the patient, and the gut should be fomented with a weak solution of *Saccharum Saturni*, rendered moderately warm; and when, by these means, the swelling is nearly, or perhaps entirely dissipated, little or no obstruction will occur to the reduction of the parts by the means we have recommended.

It seldom happens, indeed, that much difficulty is experienced in the reduction of protruded portions of the rectum; but it is frequently no easy matter to retain them after they are reduced: For the sphincter muscle, by repeated descents of the gut, often becomes so debilitated as to have little or no power in retaining it; so that a protrusion is liable to occur, not only in going to stool, but, in many instances, on every attempt to walk, or to sit in an erect posture.

When the gut is found to fall so readily down, from the causes we have mentioned, much advantage is derived from the use of a proper bandage. After the protruded portion is replaced, if a thick compress of linen be applied directly upon the anus, a proper application of the T bandage over the whole is on some occasions found to prove very serviceable: But in Plate XIX, there is delineated a truss originally invented for this purpose by the late Mr. Gooch*, by which such parts may be more effectually retained than by any other bandage, while at the same time the patient is allowed to take exercise with more freedom than can possibly be enjoyed by any other means.

The

* Vid. Cases and Practical Remarks in Surgery, &c. Vol. II. by Benjamin Gooch.

The parts which protrude upon going to stool being immediately replaced, an operation which a patient is frequently capable of effecting himself, this truss ought to be directly applied; and with a view to strengthen the sphincter ani and neighbouring parts, the debility of which is often to be considered as the sole cause of the disorder, the patient ought to be directed to the use of steel, bark, the cold bath, and particularly of cold applied directly to the parts affected, by throwing cold water frequently upon the buttocks and on the under part of the back: Considerable advantages have been experienced, too, from a frequent use of astringent injections, particularly of infusions of galls or of oak bark; and when a small proportion of opium is added to the liquor, the irritability in the extremity of the rectum, which on many occasions we consider as the original cause of the disease, is thereby more effectually removed than by any other means. On some occasions, I have ventured to add a small quantity of allum, and in others of saccharum saturni, to these injections; but in general, any addition of a saline nature is here totally inadmissible, from the irritation which such remedies commonly give to the gut.

By one or other of these means, every complaint of this nature may be either entirely cured, or at least so far palliated as to prevent the patient from suffering any material inconvenience from its continuance.

C H A P. XIX.

OF AN IMPERFORATED ANUS.



ALTHOUGH an imperforated anus is not a frequent occurrence, yet as it is occasionally met with, and as it is of much importance to have such deficiencies soon discovered, every midwife ought to examine with attention the state of all the natural passages as soon as possible after delivery.

In some cases of this nature, the end of the rectum is found to be somewhat prominent at the usual situation of the anus, and to be only covered with skin and a small quantity of cellular membrane: But in others no vestige of the rectum can be perceived; and the skin retains its natural appearance, without being any where elevated betwixt the scrotum and the point of the coccyx.

In some of these, the rectum has been found to terminate within an inch of the ordinary seat of the anus; in others, it has reached no farther than the top of the sacrum. In some it has been known to terminate in the bladder; and in others, in the vagina.

When the assistance of an operator is required in such cases, as death is in all probability to be the consequence if a proper vent be not obtained for the fæces, no time should be lost in deliberation. If the end of the gut is found to be covered with skin merely, and if a protuberance is formed by the fæces pushing it forward, all that a surgeon has to do, is with a scalpel or lancet to make an opening sufficient for evacuating them; but when no direction of this kind is met with, the case comes to be
much

much more complicated, and more difficulty and danger are accordingly to be expected.

In such cases where the gut is found to lie deep, on the child being properly secured, an incision of an inch in length should be made directly on the spot where the anus ought to be; and this should be continued by gradual and repeated strokes of the scalpel, in the direction the rectum is usually known to take: Not in a direct course through the axis of the pelvis; for in that direction the vagina or bladder, or perhaps both, might be brought to suffer: But backwards along the coccyx, where there is no risk of wounding any part of importance. The best director, in every case of this kind, is the finger of the operator. The fore finger of one hand being pushed in towards the coccyx, the surgeon with the scalpel in the other, should dissect gradually in this direction, either till he meets with fæces, or till the scalpel has reached at least the full length of his finger; and if, after all, the fæces are not evacuated, as death must undoubtedly ensue if something farther be not attempted, a long trocar should be pushed forward upon the finger, in such a direction as the operator thinks will most probably meet with the gut.

In this manner many lives have been saved which would otherwise have been lost. I myself have had two such cases; in both of which the gut lay deep and in both I was fortunate enough to form an anus, which for a good many years has continued to answer the purpose sufficiently. But in each of these a great deal of difficulty was experienced in preserving the passage sufficiently wide and open: For as soon as the dossils of lint and other tents made use of for preserving the passage were withdrawn, such a contraction occurred as for a considerable time rendered the evacuation of the fæces extremely difficult.

Sponge

Sponge, tent, gentian root, and other substances, which, swell by moisture, were at different times employed; but these were uniformly found to produce so much pain and irritation as rendered their continuance altogether inadmissible: Applications of this kind are frequently, indeed, recommended in such cases; but any person who has ever used them in parts so exquisitely sensible as the rectum always is, will readily acknowledge the impropriety of the advice.

Dossils of soft lint moistened in oil, and rolls of bougie plaster of a proper size, were found to irritate less than any other application; and for the purpose of dilating the passage, when, at different times during the cure, it was found to have become too strait, the method we have already had occasion to mention, of compressing blood vessels in the rectum by introducing a sheep's gut, shut at one end, into it, and forcing water into it by the other, was also found to answer here. But, upon the whole, although this part of the cure may appear to those who have not met with such cases, to be a simple and easy matter, it is found to be much otherwise in practice. Indeed, no case I was ever concerned in afforded so much trouble and perplexity as was experienced from each of those I have mentioned; for although in both, the openings were at first made sufficiently large, yet nothing but a continued attention for the space of eight or ten months prevented the necessity of a frequent repetition of the operation. When the skin alone is to be cut, it is a very simple matter indeed; for in this case nothing in general is necessary but the introduction of a dossil of soft lint for a few days into the opening made by the scalpel. But when the rectum lies very deep, I am inclined to think, from the event of these cases alluded to, that although, ultimately, a complete cure may commonly be obtained after a free discharge of fæces is procured, that much nicety and attention on the part of the operator will always be required for a con-

siderable time after the operation; and in general we may suppose, that the difficulty will be in proportion to the depth of the cut.

Even where the gut is found to terminate in the bladder or in the vagina, the operation we have recommended should be undoubtedly practised: for, in the former case, as all the fæces must be emptied into the bladder, much risk must occur of such accumulations being formed as may put a total stop to the discharge by the urethra; and in the latter, where the rectum terminates in the vagina, much inconvenience and distress must be incurred; which, if the operation succeeds, may possibly be prevented. There cannot indeed be any certainty of the operation in question proving altogether effectual in obviating the inconveniences produced by the gut terminating in the bladder or vagina, as there must still be a probability of part of the fæces continuing to pass off by these outlets; but as a free passage procured in this manner, affords at least a tolerable chance of relief, no doubt ought to be entertained of putting it in practice.

When it unfortunately happens that no passage is obtained for the fæces by any of the means we have pointed out, might not we attempt an opening above the pubes, or perhaps on the right side so as to reach the caput coli, with a view of making an artificial anus in one or other of these places? It is true, the chance of success from such a measure would not be great; and, even allowing the attempt to succeed in the most complete manner, the discharge of fæces from such openings would always prove troublesome and uncomfortable; but the melancholy idea of leaving a child in such a situation, to die in much pain, must prove so highly distressing, both to the friends and the operator, as would at any time rather incline one to have recourse even to the doubtful and desperate remedy we have mentioned.

CHAPTER XX.

Of the Fistula in Ano.

EVERY sinuous ulcer in the neighbourhood of the rectum is termed a Fistula in Ano. This is the most accurate and most simple idea that can be given of the disease: for although, in different instances, it assumes a variety of appearances, and although the descriptions given of these have tended to render this part of chirurgical pathology exceedingly perplexed; yet whoever will attentively consider the different circumstances relating to it, will find, that the fistula in ano is of a nature as determined and fixed as any disorder which falls within the limits of Surgery.

Several varieties of this ulcer are described by authors: an external opening in the neighbourhood of the anus, communicating with an internal ulcer, but without any connection with the rectum, is termed an Incomplete Fistula: when the ulcer has two outlets, one external, and the other opening into the gut, the fistula is said to be complete; and again, when the sore communicates with the gut only, without any external opening, it is termed an Internal, or Occult Fistula.

This disease has been likewise distinguished into Simple and Compound. When the parts through which the sinus runs are hard and much tumefied, or when a communication is discovered between the ulcer and the bladder, vagina, os sacrum, and other contiguous parts, the fistula is said to be of a complicated or compound nature; and, on the contrary, it is termed a Simple Fistula, when there is one or more

sinuses connected merely with the internal ulcer, and when all the neighbouring parts are found.

In the commencement of the disorder, the contiguous parts are very commonly found; but whenever the ulcer has been of long duration, not only the parts about the anus, but even the perinæum and buttocks, frequently become diseased: an occurrence which may depend on different causes, but which seems most commonly to originate from the matter of the different abscesses or sinuses not finding a proper vent, and from its being allowed therefore to spread along the contiguous cellular substance. Thus, we sometimes find, that the perinæum and part of the nates have acquired a scirrhus degree of hardness, with various sinuses running in different parts of them; and when the matter has become sharp and acrid, instances now and then occur of the os sacrum becoming carious, and of the bladder and vagina being corroded so as to have the contents of the rectum emptied into them. This last stage of the disease is not, however, very frequently met with; and it would probably never occur, if all such cases were properly managed from the beginning, by a free discharge being given to the matter.

In enumerating the causes of the disease, it may be remarked, that whatever tends to effect the formation of matter about the anus, may have an influence in producing it. Thus, the piles, condylomatous tumors in the neighbourhood of the rectum, hardened fæces collecting in the extremity of the gut, and in short every cause that can have any effect in exciting irritation and inflammation of these parts, will occasionally terminate in suppuration: and if the matter thus produced be not absorbed, or if the sore formed by the bursting of the abscess, does not soon heal, the disease now under consideration must occur as a necessary consequence. Inflammatory tumors in these parts also frequently occur from fevers and other disorders of the constitution.

As the circulation is more languid here than in other parts, every inflammatory swelling which occurs in this situation is not only apt to terminate in suppuration, but the sores which are thus induced heal with difficulty; on all occasions they are productive of much distress, and require great caution and attention in the treatment. Practitioners have it much in their power, however, by proper management from the first appearance of inflammatory tumors about the anus, to prevent much of that pain and misery which such swellings, when neglected, are ultimately sure to induce.

As soon as a swelling of this kind has advanced so far as to render it probable that suppuration will ensue, we ought to employ every means to accelerate the formation of matter; and as nothing is more likely to be attended with this effect than a continued application of a proper degree of heat, warm emollient poultices, fomentations, and the steams of warm water, are to be particularly depended on. By these remedies being duly persisted in, every tumor of this nature will in general be quickly brought to suppurate; and as soon as matter is formed, it ought to be evacuated by a free incision in the most depending part of the tumor.

In the treatment of this stage of the disorder, much more depends upon the boil or abscess being properly and timely opened than is commonly imagined; for if this be long delayed, or if the opening be not made of a size sufficient for evacuating all the collected matter, it is thus allowed to insinuate itself into the contiguous cellular substance, so as to separate not only the skin, but all the under part of the rectum, from the muscles and other parts with which they ought to lie in contact: And in this manner, instead of a simple sore, or perhaps one sinus running to no great depth, which, when such abscesses are rightly treated, is all we ought to meet with, the whole under part of the gut is on some occasions entirely separated from the surround-

ing parts, and a variety of sinuses are found to run in different directions, either along the perinæum, or by the side of the gut, or perhaps among the muscles of the buttocks.

With a view, therefore, to prevent all the disagreeable consequences which commonly ensue from improper management in this state of the disorder, as soon as matter is found to be fully formed, it ought, as we have said, to be immediately evacuated by a large opening in the most depending part of the tumor; by which means, and by a proper subsequent treatment, if the constitution is otherwise healthy, almost every affection of this nature may be safely and quickly cured.

After the matter collected in abscesses has been discharged, it is not an uncommon practice to introduce dossils of lint and other substances, in order to prevent the lips of the sore, as it is said, from adhering too soon together. This, however, is a very erroneous practice: For these extraneous substances, by the irritation they give to the extremity of the rectum, almost always do mischief; and if the opening has been made of a sufficient size, there is no kind of necessity for such a precaution, as the constant stillicidium of matter from the sore, proves in general sufficient for preserving it of a size adequate to the quantity to be discharged, which is the principal object we have in view in the opening of such collections.

Instead of such irritating applications, therefore, as dossils introduced into a sore always prove, as soon as the matter of the abscess has been freely evacuated, the parts should be slightly covered with soft lint spread with any mild ointment, and an emollient poultice ought to be kept constantly applied over the whole.

Any hardness which did not disappear during the suppuration, will be thus effectually removed; and when no farther obstruction occurs to the healing of the sore, a complete cure will in general be quickly obtained.

It most frequently happens, however, that the assistance of surgery is not desired in this first and very simple state of the disorder; nor till the abscess has burst of itself, and perhaps at an improper part; and till of course a great deal of mischief is found to be produced, by the matter having insinuated itself into the surrounding cellular substance: when one or more sinuses are discovered, forming, according to their duration, different degrees or stages of the real fistula in ano.

When, in this state of the disorder, the advice of a practitioner is desired, the first object he should have in view, is to discover with accuracy the course of the different sinuses; for nothing can be done with much certainty for the relief of the patient till this is accomplished. When the sinuses discharge their contents by external openings, there is not commonly much difficulty in discovering the direction in which they run: If they run along the perinæum, or spread among the muscles of the hips, a probe introduced in the usual manner, will readily pass along in the course which they are found to take: But when one or more of the sinuses follow the direction of the gut, the fore finger of one hand, after being well oiled, should be introduced into the rectum at the same time that the probe is entered at the wound. By this means the gut is not only protected from being much injured with the probe, but if any communication occurs between the gut and the sinus, it is commonly in this manner very readily discovered, by the point of the probe passing out of the sinus, and being found by the finger in the rectum. On some occasions, however, even when we are certain that the sinus communicates with the gut, a good deal of difficulty is experienced in getting the probe to pass from the one to the other, but a due perseverance at last always effects it; and if the probe is managed with caution, it may always be done without any risk of injuring the gut.

As it is of much importance in the treatment of this disorder to know with certainty, whether a sinus communicates with the gut or not, nothing should be overlooked that may enable us to determine this point with precision. When air or fæces are discharged by a sinus near the anus, or when water or any other fluid injected through the external opening of the sinus, is returned by the anus, the existence of such a communication cannot be questioned.

The absence, however, of these tests, does not imply that no communication takes place between the gut and the sinus: for we know that the passage of fæces from the rectum into such sores, does not always happen; and we may easily suppose it possible for an opening between the sinus and the gut, to be so formed as to prevent entirely the passage of any liquid from the former into the latter.

When, by a repetition of cautious trials with the probe, or with injections of warm water into the sores, the course of the different sinuses is discovered, the method of cure is next to be determined. In a former work, the method of cure adapted to the treatment of sinuses in general has been pointed out: * but from the nature and situation of the parts in which this variety of the disease is seated, some peculiarities occur with regard to the management of it.

Astringent injections, pastes and ointments of the same nature, have at different times been recommended for the purpose of putting a stop to the discharge from these sinuses. But the caustic property of these remedies is by no means suited to the irritability of the parts in which the disease now under consideration always occurs; nor have they by experience been found to answer the intention for which they were proposed: they have now therefore very universally fallen into discredit.

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* Vide Treatise on the Theory and Management of Ulcers, Sect. V.

We have elsewhere shewn, that the leading object to be kept in view in the treatment of sinuses, is the destruction or annihilation of the cavities from whence the matter produced by them is discharged. For effecting this, different means have been advised.— Where pressure can be employed, the sides of sinuses are, in some instances, brought to adhere by a long continued application of this remedy alone. But in many situations, particularly in the fistula in ano, this method of cure is altogether inadmissible, as such a regular and equal compression cannot here be applied as is necessary for effecting a cure.

When pressure, therefore, is found to be inapplicable, practitioners have recourse to the production of inflammation upon the parts which they wish to adhere to each other: for no fact is better ascertained, than that adhesion very readily occurs between contiguous parts in a state of inflammation; insomuch that it appears to be a doubtful point, whether animal substances can be made to adhere by any other means than through the intervention of this cause.

For the purpose of exciting this inflammatory or adhesive state of a sinus, so necessary for the reunion of its sides, different means may be employed. It may be accomplished either by the introduction of a cord of cotton or of silk along the course of the sore, or by laying the sinus open through its whole length, so as to convert it as nearly as possible into the state of a recent wound.

In other parts of the body we have recommended the use of a cord, or of a seton as it is termed, in preference to every other method of cure; as by means of this remedy we have it in our power to excite almost any degree of inflammation we desire, without any of the disadvantages which now and then occur from the extensive cicatrix of a large wound. In the fistula in ano, however, the seton cannot with propriety be employed; for the irritation produced by it, would prove always too severe a stimulus for the extremity of
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the rectum, with which it would at all times be in immediate contact.

As in this situation, therefore, astringent or escharotic injections and pastes cannot be employed with safety; as pressure cannot be applied with advantage; and as cords of even the softest materials would produce a very unsupportable degree of irritation; we are under the necessity of employing the only other remedy by which a due degree of inflammation can be induced on the sides of the sinus, namely, a free and extensive incision along the whole course of the sore, commencing at one extremity of the sinus and terminating at the other.

Having thus ascertained the proper method of cure, we shall now proceed to describe the easiest and most effectual manner of putting it in practice.

The course of the different sinuses having been discovered by a previous search in the manner we have directed, as it is of importance to have the bowels, and particularly the rectum, emptied, a laxative should be administered on the day preceding the operation, and a glyster an hour or two before proceeding to it.

There are two postures, in either of which the patient may be placed with nearly equal advantage. He may be either allowed to stand upon his feet, with his back exposed to the light of a window, and with his head and upper part of the body bent forward, and leaning upon a chair, a table, or on a bed, a posture which exposes the parts affected sufficiently well; or he may be laid upon a table in the same manner as is done for the operation of lithotomy, with his legs bent and kept asunder by an assistant; but this being more formidable, and not answering the purpose much better, the other is commonly preferred.

The patient being firmly preserved in one or other of these positions, the surgeon, after dipping the fore finger of his left hand in oil, must introduce it as far as it will reach into the rectum; and with his right hand, he must now enter the point of the probe pointed

ed bistoury, at the external opening of the sinus ; and having carried it along the course of the fore till he feels the point of it, through the opening in the gut upon his finger in the anus, for we are supposing this to be a case attended with a communication between the sinus and the rectum, he is now to push the point of it out upon his finger ; by means of which, he not only protects the opposite side of the intestine very effectually, but, by thus directing the point of the instrument, he cuts with great steadiness, and the sinus is in this manner laid open with much ease from one extremity to the other. This being done, if there are any other external openings, the finger should be again introduced into the rectum, and every sore that is met with should be laid open in the manner we have now directed. The bistoury here recommended, is delineated in Vol. I. Plate VII.

It has been alleged, that every external opening met with in this disease communicates with a separate and distinct fore ; and some have gone so far as to say, that these again are commonly found to communicate by separate openings with the gut. This, however, is seldom if ever the case ; for it almost constantly happens, that all the external sinuses communicate with one common fore or abscess, and that this again has no communication with the rectum, but by a single aperture. In some instances, indeed, more than one opening is discovered between the gut and the cavity of the fore : But this is a rare occurrence ; and at any rate, the means to be employed are in both cases nearly the same : That is, whether the external or internal openings communicate with one or with more abscesses, they are all to be laid open from one extremity to the other.

In almost every instance, however, it is, as we have already remarked, when the principal sinus is laid open through its whole course, from the entrance of the knife, to the aperture in the rectum, the others are found to run no farther than into some part of the
fore,

fore, without communicating directly with the gut; so that their entire division is quickly and with much ease accomplished.

We have desired, in searching for the course of the different sinuses, that this part of the operation may be done with much exactness, so that it may be known with certainty, whether a communication actually occurs between the gut and the fores or not. The most material motive for this is, that, in making the incision, the knife may enter from the sinus into the gut at this very opening; which is not only proper from such openings being commonly found to lie at the most superior point of the sinus, but from its being necessary in making the cut to direct the knife, so that the aperture into the gut may form a part of the incision: For, if the passage between the gut and the sinus should not be divided, little or no advantage would probably be derived from the operation; for as the parts would not readily adhere at this point, the fæces getting access to the cellular substance behind the gut would be apt to give rise to a new collection of matter.

It frequently happens, however, as we have already remarked, that no direct communication can be discovered between the rectum and any of the sinuses which occur here; in which case the fistula is said to be incomplete: But, in the method of cure, the treatment is nearly the same as when such a communication takes place; only with this difference, that in the latter, the point of the bistoury passes into the gut at the aperture found in it; whereas in the former, an opening similar to this must be made in it at the superior part of the sinus, by pushing the point of the bistoury against the finger in the rectum with such a force as is found to be necessary for penetrating the gut; and this being done, the operation is to be finished in the manner we have already directed, by drawing the point of the instrument out at the anus, so as to divide the sinus through its whole length.

In the course of this operation, the sphincter ani will be always divided, when the fistula penetrates to any considerable height in the rectum: but this is not a matter of much importance; for although some degree of inability to retain the fæces frequently ensues for a few days after the operation, yet experience shows that the parts in general recover their tone very completely, insomuch that want of retention is scarcely ever mentioned as any of the inconveniences to which patients are exposed who have been cut in the manner we have recommended.

A variety of instruments have been proposed for effecting this operation; but none of these answer the purpose with so much ease and safety as the probe pointed bistoury. A razor with a probe point may be used in nearly the same manner; but as the bistoury is possessed of all the advantages attending the razor, and as it can be directed with more steadiness, it ought therefore to be preferred.

It has been objected to this mode of performing the operation, that, in the case of an incomplete fistula, the point of the bistoury, on being pushed through the gut, will be apt to hurt the finger in the rectum; and likewise, that this method can never take place where the sinus runs farther up the rectum than the finger is capable of reaching: And with a view to obviate these inconveniences, different instruments have been proposed, particularly a director and scalpel.

The director, which ought to be very large, being introduced into the rectum, the sinus or fistula is advised to be laid open through its whole length, by a scalpel being made to cut directly upon this instrument, after being entered at the external opening of the sore, and gradually passed as high as the sinus is found to reach. This, we must observe, however, is a practice that ought not to be imitated: for the hazard with which it must be attended, is evidently so great, as to give cause to suspect that it has seldom been attempted; and that it has been recommended merely

merely by such writers as have copied from one another, while few have ever employed it. The parts chiefly affected by the operation, lie so contiguous to organs which it would prove extremely dangerous to injure, particularly to the bladder, that we ought never on any account to attempt to lay sinuses in this situation open, unless the finger is previously introduced to serve as a director for the bistoury; and for the same reason the instrument ought never to be carried farther than the finger can easily reach. Fistulous sores do not commonly penetrate deeper here than the length of the fore finger: In some cases, however, it is otherwise; and they are found to pass to the very superior part of the os sacrum, or perhaps across the pelvis in a direction between the rectum and the bladder. In every such instance, however, all that can or ought to be done by an operator, is to lay the under part of the sore completely open, so as to procure as free and easy a discharge to the matter as possible; for any advantage to be derived from carrying the incision to a greater depth than the finger can reach, would seldom if ever compensate the hazard of the attempt: And in every case of this nature, where the sinuses are confined to the under part of the gut, no necessity whatever occurs for the assistance of a director; for whoever has attempted this operation in the manner we have advised, will find that the rectum is penetrated by the probe pointed bistoury with much ease, and that this may be done without any hazard of injuring the finger previously introduced into the gut.

It is alleged by some operators, that danger may occur from laying sinuses in this situation freely open with the scalpel: Troubleſome hæmorrhagies, they think, may happen, from cutting the hæmorrhoidal arteries and veins; and in order to prevent them, it has been proposed to open the sinuses by means of ligatures: By introducing one end of a piece of pliable silver or lead along the course of a sinus, pushing it into the rectum, and drawing it out at the anus, so

as to twist the two ends of it together, the contained parts are thus directed to be gradually compressed so as to produce an entire and safe division of them. But this is a much more painful, as well as a more tedious, method than that by the scalpel, and it is not in any respect necessary; for every practitioner of experience must acknowledge, that the risk in this operation of suffering from hemorrhagy is very trifling indeed, even after the scalpel has been used with much freedom. It is not probable, therefore, that the practice we have mentioned, will ever be generally employed.

The different sinuses which are met with having all been laid open with the scalpel, care must be taken to apply the necessary dressings; and upon this much of the success to be derived from the operation certainly depends. Some operators are so inattentive to this point, as to suppose every thing is done that is necessary, when the parts are merely divided; but this is so far from being the case, that we may venture to assert, no cure can ever be reasonably expected, if much attention be not given to the subsequent dressings of the sores.

The sores ought by no means, however, to be much crammed with any kind of dressings; and nothing should be employed that is not perfectly mild, and incapable of producing irritation. Dry lint is almost the only application which practitioners use, but it is ill suited for the purpose for which it is intended. One of the most troublesome and perplexing symptoms subsequent to this operation, is a diarrhoea, attended with a tenesmus, or a frequent desire to go to stool. In some instances, the division of the sinuses alone may produce this effect; but it very commonly happens, that any mischief of this nature may be traced as a consequence of the after management of the sores: for every application that is not of the very mildest nature, and especially when pushed with any degree of violence into the bottom of the wound, is
sure

sure to induce a very disagreeable and almost constant irritation in the extremity of the gut ; and as this irritation is almost always attended with a frequent discharge of fæces, which proves not only debilitating to the system in general, but has a considerable influence in interrupting the cure of the sores, it becomes highly necessary to avoid it.

For this purpose, instead of dry lint, I have long been in the practice of using either lint or soft old linen spread with any simple mild ointment ; which effectually prevents that distressing irritating sensation which dry applications to such sores are so very apt to induce. After the sores, therefore, have been cleared of any coagulated blood, a piece of soft lint, thinly covered with a simple liniment of wax and oil, should be gently insinuated between their edges ; but not to such a depth, or with such force, as to create any kind of uneasiness. This being done, and a compress of soft linen with a T bandage being applied over the whole, the patient should be carried to bed ; and the dressings being renewed, either after every stool, or when these are not frequent, once in the twenty four hours, the sores will in general fill up from the bottom, and will at last cicatrise in the same manner as wounds in any other part. Such sores, indeed, ought to be treated in every respect as similar affections in other parts of the body : for although, by writers in general, something mysterious or peculiar is supposed to exist in sores about the anus ; yet the fact is undoubted, that this is by no means the case : they are of a nature exactly similar to sores in other parts, and are to be cured at all times by the very same means. They ought to be lightly and easily dressed, in the manner we have directed. As soon as a suppuration takes place, or if in the mean time the dressings are disturbed by the passage of fæces, they ought to be renewed ; taking care to remove, with as little force as possible, any fæces that may happen to lodge within the lips of the wounds ; but by no means to use, with such freedom

dom as has been recommended, injections of detergent liquors, for the purpose, as is said, of cleansing the sores. Every application of this nature, so far as I have ever seen, does much harm. It irritates the parts to which it is applied; and this is commonly succeeded by some degree of inflammation. All remedies of this kind, therefore, should be carefully avoided.

We have already said, that, by persevering in the mild course of treatment here pointed out, a cure in general will at last be obtained. But in some instances it is otherwise; and instead of a good suppuration, with red fresh granulations, with which the wound in a healing state ought to be covered, the sore acquires a soft, flabby, unhealthy appearance, and the matter discharged from it, is thin, fetid, and perhaps mixed with blood. In such circumstances, if, on a minute examination of the sore, any part of a sinus is found to have been overlooked, and matter is found to lodge in it, a certain and almost immediate advantage may be expected from laying this freely open to the bottom. But it commonly happens, that such untoward appearances as those we have described, proceed from some morbid affection of the general system; and till this is perfectly eradicated, it will be vain to expect a cure of the sores. When, indeed, any general indisposition is previously suspected, it would be better to attempt the cure of it before performing any operation; but this we have not always in our power, as the first indication of any such affection is very commonly received from the appearance assumed by the sores several days after the sinuses have been laid open.

As soon as it is with certainty known, however, that any disorder exists, by which the cure will in all probability be retarded, all our endeavours should be employed for removing it. If the patient is found to labour under lues venerea, scurvy, or scrophula, the remedies adapted to these should be immediately prescribed; or if the constitution has suffered merely from debility, as the consequence either of a preceding

fever, or of a plentiful discharge of purulent matter from the sores, the natural tone of the system should be restored, by a nourishing diet, together with a proper use of some generous wine.

In a former publication upon *Ulcers*, we have endeavoured to inculcate the utility of issues in every species of sores; but in no variety of the disorder does this remedy act with more evident advantage than in the fistula in ano, especially when the discharge of matter has been of long duration. Different instances, indeed, have in the course of practice occurred to me, in which, without the assistance of issues, no advantage of importance could be obtained; and upon the whole, I am now so much convinced of their utility, that whenever the disease has been of long duration, I never advise the operation till a drain of this nature has been previously opened. In every case, therefore, of this kind, at the same time that any disorder under which the constitution may labour, is attended to, an issue, somewhat proportioned to the quantity of matter discharged by the sores, should be immediately employed. By this means, if the operation has been properly performed, and if the disorder has not previously affected any of the contiguous bones, there will be, in general, much reason to expect that a complete cure will be obtained.

We have hitherto been supposing, that the disease has not as yet advanced farther than to produce sinuses along the course of the rectum, and in its neighbourhood: We shall now proceed to consider it in its more advanced stages.

The first of these we shall take notice of, is that in which the parts lying contiguous to the sores have been separated, or detached from one another, by a mere effusion of matter into the cellular substance, by which in a state of health they are naturally connected together. This, to a certain degree, is the case in every sinus; but when the disorder now under consideration has been of long duration, the matter produced

duced by the fores, if it does not find a very free outlet, is in some instances known to spread so surprisngly among the contiguous parts, as to separate, not only all the skin and other teguments from the muscles underneath, but to detach all the under part of the rectum from the cellular substance with which in a state of health it is firmly connected.

This, it must be remarked, is not a common occurrence; but in some instances it is met with, and some variety has been proposed in the treatment best suited to its removal. Two modes of operating have been recommended in this state of the disorder; either to take away a considerable portion of the external teguments, so as to give a free vent to any matter that is collected; or, if this does not prove sufficient, to extirpate all the inferior part of the rectum that is found to be detached from the surrounding cellular substance and muscles.

These operations, however, are both productive of a great deal of temporary pain, and of much subsequent distress; and as all the advantages attending them may be attained from a much more simple method of cure, they ought undoubtedly to be laid entirely aside. To take away any considerable portion of the teguments about the anus, must always be considered as formidable: but to extirpate the extremity of the rectum, must in all probability be the cause of more pain and misery than could ever be induced by the disorder intended to be removed by it; for, besides the difficulty and pain that would be constantly experienced in the passing of hard fæces, it would be almost impossible for a patient in such circumstances to retain stools of a more liquid kind.

There is fortunately, however, no good cause why any person should be ever forced into such a disagreeable situation; for a simple division of the gut, in one, or at most in two different parts, will always accomplish a cure with more certainty than any other means with which we are acquainted. In such circumstances,

therefore, all that ought to be done is, to lay the detached portion of gut open from one extremity to the other, in the manner we have already directed in cases of more simple affections; and if this is not found to be fully sufficient for allowing the gut to apply with perfect equality to the contiguous parts, another incision should likewise be made on the opposite side of the rectum; by which means all that portion of it which was separated from the surrounding muscles will now be equally applied to them; no portion of it will be in any degree puckered or improperly elevated; and if the neighbouring bones and other parts are all sound, and if the constitution be not otherwise diseased, a complete cure will in all probability be obtained by an adhesion again taking place between the gut and parts lying behind it.

Upon similar principles too, when the matter, instead of having separated the gut from the surrounding parts, is found to have insinuated itself, either between the skin and muscles of the perinæum, or of the hips, which in some instances it does, the sacculus or bag produced by it, should be freely laid open from one extremity to the other; and if one incision is not found sufficient, another should be made immediately; care being taken to follow out the direction of the abscess or collection of matter in such a manner, as will most readily bring the parts which have been separated into close contact with those lying underneath.

We have already recommended light easy dressings in the operation proposed for the first stages of the disorder; and we may here remark, that they are equally proper after the operation we have now been pointing out: Nothing should be inserted between the teguments and the subjacent parts; all that is necessary, being to cover the sore, with pledgits of soft lint spread with any emollient ointment.

Hitherto we have been supposing, that the fistula or sinus discharges its contents by one or more external openings in the neighbourhood of the anus: in some instances,

instances, however, this mark of distinction is not met with; and the matter, instead of being evacuated in the usual manner, is first emptied into the gut, and is afterwards discharged either by itself, or mixed with fæces on the patient's going to stool. This, as we have said, forms what has been termed an Occult Fistula, or, according to French authors, *une Fistule Borgne*.

As the most certain characteristic of this disorder, namely, an external opening discharging matter, is totally wanting in this variety of it, some attention is commonly requisite, in order to ascertain its existence, as well as to prevent other diseases from being confounded with it. Thus matter discharged from abscesses in the superior part of the bowels, has, in some instances, been supposed to proceed from an occult fistula in the neighbourhood of the anus; and vice versa, pus collected in and discharged from an imposthume near to the anus, has, merely from want of attention, been supposed to originate from some affection of the upper part of the guts; and upon this supposition, remedies have been prescribed without any effect, when a complete cure might have been obtained by very simple means.

The distinction, however, between these affections, in general is sufficiently evident. When matter collected in the superior part of the alimentary canal, is at last discharged by stool, it is commonly thoroughly mixed with, and seems to constitute a part of, the fæces, and no pain or swelling is observed in the parts contiguous to the anus. But, in the case of an occult fistula, the matter discharged by stool is not mixed with the fæces; on the contrary, when examined, they are found to be perfectly distinct and separate: and, on a minute investigation, some degree of hardness, swelling, or discolouration, is always discovered in the vicinity of the fundament; and on this spot, a considerable degree of pain is uniformly complained of, on much pressure being applied to it. By attending to

these means of distinction, little or no difficulty upon this point can ever occur.

In cases of occult fistula, a variety of means have been proposed for discovering the abscess in which the matter is collected. By some, it is said that a curved probe may be passed up the anus; and by searching with the point of it, that the opening into the rectum may in this manner be discovered, and, by pushing it forward, that it must for certain pass into the abscess:* And others, again, advise a thick firm tent to be pushed into the rectum, so as to obstruct every means of communication between the sinus and gut; and by this means, they suppose, that the matter of the abscess may be made to collect in such quantities as evidently to point out its situation. Neither of these methods, however, is in any degree necessary, nor is it probable that they would often succeed.

Whenever an abscess is seated near to the verge of the anus, a very little attention will discover the part chiefly affected: For, even although the matter be not allowed to collect, from the frequent pressure on going to stool forcing it always out by the orifice in the gut, yet still some degree of hardness, a small tumefaction, and most frequently some discolouration, is observed at some part contiguous to the extremity of the rectum; and whenever this mark is discovered, and especially if the patient complains of pain on pressure, no doubt can occur of this being the seat of the abscess.

In such circumstances, what are we to do? We ought here to have the same object in view, as if the matter had been discharged by an external opening: For the disease is in reality the same; and differs only in this single circumstance from the most frequent species of fistula, that the matter is in this case first thrown into the rectum, before it can be evacuated, instead of coming freely off by one or more external outlets near

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* Vide Dionis—*Course of Operations*, Demonstr. IV.

to the anus. And as the two varieties of the disease are very nearly the same, so the means necessary for their removal are very similar.

As soon as the operation is determined upon, the point of a lancet or of a scalpel, should be plunged into that spot, where, from there being some degree of tumefaction, discolouration, or pain, we have reason to suspect that matter is lodged; and upon the point of the instrument reaching the abscess, which will be always known by a partial discharge of pus taking place, as the disease is now reduced to the state of a simple, complete fistula, the operation is to be finished in the same manner as we have directed for that variety of the disorder, by the introduction of the finger of the left hand into the anus, passing the probe pointed bistoury in at the wound newly made, and, on its point being discovered by the finger in the rectum, drawing it out in such a manner as to divide the abscess or sinus through its whole length. The subsequent treatment of the fore ought to be the same here as in other cases of fistula.

All that has been as yet said, relates to the mildest and most simple stages of the disorder, whilst the parts chiefly affected are supposed to be in no other respect diseased, than by having an abscess seated in them, either occult, or with one or more external sinuses running into it. But when by neglect, or improper treatment, the matter collected in such abscesses does not find a free vent, the parts most contiguous to it inflame, become painful, and in a gradual manner acquire such a morbid hardness or callosity, as is productive of much inconvenience and distress.

In such circumstances, various remedies have been recommended. It has been proposed, as a previous step to any operation, to dissolve this hardness of the parts affected, by means of mercury exhibited internally; by the application of mercurial and other plasters of a discutient nature; and lastly, by suppurative or emollient poultices. Caustic preparations, with a

view to corrode or destroy the hardened parts, have also been recommended; but the opinion that has till of late most generally prevailed, is, that in all such cases, the parts that have become very firm and hard, ought to be altogether extirpated with the scalpel.

But whoever has had opportunities of becoming acquainted with this part of practice, will know, that it is perfectly impracticable to dissolve or dissipate any callosity that has been of long duration, either by poultices, by mercurials, or any other discutients; and it very fortunately happens, that a cure of the disorder may in general be obtained with tolerable certainty, by means of a more gentle nature, than the destruction of the parts affected, whether by caustic or extirpation: When the parts cannot be preserved but at the hazard of the patient's life, they ought undoubtedly to be removed; but as necessity only ought to point out the propriety of such a violent remedy, it should never be employed when our views can be accomplished in a milder manner.

We have endeavoured to show, and indeed the fact is self evident to all who will be at the trouble of observing, that the hardness of parts which occurs towards the latter stages of this disorder, proceeds uniformly from the matter of the abscesses or sores not finding a free vent, and from its being thereby forced to disperse among the contiguous muscles, by which pain, inflammation, and hardness, are successively and necessarily produced.

If this is a true state of the matter, and we believe all who pay due attention to the subject will find it to be so, there can be no necessity for the use of such violent remedies as those we have mentioned, namely, the removal of the diseased parts either by caustic or the scalpel: The means of relief which naturally occur here, are merely such as will afford a free outlet to the collected matter, at the same time that they tend to prevent every such collection in future, whilst they also serve to induce and preserve a suppuration in the
 substance

substance of the parts chiefly affected, and which we are inclined to consider as the most effectual method hitherto discovered for the removal of all such morbid callosities.

Through the whole of this chapter, I have avoided the use of the word Scirrhoty; and I am here particularly anxious to have it remarked, that I have done so: for in a real scirrhous, the remedy now recommended, namely, the excitement of suppuration in the substance of the diseased parts, would in all probability prove very pernicious, by forcing quickly forward to a real cancerous state, a tumor, which, if left to itself, might possibly have remained indolent for a considerable length of time. But both here and elsewhere, when treating of such affections, we would wish to excite the attention of practitioners to an accurate diagnosis of the subject; for negligence or ignorance on this point, is sure to be succeeded by perplexity and maltreatment in the method of cure. Every hard tumor of the soft parts which from experience is known to be apt to degenerate into cancer, I would denominate Scirrhous; and I am clear that the term ought to be confined solely to this species of tumor. Now we know well, that cancers very rarely attack tumors that are not glandular: so that to every indurated swelling of the cellular substance and other soft parts not evidently glandular, a different appellation may with great propriety be given; and to all these, the term Callous, I think, is very properly applied. Such hard tumefactions, therefore, as occur in cases of this nature in the vicinity of the anus, as they are in general seated entirely in the cellular substance, and as they probably never, while they are confined to this substance, degenerate into cancer, I have termed Callosities; and, so far as my experience goes, nothing tends so effectually to dissipate such indurations, as to induce a free and plentiful suppuration in their substance. It fortunately happens, too, that the very remedy which with most certainty answers this important indication,

proves

proves in the disorder we are now considering perfectly sufficient for every other purpose. The means alluded to, are, incisions along the course of every sinus that can be discovered; and, when these are not numerous, in proportion to the extent of callosity which occurs, it even proves serviceable to make one, two, or more deep incisions along the whole extent of the induration. For, as we have already remarked, nothing tends so effectually to dissipate swellings of this nature, as a free suppuration being kept up in their substance; and no means whatever promotes this with so much certainty, as such incisions as we have here recommended. By carrying them to the full depth of the indurations, such a plentiful suppuration ensues to the inflammation which first occurs, as has commonly a very powerful influence in removing them.

Indeed no person can well conceive the great utility which frequently results from this practice, but such as have experienced the advantages to be derived from it: In different instances, I have known complete cures effected by it, where extirpation of the diseased parts had been previously considered as absolutely necessary. In long continued affections, however, of this nature, and where the parts have become very considerably thickened, the remedy must be persisted in for a great length of time; that is, a plentiful discharge of pus must be long preserved, either in the incisions first made, or, if these heal too quickly, in others that have been made to succeed them.

In some instances, these incisions are not easily induced to suppurate; their edges inflame, become painful, and discharge a thin fetid matter.—When this is found to proceed from a venereal affection, or any other diseased state of the constitution; this general disorder, of whatever nature it may be, must be first removed, before any beneficial alteration can be induced on the incisions. But when the system is otherwise healthy, and when there is therefore reason to imagine that the untoward state of the sores proceeds

ceeds merely from irritation or some other local affection; in such circumstances the greatest advantages may be derived from the use of warm poultices: By their emollient properties, they tend to remove irritation more effectually than any other remedy; and we have elsewhere shown, that they operate with more effect than any other means in promoting a laudable suppuration.

In every case of fistula, therefore, attended with much hardness and tumefaction of the contiguous parts, instead of removing such parts as are diseased either with caustic or the scalpel, the practice we would advise is this.—The sinus or fistula should be treated in the very same manner as if no hardness existed; that is, it should be laid freely open from one extremity to the other: if more sinuses are discovered, these should also be laid open; and if the hardness in the contiguous parts extends either laterally or in any other direction far beyond the course of the sinuses, one or more deep incisions should be made along the whole length of it: and by preserving a suppuration in these incisions till the hardness is mostly dissolved, they may then be allowed to heal from the bottom in the same manner with wounds or ulcers induced by any other cause.

By this management alone, when the constitution is otherwise healthy, the very worst species of fistula may be brought to heal much more readily, and with much more comfort to the patient, than by the extirpation of the hardened parts.—Indeed scarcely any case, we think, can occur, of this disorder being in such a state as to require the removal of such parts, unless when it accidentally happens, that, together with much tumefaction and callosity, the parts which are diseased have been long and almost entirely separated from the subjacent muscles, with which, in a healthy state, they ought to be connected. This, however, is an occurrence which never happens but from very gross mismanagement: but when it is met with, and when the hardened

hardened parts are so much detached from the others, as to render it probable they would not again be easily brought to adhere, necessity, in such circumstances, points out the propriety of extirpating them; and in cases of external ulceration in these parts, when the edges of the sores have become hard and reversed, the cure may be promoted by removing such portions of them as are more particularly diseased; but in no other instance ought this practice to be attempted; for all the advantages said to be derived from it, may be obtained with much more ease and safety, from the means of cure we have here pointed out.

The only other symptoms connected with this disorder, which we have not yet adverted to, are such as proceed from affections of deep seated parts; namely, such as originate from diseases of the coccyx, of the sacrum, of the bladder, &c.

It sometimes happens, indeed, that the matter collected in fistulous sores about the anus, by being allowed to spread among the neighbouring parts, comes at last even to affect the bones themselves; but instances likewise occur of such affections of the bones being the primary disorder, and of their giving rise to, instead of being produced by, the sinuses about the rectum. Thus, collections of matter on the psoæ muscles, originating, in some instances, from a caries of the lumbar vertebræ, instead of falling down and pointing, as they most frequently do in the upper and fore part of the thigh, are now and then found to follow the course of the intestines, and to discharge their contents in the vicinity of the anus. A severe bruise upon the hips, too, by inducing a fracture and a subsequent caries of the os coccyx, has, in some instances, produced the same effect.

But the most distressing circumstance ever known to accompany this disorder, is the formation of a passage between the rectum and bladder. This, indeed, occurs in some instances independently of any previous sinus or abscess about the anus; but it is more frequently

quently induced by ulcerations in these parts, and by these being improperly treated, than by any other cause. The symptoms by which the existence of this dreadful occurrence is most certainly known, are, in the first place, an unusual dark brown thick sediment being observed in the urine, which by degrees becomes of a darker colour, and of a more offensive fæcal smell; and in the latter stages of the disorder, it very commonly happens that obstructions occur to the passage of the urine, and air is frequently discharged in considerable quantities by the urethra both before and after voiding urine.

By the presence of these symptoms, the nature of the disorder is rendered sufficiently evident; but hitherto we have not been so fortunate as to discover any means of removing it. So that whoever have yet been attacked with it, have always fallen victims to its influence, after dragging on twelve or eighteen months, or perhaps two years when the constitution has been good, of a very miserable existence.

In the event of any of the bones of the coccyx, of the sacrum, or lumbar vertebræ becoming carious, from the matter in this disease having been allowed to penetrate and to corrode them, all that art can do, is to preserve a free vent to any matter that may happen to form; to keep the parts clean; to extract any pieces of loose bone that may be discovered; and to strengthen the constitution by a proper nourishing regimen, with a view to enable it to support the long continued discharge to which in all probability it will be liable. Some few have in such circumstances, and with such a plan of management, been fortunate enough to obtain cures, by such pieces of bone as were spoiled being at last thrown off, and by the parts being then induced to heal. This, however, it must be confessed, is a very uncommon occurrence; and all that, in this situation, is in general to be expected, is a mere palliation of such symptoms as prove most distressing.

We have thus concluded what was proposed to be said upon the fistula in ano; and as it is a very distressing as well as a very frequent disorder, and especially as it is one of those subjects which till of late has never been distinctly or accurately treated of,* I have for these reasons entered more minutely into the consideration of it than might otherwise have been necessary. What I have all along endeavoured to show, and what I still wish to excite the attention of the younger part of the profession to, is, that a sinus or fistula is a disease of the very same nature when seated in the neighbourhood of the anus, as in any other part of the body; and therefore that the method of cure ought to proceed upon the same principles here as in similar affections of other parts. Till the late improvements made in the treatment of this disorder, and till the true nature of it was understood, much confusion subsisted in the ideas entertained of it. Except in the most trifling cases of superficial sinuses, it was never imagined that a simple incision could accomplish a cure: nothing less than a total destruction or removal of the diseased parts was supposed to be sufficient for this purpose.

But it will now, we hope, appear evident, that this is very rarely necessary; and when a cure is practicable, that it will be more readily effected by the means we have recommended, namely, by a mere division of the sinuses, than by any other as yet proposed. It will sometimes happen, indeed, that, in cases of a very inveterate nature, no means with which we are acquainted will accomplish a cure; but, in such instances, no advantage would be derived from the more violent remedies we have mentioned, and a great deal of distress would in all probability be induced by them.

* Mr. Pott, in his excellent Essay upon this disease, was the first who treated it with any degree of accuracy.

CHAPTER XXI.

Of the Paracentesis of the Abdomen.

IT is the effect of different diseases to produce collections of fluids in the cavity of the abdomen; the removal of which is obtained by an operation termed Paracentesis or Tapping.

There is naturally secreted into the cavity of the peritonæum, a serous exhalation, for the purpose of lubricating the surface of the intestines. A variety of causes may concur to produce a morbid increase of this secretion; and whenever the quantity of fluid collected in the abdomen is considerable, it constitutes a disease termed Ascites.

This species of dropsy often occurs as a symptom of a general affection, being frequently combined with anasarca; but on many occasions it is perfectly local, and is evidently induced by compression of the lymphatics, by scirrhus swellings of some of the viscera, and particularly by enlargements of the liver.

The presence of a fluid in the cavity of the abdomen, is known by the swelling which it produces; by a sense of tightness in the parts affected; by the breathing being difficult and laborious, especially when in a horizontal posture: and by a sense of fluctuation being communicated to the fingers placed in one side of the abdomen, when the swelling is forcibly struck on the opposite side. A concurrence of these circumstances will always, to a discerning practitioner, point out the real nature of the disorder; but a farther confirmation is obtained of it when the patient complains of

of much thirst, a dry skin, scarcity of urine, and other symptoms of dropsy.

When the swelling is found to extend equally over the abdomen, the water is commonly diffused among the different viscera, and is contained within the peritonæum only. It sometimes happens, however, that the fluid is collected in different cysts, or perhaps in one or other of the ovaria; in which case, the tumor produced by it is not commonly so equal, nor is the fluctuation altogether so distinctly perceived, as when the water flows freely through the whole cavity. This circumstance of fluctuation depends also on the consistence of the collected fluid; for, on some occasions, the contents of such tumors are found to be thick and gelatinous, whilst most frequently they are thin and perfectly serous. In some instances, too, an innumerable quantity of small hydatides are found swimming in the water of ascitical swellings.

Whatever may be the influence of diuretics and other evacuants in the cure of general hydropic affections, they are very rarely, as we have elsewhere observed, found to prove serviceable in local disorders of this kind. The principal object, therefore, of practitioners ought here to be, to evacuate the water collected in the abdomen, by a chirurgical operation, as soon as its existence is freely ascertained; while the most effectual remedies should in the mean time be employed for preventing a recurrence of the swelling, by endeavouring to remove the cause which produced it. In many instances, this is indeed impracticable: But, in some cases, cures are effected; and they would probably be more frequently obtained, if the fluid collected in the belly was more early discharged. But in general it is delayed till it is too late to have any effect; for the bowels must surely suffer irreparable injury by being so long soaked in water, as is usually the case in ascites, before the operation is undertaken. This, too, is the more surprizing, as the operation of tapping is in itself exceedingly simple. It is produc-

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tive of little pain; and any danger attending it, does not proceed so much from the nature of the operation, as from the constitution being, in general, much debilitated by the long continuance of the disease before it is performed; which renders it liable to consequences which otherwise would not occur, and which frequently terminate fatally. I am so perfectly convinced of this, indeed, that I have commonly been in the practice of drawing off these collections as soon as a fluctuation can be distinctly perceived; and I have never been sensible of any detriment occurring from it.

In large collections of any kind of fluid, and wherever they are situated, but particularly in such as occur in the abdomen where a great number of large blood vessels are surrounded by them, it is found to be extremely hazardous to discharge their contents suddenly; owing, as we suppose, to the immediate influence produced upon the circulating system, by a considerable part of it being too quickly deprived of a support which it has been long accustomed to receive.

But whatever may be the immediate cause of the symptoms which ensue from sudden evacuations of this kind, the effect is always certain. Syncope is a common occurrence; but in many instances death itself has been induced by it. This, in former times, rendered tapping a hazardous operation; and when the collection was large, in order to avoid those inconveniences which always occurred from drawing the water off at once, it was done at different times, a day or two being commonly allowed to intervene between one operation and another.

This, however, proved very inconvenient and distressing; and by the frequent introduction of the trocar which thus became necessary, mortification of the wounds, and other troublesome consequences, were frequently induced.

The late Dr. Mead, reflecting on the probable cause of those symptoms which occur from the sudden discharge of large collections of water, was induc-

ed to try the effect of pressure upon the parts affected, as a substitute for the support of which they are deprived by the evacuation: And the success attending the practice, has fully justified the ideas entertained of it; for, when pressure is properly applied, almost any quantity of water the abdomen can contain, may with safety be drawn off. It ought, however, to be applied, with as much equality as possible, over the whole belly; and it should be continued without interruption, for the space of several days at least.

Various means have been proposed for applying an equal degree of pressure in this operation; but none of these answers the purpose so easily, and with so much effect, as a bandage invented by the late Dr. Monro, represented in Plate XXII. Two different sizes of this bandage should be always in readiness; and they should be made so large as to cover the whole abdomen, and to press with equality upon every part of it.

It is not unnecessary to recapitulate the means used in former times, for evacuating the water in dropsies: For they are now very universally, and with much propriety, laid aside; and the trocar only is at present employed for this purpose. This instrument, till of late, was always of a round form with a triangular point. As this form, however, is evidently ill calculated for an easy entrance of the instrument, an object of great importance in every operation of this kind, I was led a good many years ago to the use of a flat trocar with a lancet point.* This has always answered the purpose with much ease; but some improvements have been proposed upon it, by which the entrance of the instrument is still more easily accomplished.—In the first volume of this Work, Plate X. I have already delineated a very neat invention of this kind, by Mr. Andrée.—It has been objected, however, to this instrument, and I believe with good reason, that the canula, by consisting of two sides
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* See Treatise on the Theory and Management of Ulcers, &c.

which fall together with some force on the filette being withdrawn, may thus lay hold of a portion of intestine; and if it should ever do so, a great deal of distress might ensue from it. I have now, however, in Plate XXI. the satisfaction of exhibiting an improvement upon the trocar, to which no such objection can apply: It enters with the same ease as a lancet; and the two sides of the canula, by not falling close together, can never injure the intestines.

In performing the operation, it has been said, that the opening may be made with almost equal propriety in any part of the inferior boundaries of the abdomen. This, however, is by no means the case: for, in the centre of the abdomen, immediately below the umbilicus, and in the course of the recti muscles, it might probably fall upon the epigastric artery; and, if carried near to either of the ossa ilia, the intestines would more readily be injured than if made nearer to the umbilicus. The most approved part for the perforation seems to be, at a point lying at nearly an equal distance between the umbilicus and the centre of the spine of the ilium. No large blood vessels can be wounded here.—The abdominal parietes are not in this part altogether tendinous; but are somewhat fleshy, so that they more readily heal when wounded.—None of the intestines can in this situation run any risk of being wounded; and when the patient is laid on a horizontal posture, in which he ought always to be during the whole course of the operation, the point above mentioned will be found to be more depending than perhaps any other.

The operation being determined upon, the method of performing it is as follows. The point we have mentioned as the most proper for perforating ought to be marked with ink; and in applying the bandage, Plate XXII. one of the openings in it ought to be placed exactly opposite to this mark. The bandage being accordingly applied in this manner, and the straps being put through the buckles and drawn a little

tle tight, the patient should now be laid in a horizontal posture, with the side in which the perforation is to be made lying over the side of the bed. The surgeon is now to take the trocar in his right hand; and fixing the head of the stilette in the palm of it immediately below his thumb, while his fore finger directs the point of the instrument, he is now to push it forward till he is satisfied that the extremity of the canula is fairly through the muscles, and lodged in the cavity of the abdomen; which he may be certain is the case, as soon as he finds no farther resistance to the stilette.— The stilette is now to be withdrawn, and the water allowed to flow as long as any of it can be drawn off, care being taken to pull the straps of the bandage gradually straiter as the water is discharged; or, if the patient, notwithstanding this precaution, should happen to turn faintish, it may be proper to put a total stop to the evacuation for a few minutes every now and then, which is easily done by the surgeon from time to time placing his finger upon the mouth of the canula.

It sometimes happens in the course of the operation, that the discharge stops before the swelling is much diminished: When this is owing to a portion of omentum or of intestine stopping up the extremity of the canula, the discharge is easily renewed by inserting a blunt probe into the canula, so as to push back whatever may have plugged it up; or when the serum is found to be thick and gelatinous, in order to effect a complete evacuation, it may sometimes be necessary to introduce a trocar of a larger size than the one first employed. But when it proceeds, as it sometimes does, from the water being collected in particular cysts, no attempt of this kind will have any effect; and, in such circumstances, the canula must be withdrawn, and the wound being covered in the ordinary way with a pledgit of any simple ointment, the operation may be renewed either immediately or on the following day, on the opposite side of the abdomen;

men ; or, if the swelling should happen to be confined to any other part of the belly, the perforation must be made in the most depending part of it, wherever that may be.

Dropfical swellings of the ovaria exhibit nearly the same appearances with encysted dropfies of any other nature : only, in collections of this kind in the ovaria, the fluctuation of a fluid is not commonly very distinct ; and unless they are complicated with ascites, the swelling is commonly fixed on one side of the abdomen.

The propriety of drawing off the water by a perforation is here, however, equally obvious as in any other species of the disease.

The water being all drawn off, and the wounds being dressed in the manner above directed, the bandage, as we have said, must still be continued of a sufficient tightness, for preventing any uneasiness from the evacuation of the water ; and we even suppose, that the support which the bandage affords to the weakened parts may have some effect in preventing a return of the disorder : but when, notwithstanding of this, and of such internal remedies as are employed, the water is again found to collect, the operation should be repeated whenever the swelling has acquired any considerable size.

The disease we have just described is by much the most frequent species of swelling to which the abdomen is liable ; but in some instances swellings of this cavity are of a different nature, and, instead of water, are found to contain air, constituting a disease termed Tympanites.

The effect produced by this species of swelling upon the breathing, is nearly the same as what occurs from watery collections ; but the swelling itself is much more tense than the other, and affords to the touch and pressure nearly the same sensation as is received from a bladder filled with air.

In many cases of tympanites, the air after death has

been found collected in the intestines ; which, in some instances, have been inflated to a most enormous size. This we suppose to proceed from the intestines losing their tone. But there is another variety of the disease, in which the air is diffused in the cavity of the peritonæum, in a similar manner to water in cases of ascites. I have seen one instance of this, and I have heard of another which happened lately in this place ; but in both of these the air was found to have escaped from the intestines by a very small hole which was discovered in one of them. I am therefore inclined to believe, that this species of the disorder very rarely proceeds from any other cause, than from a communication of this kind between the intestines and cavity of the peritonæum ; and if it is so, no remedy will ever be able to effect a cure. But from whatever cause the disease may have originated, and whether the air should be contained within the bowels themselves, or diffused in the cavity of the peritonæum, no doubt should be entertained of the propriety of discharging it, as soon as it is found to be productive of much distress : and it may be easily done in the very manner we have directed for ascites ; taking care to use a trocar of the smallest size, and to employ pressure in the same guarded manner as when the tumor is formed by water. For as the air will produce nearly the same effects by pressure upon the neighbouring parts as water, it is equally necessary to employ such a degree of compression after it is evacuated as will obviate the effects of abstracting it. Making a perforation into the abdomen for air collected in the intestines, is no doubt a very formidable operation, and ought not to be attempted but in cases of real necessity ; but as death has often ensued from this variety of the disease, and of which I have met with different instances, I am clearly of opinion, when all the usual remedies prescribed by the physician for removing it have failed, that the assistance of surgery should always be desired, rather than to allow such patients as labour under it

to die in certain misery. The same remedy has frequently been employed with safety and advantage for the evacuation of air collected in the stomach and bowels of other animals; so that there is reason to imagine that it would be attended with similar effects in the human species.

After the operation of tapping, whether in cases of ascites or collections of air, we are commonly advised to rub the abdomen frequently with astringent spirituous applications. This can never do harm; and as it may sometimes serve to restore the tone of the integuments, and as the friction employed in it may possibly have some effect in promoting absorption, it ought never to be omitted. For the first two days after the operation, it cannot be employed, as during that period it would be very improper to remove the bandage; but this being elapsed, the bandage may be removed daily for about a quarter of an hour at once, for the purpose of applying camphorated spirit of wine with strong frictions over the abdomen; care being taken to preserve the body during the time of it in a horizontal posture, and to renew the application of the bandage as soon as it is over.

CHAPTER XXII.

Of the Paracentesis of the Thorax.



SECTION I.

General Remarks on this Operation.

THE operation of the paracentesis or tapping of the thorax, is necessarily indicated, when the action either of the heart or of the lungs is impeded by fluids collected in the cavity of the chest. A free uninterrupted motion of these organs, we know to be highly requisite for the support of life; so that all the power of art should be employed to remove whatever may occur to obstruct it; and when the collection of a fluid is found to be the cause, little dependence can be placed on any remedy, but an immediate discharge of it by a perforation.

This operation has in general been considered as applicable to the evacuation of water or of pus only; and chiefly of the latter in the disorder termed Empyema. But after much attention to the subject, and having had several opportunities of practice in cases of this kind, I am clearly of opinion, that a perforation is equally proper for the discharge of any other fluid, as for collections of water or of purulent matter.

The symptoms induced by collections of different fluids, may vary in some points according to the nature

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ture of the disease, or of the accident giving rise to their formation. But it is their effect on the motion of the heart and of the lungs, to which practitioners ought chiefly to attend; and this will always depend in a great measure on the quantity of fluid that is collected, independently of every other circumstance.

The different kinds of fluids met with in the thorax, and requiring to be evacuated by a perforation, are, serum, blood, pus, and air. Of these we shall treat in separate sections.

SECTION II.

Of Serum collected in the Thorax.

COLLECTIONS of water or of serum are found to form in every cavity of the body, and not unfrequently in one or both divisions of the chest. Water in the chest is frequently combined with dropsy in other parts: but many instances occur, where it is merely a local affection; and it is in these chiefly, that any advantage is to be expected from a surgical operation.

Independent of general effusions of serum into the two large cavities of the thorax, dropical collections are also met with in the pericardium, and they may likewise be confined to the mediastinum immediately below the sternum.

Various symptoms accompany watery collections in the thorax; but it requires much attention to ascertain their existence, and especially their particular situation, with such precision as is necessary to warrant an operation of such importance as the paracentesis of the chest.

A patient complaining of a sense of weight or oppression in the thorax; of difficult respiration; of a more uneasy sensation in one side of the chest than in the other; of inability to lie on the sound side; of
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being liable to sudden startings during sleep, from a fear of immediate suffocation; and if, along with these, he is teased with a frequent cough; if the pulse is found to be small and irregular; and especially if a dry skin; a scarcity of urine, and other symptoms of dropsy occur, little doubt can remain of water being collected in some part of the chest. A sense of undulation, as of water passing from one part of the breast to another, is sometimes observed by the patient on rising suddenly from a horizontal posture; and this, we may remark, serves not only to assist in ascertaining the real nature of the disease, but to determine in what particular part of the chest the water is collected. Much attention, therefore, should be given to this circumstance; for by means of it we may commonly determine, with some precision, where a perforation ought to be made.

In order to receive every possible advantage from this circumstance, the patient should have his chest uncovered while under examination. When the quantity of water collected is considerable, it may commonly be discovered by placing one hand upon the anterior part of the ribs near to the sternum, and striking with some force near to the back bone with the other; and if an undulation is perceived in one side of the chest and not in the other, the real seat of the disease is thereby rendered evident. But when the quantity of fluid is not great, this trial is not to be depended on. In this case, a person standing behind the patient upon a chair, should be directed to take a firm hold of the upper part of his body, and to swing it repeatedly by sudden jerks from one side to another; and if water is contained in the chest, it will thus be very certainly found to undulate, and an evident noise will be produced by it. I have met with different instances of this, in which the existence of the disorder was thus precisely determined.

In long continued affections of this nature, assistance in the diagnosis is sometimes obtained, from the
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part in which the water is collected being more prominent than the rest of the chest. It has even been alleged, that all the ribs of one side of the thorax have, in some instances been found considerably elevated, by the water collected underneath being in such considerable quantities as to prevent them from contracting in the act of expiration. This can only happen in the very late stages of the disorder; but when it is met with, it demonstrates to a certainty where the water is to be expected.

When water is contained in the pericardium, nearly the same symptoms take place with those which occur from dropical collections in other parts of the chest. Indeed the most accurate observation will sometimes fail in judging of this point; but in the hydrops pericardii, it is observed, that the patient complains chiefly of the middle and left side of the thorax: And Senac, in his excellent Treatise on the Structure of the heart, mentions as a characteristic mark of this disease, a firm undulatory motion being perceived between the third, fourth, and fifth ribs on every pulsation of the heart.

As it is not in any respect necessary for our subject to enter minutely into the investigation of the causes of such collections, all we shall say respecting this point is, that whatever tends to produce dropsy in other parts of the body, will have a similar effect in the formation of it here.

The existence of water in the thorax being ascertained, and the part in which it is collected being discovered, as no medicines hitherto known can be much depended on for removing it, the operation of the paracentesis should be advised, as soon as there is reason to suspect that danger may ensue from delaying it longer. Perforating the thorax is no doubt an operation of importance, and should not be recommended for a trifling affection; but it should be employed in every instance where the attending symptoms are evidently hazardous, and when no relief is obtained from
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other means. The method of performing it is as follows.

The patient should be laid in a horizontal posture, with the side in which the perforation is to be made lying over the bed : When in this situation, the skin opposite to the part to be cut must be pulled as much upwards as possible by an assistant, who must preserve it firmly in this situation during the operation ; and the surgeon is now, with a scalpel, to make an incision of about two inches in length between the sixth and seventh ribs, in the very direction of these bones, and at an equal distance between the sternum and back bone ; taking care to avoid the under border of the superior rib on account of the blood vessels running in its groove. But although it is necessary, in order to obtain sufficient freedom for the scalpel, to have the opening in the skin and cellular substance of this length, there is no reason for continuing it of the same extent to the bottom ; so that, as the knife passes through the intercostal muscles, the incision may in a gradual manner be diminished to the length of an inch. On the pleura being laid bare, it is to be slowly and cautiously divided, in order to avoid all risk of wounding the lungs, in case they should at this place happen to adhere. If they do not adhere, the water will rush out with great force immediately on a small hole being made in the pleura ; but if an adhesion should unfortunately occur here, the incision may be either continued forward for an inch or two nearer the sternum, or another opening may be made either an inch or two higher or lower in the thorax. As soon as water is found to flow, the silver canula, Plate XXI. fig. 5. should be introduced at the opening ; by which means the discharge will not only be more easily accomplished, but will likewise be more readily stopt, if this should be found necessary, by the patient becoming faint. By this means also, air is prevented from finding such ready access to the cavity of the chest ; a circumstance of some importance in this operation.

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When the water collected is not in a great quantity, it may commonly be all drawn off at once ; but as we are, from the structure of the thorax, deprived, during this operation, of the advantage of compression, except of that which may be communicated through the abdomen, which must here be very limited, when much water is collected, partial evacuations ought to be made, at longer or shorter intervals according to circumstances. For this purpose, and with a view to suspend for a time the discharge of water, the canula should be secured by a ribbon connected with it tied round the body of the patient ; and it should be stopped by means of a piece of cork adapted to its opening. A pledgit of emollient ointment should be laid over the wound ; and the whole being secured by the napkin and scapulary bandage, the patient should in this state be laid to rest. After a suitable delay of perhaps a day or two, an additional quantity of water may be drawn off ; and by thus taking it away in a gradual manner, all risk may be avoided of injuring the patient by too sudden an evacuation.

In this manner any quantity of water contained in the chest may be drawn off with safety ; and the patient being now relieved from the great distress under which he laboured, the canula may be withdrawn, proper means being at the same time employed for preventing a relapse of the disorder.

We have hitherto proceeded upon the supposition of the water being collected in only one of the cavities of the chest ; but when both sides of the thorax are affected, the water cannot be all drawn off by one operation. In such a case, therefore, after it has been evacuated from one side, the operation should be repeated on the other. But some risk might occur from performing the operation in both sides at nearly the same time, by the external air getting access at once to both cavities of the chest : For although we have directed the opening in the pleura to be very small, and a canula to be immediately inserted into it, yet

still it is impossible, even with the utmost caution, to prevent the air so effectually as we could wish from finding access, either by the wound or by the canula, to the surface of the lungs; and if both cavities of the chest should at the same time be filled with air, nearly the same oppression would occur upon the lungs as was produced by the serum newly evacuated. Before the operation, therefore, is repeated on the opposite side, some method should be attempted for expelling the air received into the cavity of the chest by the perforation already made. This may be done by two different methods; the most easy and convenient of which is this: Immediately after the canula is withdrawn, let the patient endeavour, as far as he dare safely venture, to fill the lungs with air. This will expel a considerable part of what was collected between the pleura and lungs, by the perforation; and if the skin, which was retracted before the operation, be instantly drawn over the sore, and pressed down by an assistant during inspiration, all access will thus be prevented to the external air; and by repeating this different times, almost the whole quantity of air collected between the pleura and lungs may be expelled: After which the skin must be drawn over the wound; and by means of a compress and bandage properly applied, the parts may be brought to adhere without any further trouble.

The other means we wish to propose for drawing off air from the thorax is by suction. An exhausting syringe may be fitted with such a mouth of ivory or of metal as will allow it to be closely applied over the opening in the pleura. When thus applied, every stroke of the piston will extract a considerable quantity of air; and as soon as the whole is supposed to be nearly exhausted, the instrument may be removed, and the wound treated as we have already directed, by drawing the skin over it, and endeavouring to heal it by the first intention.

Or, instead of an exhausting syringe, one of the elastic vegetable bottles, fitted with the same kind of
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mouth, will answer the same purpose. By expelling all the air out of the bottle, and applying the mouth of it over the wound in the pleura, a quantity of air nearly equal to the bulk of the instrument will be extracted, and the application of it can be renewed as often as may be necessary; care being taken at each removal of the instrument to exclude all access to the air, by drawing the retracted skin over the wound.

Air collected in considerable quantities in the cavities of the chest, may not only prove hurtful by impeding the motion of the lungs; but it must likewise do harm by that tendency to inflame, which is always communicated to parts naturally secluded from the external air, on their being by accident laid open so as to admit of its being freely applied to them. In every case, therefore, of this nature, much attention should be given to this circumstance. When one side only of the thorax is laid open, either in collections of water or of matter, the oppression produced upon the lungs by the admission of air through the wound, is not commonly of much importance, as it is in general expelled by the effects of expiration alone. This I know from experience is the case; but inflammation, as we have said, being sometimes induced by air finding access to any of the cavities, it ought at all times to be guarded against as much as possible; and, as much distress has on some occasions ensued from both cavities of the chest being at the same time laid open, it ought never to be attempted.

Our views in what we have ventured to advise in the different steps of the operation, will appear, we hope, sufficiently obvious; but as some surgeons prefer a different part of the chest, as well as a different instrument, for performing the operation, we think it necessary to enter somewhat more minutely into the consideration of these points.

It has been said, that unless the opening be made lower down in the chest than we have advised, that the water will not be completely evacuated, as all that part
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of the cavity laying below the wound will still continue to be filled with it. But, if the patient be laid in a horizontal posture, with his body inclined a little to the side in which the perforation is made, the spot we have recommended will be found to be the most depending of any that can be fixed upon; and in this situation we have this material advantage, that the lungs do not so readily adhere to the pleura, as they do farther down, where they come more closely into contact with the diaphragm; and here, too, the perforation is effected with much more ease than it can possibly be nearer the spine, where the thick fleshy muscles of these parts cannot be avoided.

With respect to the instrument with which the operation is performed, the scalpel, we think, is by much the best that can be used. A trocar has been recommended for this purpose by many: but however well adapted this instrument is for piercing the abdomen or the scrotum, in which none of the contained parts can be injured by it if the operation is cautiously performed, yet in the thorax considerable risk must commonly attend the use of it from the adhesions which often occur of the lungs to the pleura, and from our not being previously able to determine whether they may not adhere at the very point in which the perforation is made. In the event of no adhesion being met with, the trocar would no doubt effect the intention of the operation very completely, and with perfect safety if it is cautiously introduced. But if it should unfortunately be introduced at a part where the lungs adhere, it would not only injure that organ in a very material manner, but it would not answer the purpose for which it is employed; for the instrument entering the substance of the lungs, would not come into contact with the water collected between the lungs and the pleura lining the ribs, and consequently no evacuation would ensue. With the scalpel, however, no such inconvenience can occur. On the pleura being laid bare, a small hole must be scratched in it
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with the point of the instrument ; and as soon as the surgeon has reason to think that this membrane is completely penetrated, if no water is evacuated, there will be much reason to suppose, that the lungs adhere at this place ; and he will now either desist altogether, and make an attempt at another place ; or, if the adhesion of the lungs to the pleura is slight, which may be known by the cautious introduction of a blunt ended probe, as much of them may possibly be separated as to admit of the introduction of a canula into the collection of water : At least such a trial may be always made with safety. If the separation of the lungs is easily effected, and if the adhesion is not very extensive, the operation will be thus completed ; and if the contrary should unluckily happen, the operator will at least have the satisfaction of having done no mischief, which he could not however, in such circumstances, avoid in employing the trocar. After duly attending, therefore, to every circumstance, we are clear in opinion, that the scalpel should in this operation be preferred to the trocar.

We have hitherto been supposing, that the water is collected in one of the large cavities of the thorax. But when it is contained in the pericardium, or confined in a cyst between the two lamellæ of the mediastinum, what are we to attempt for its removal ? It has commonly been supposed, in dropsical collections in the pericardium, that no advantage would be obtained from discharging the water, as the success attending the practice would probably be very uncertain, and that more danger might occur from the operation than from the disorder itself ; and accordingly, patients labouring under this disease have been uniformly left to their fate, for few indeed have been the cures effected by medicines.

But although the success resulting from this operation would not probably be very considerable, yet still a few of the great number at present carried off by the disease might possibly be saved, and they could not in

all probability be brought into a more dangerous situation than is induced by the disorder itself: for few, if any, recover, of all that are seized with a real hydrops pericardii; and we have no reason to suppose, that a mere division of that membrane is in itself attended with such danger as on this account to warrant a total rejection of this operation. Indeed different instances have occurred of people recovering of wounds accidentally inflicted on it.

When, therefore, it is either previously suspected that the water is collected in the pericardium, or when it is in reality found to be so on an incision being made into the left cavity of the chest, no doubt ought to remain of the propriety of making a perforation into it.

In dropsies of this part, the pericardium is in general so much distended, that no difficulty can occur in finding it. Upon making an opening in the left side, between any two of the ribs from the third or fourth to the seventh or eighth, and within the distance of five or six inches of the sternum, we will in this distended state of it be sure to meet with it: And when it is brought fully in view, by the pleura being freely divided for the space of about an inch, which will commonly be found necessary, the best method of finishing the operation, is by pushing a small trocar with much caution and steadiness into the pericardium; and if the quantity collected is small, it may all be drawn off at once: but, when considerable, the discharge ought by all means to be frequently stopt for a few minutes together, with a view to prevent those inconveniences we have so frequently had occasion to mention as the consequence of large collections of fluids being suddenly evacuated wherever they may be situated; and if this precaution is necessary in other parts, it must probably be much more so in a situation so very contiguous to the heart.

When, again, water is collected in a cyst between the lamellæ of the mediastinum, as this is situated immediately

mediately below the sternum, any pain or oppression which occurs from it, will be more confined to the centre of the breast, than when the collection is situated in either of the cavities of the chest; and for the same reason, any opening intended to discharge it must be made directly through the sternum itself, by a piece of that bone being taken out with the head of a trepan, so as to admit of the parts affected being brought clearly into view. The method of applying the trepan we need not now enter upon, as we shall have occasion to treat of it more particularly in a different chapter than would be necessary here: and all that we think requisite to say farther upon the subject is, that as soon as the cyst containing the fluid is laid bare, a perforation should be made into it by a trocar; care being taken to manage the evacuation of it in the same cautious manner we have already directed, and not to admit of the parts newly laid open being more exposed to the influence of the air than is merely necessary.

S E C T I O N III.

Of Blood collected in the Thorax.

WHEN blood is collected in considerable quantities in any part of the chest, the breathing becomes oppressed, and the motion of the heart and arteries feeble and irregular. These, indeed, are symptoms which occur in every collection seated in the thorax; but they are observed to arrive at a greater and more distressing height from blood, than from collections of other fluids. In other respects, collections of blood and of serum give rise to the same symptoms, so that we need not again enumerate them particularly.

Different causes may occasion extravasation of blood into the cavity of the thorax.

1. Wounds of any of the blood vessels contained in the thorax, by the forcible introduction of sharp instruments.

2. The spiculæ of a fractured rib forcibly pressed upon any of the arteries or veins, and splinters of the sternum or of any of the vertebræ, may also be attended with this effect.

3. The erosion of any of these vessels, by the matter of an ulcer or of an abscess; and,

4. The rupture of these vessels by any violent exertion, particularly by the action of coughing.

As it commonly happens, where blood is collected in the chest, that the vessels from whence it is evacuated are seated in the substance of the lungs, part of the blood is usually brought up by the mouth in a fit of coughing; and when the quantity discharged in this manner is considerable, it proves a temporary relief to the oppression both of the lungs and of the heart. But whenever the action of either of these organs becomes much impeded by a great accumulation of blood, some attempt ought to be made to draw it off by a perforation: and as blood, when extravasated, coagulates very quickly, and as in this state it would be discharged with difficulty, an opening should be made for this purpose as soon as there is the least reason to imagine from the symptoms that it is beginning to stagnate.

When blood extravasated in the thorax is found to be so firmly coagulated as not to pass off by a perforation, it has been proposed to dissolve or to dilute it by injections of warm water or of emollient infusions. This, however, is a practice which if possible ought to be avoided; for injections, even of the mildest nature, must in this situation be always attended with much risk; but when it so happens, that a considerable quantity of blood is collected in a coagulated state, and that it cannot be evacuated even by enlarging the opening in the pleura to the extent of an inch or so, and as much hazard would be incurred by allowing it

to remain, even a doubtful remedy in such circumstances becomes eligible. In this situation, tepid water being frequently though cautiously injected, and especially if small quantities of it are allowed to remain in the chest for some time together, which may be done by the injection being thrown in while the orifice is somewhat elevated, the coagulated blood may in this manner be gradually so much softened and dissolved as to be at last evacuated. But when a practitioner has it in his power to make a choice, it will be much for the interest of his patient, that he prevents the necessity of employing such a remedy, which he may commonly do by making an incision in the manner we have directed in that part of the thorax where the blood appears to be collected. By some practitioners, particularly by Mr. Sharpe, we are advised, in cases of blood collected in the thorax, rather to trust to its being absorbed or coughed up from the lungs, than to endeavour to draw it off by this operation.* Where blood is either extravasated in the substance of the lungs, and is freely spit up, or when it is even collected in any of the cavities of the chest, if it is in such a small quantity as to produce no material impediment to the action of the lungs or of the heart, it may possibly be right to make no attempt for discharging it, as in course of time, by blood lettings being frequently repeated according to the strength of the patient, by the effects of a low cooling diet, and other remedies usual in such cases, it may perhaps be absorbed; and in the mean time, while the quantity extravasated is inconsiderable, no material inconvenience can arise from it. But what we wish to inculcate is, that when blood is collected in such a quantity in either of the cavities of the thorax, as to disturb the functions of the organs contained in it, it ought by all means to be immediately drawn off by a perforation. It is said by Mr. Sharpe, that, by allowing the blood

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* Treatise of the Operations of Surgery, Chap. XXIV.

to coagulate in the chest, the orifice from whence it is poured will be more readily stopt, than if it be quickly evacuated. But in answer to this, we must remark, that if the wounded vessel is not of a considerable size, little or no additional risk will be incurred by drawing off the blood as it is poured out, as in this case the hemorrhagy will probably stop on the patient's becoming faint: and on the contrary, if the divided vessel is large, the remedy proposed by Mr. Sharpe will be found very insufficient for the purpose; for a wound in any of the large vessels of the breast, will probably prove fatal, whether the operation of the paracentesis be performed or not.

In performing this operation for blood collected in the thorax, the directions we have given for evacuating serum, will in general prove applicable. Only, when the collection has been the consequence of a rupture of a blood vessel, induced either by a fractured bone, or by some extraneous body being pressed into it, the incision ought to be made as contiguous as possible to the part affected, so that the opening may serve not only for evacuating the blood, but for extracting such portions of bone as are found to be detached, or such foreign bodies as may be met with. And again, when a wound with a sharp pointed instrument is the cause of the collection, instead of making a perforation in any other part of the chest, it will commonly answer the purpose better, merely to enlarge the wound; at least, this will always be preferable, when the wound is situated in the inferior part of the thorax; but when it is found to be so high in the chest, as to be unfit for evacuating the blood contained in it, the operation must then be performed between the seventh and eighth ribs, as we have already pointed out.

SECTION IV.

Of an Empyema, or a Collection of Pus in the Thorax.

COLLECTIONS of pus in the thorax are more frequently met with than of other fluids, and the symptoms produced by them are nearly such as occur from similar quantities of any other fluid; at least, the marks of oppression on the heart and lungs which occur from them, are very similar to those which arise from collections of serum: but where pus is collected, we have symptoms of a different kind, that direct us in forming an opinion, not only of the nature of the disorder, but of its particular seat.

It has been asserted, that pus has in some instances been deposited in particular parts, without any previous inflammation. But this is acknowledged to be so rare an occurrence, that we may venture to lay it down as a fixed principle, that inflammation is to be considered as a necessary fore runner of purulency; so that an empyema, we conclude, will never be met with, but as a consequence of an inflamed state of the part affected. When, therefore, such symptoms occur as indicate a collection of some fluid in the thorax, if they have not been preceded by an inflammatory affection of the part, we may conclude that they are not induced by purulent matter. But when a patient who has for some time complained of a fixed pain in some part of his chest, attended with heat, a quick pulse, and other symptoms of inflammation, is at last seized with an oppressed respiration; an inclination to sit in an erect posture; with a total inability of lying on the sound side; a constant tickling cough; with frequent rigors or shiverings; and especially if these symptoms are accompanied either with an enlargement of the whole affected side, or with a soft œdematous fulness of the part in which the pain was at first seated;

we may conclude with much certainty, that a large collection of matter is formed.

Inflammation of some portion of the lungs, or of their coverings, may be induced by various causes. In some instances, families appear to have an hereditary tendency to tubercles in the lungs, which every slight attack of cold is apt to affect with inflammation. A natural contracted state of the thorax seems likewise to predispose these parts to inflammatory affection; and inflammation may be produced here, in the same manner as in other parts of the body, by every variety of external violence.

But by whatever means the contents of the chest may have been brought into an inflamed state, when this terminates in suppuration, if the matter, instead of being freely discharged by the mouth, as is frequently the case, is found to produce all the symptoms we have already had occasion to enumerate of an oppressed respiration, the only remedy upon which we ought to place any dependence, is a perforation.

Many practitioners have considered this operation as more hazardous than it really is; and it has been said, that it ought never to be attempted but when the seat of the abscess is clearly pointed out by an external swelling between two of the ribs. When the lungs become inflamed in a part which adheres to the pleura, abscesses of this nature are not unfrequently formed; and they are accordingly very commonly laid open. But although the operation of which we are now speaking is of some importance, and should never be employed but when indicated by necessity; yet we do not think it can ever be attended with so much risk as to render the formation of an external abscess the only cause for performing it. When there is reason to conclude, that previous inflammation in some part of the breast, with evident marks of this having terminated in suppuration, is the cause of an oppressed breathing, and when this is not quickly relieved by a free expectoration of matter, the operation of the paracentesis

paracentesis should be performed immediately on that spot where the collection is supposed to be seated, whether there are any external marks of an abscess or not. It may frequently happen, that no matter will be discharged on the perforation being made into the chest; as we know from experience, that in cases of this nature the abscesses are often seated in the substance of the lungs, and not in any of the cavities of the chest. But, even in such instances, an opening of this kind may be sometimes of use; as the lungs, by losing their usual support at a particular point, will more readily yield than they otherwise would do to the matter collected in them; and in the event of the matter being already poured into the cavity of the chest, the remedy we are now recommending is the only resource from which any real advantage is to be expected. We are therefore clearly of opinion, that, in every case of this nature, the paracentesis of the thorax should be universally employed.

The directions we have given in the two preceding sections for effecting this operation, will apply with equal propriety in collections of pus: Only, it must here be remarked, that in affections of this nature, whenever the seat of an abscess is pointed out, either by a long continuance of pain in any one point, or by matter being distinguished between two of the ribs, that this is by much the best direction for the place of the incision. But when no such mark is to be met with, the place we have advised for the operation when water or blood is to be evacuated, will answer equally well for the discharge of matter.

It is likewise necessary to observe, that, in purulent collections in the chest proceeding from external injuries, particularly from penetrating wounds, no operation can be necessary if the wound producing the abscess is so situated as to evacuate the matter completely; but when the wound is found to be too high in the thorax for answering this purpose, a perforation in a more depending situation is thus rendered proper.

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And, again, when the matter is seated so immediately below the sternum that it cannot be evacuated by an opening between two of the ribs, a piece of that bone must be removed by the trepan, as we have already directed when speaking of collections of serum.

In purulent collections in the thorax, the matter is commonly first formed in the substance of the lungs, and is afterwards discharged into one or other of the cavities of the chest. But in many instances, large quantities of pus are found between the pleura and surface of the lungs, without any apparent affection of that organ; and proceed evidently from an inflamed state of the pleura lining the ribs, or of the investing membrane of the lungs. These collections, however, seldom continue long without producing ulceration; and when ulceration has taken place, the discharge of matter which follows upon the paracentesis being performed, generally continues for a great length of time.

Different causes concur to render the cure of abscesses in the breast more tedious than in other parts: The constant motion of the lungs; our not daring to induce that degree of inflammation which we know to be necessary for the reunion of parts divided by the formation of matter; and our being precluded from receiving any benefit from compression, which the intervention of the ribs renders impracticable. Although, in a few instances, the quantity of matter gradually diminishes, and the external opening contracts and heals; yet, from the circumstance we have now mentioned, in a great proportion of those who have undergone the operation for the empyema, or who have had large collections of matter in the breast in consequence of accidental wounds, a discharge of matter continues for a considerable time, most frequently for life. The sore, indeed, will often heal up if it be not artificially kept open; but the matter almost constantly bursts out again, or another operation becomes necessary to discharge it, when it collects a-

gain

gain in such quantities as to produce a renewal of the symptoms of oppression on the lungs and heart.

We shall have an opportunity of considering this subject more fully when we treat of wounds of these parts. In the mean time, however, I think it necessary to observe, that although in the treatment of wounds, the general use of tents, whether solid or hollow, has been condemned with much propriety; yet we are evidently misled by fashion, when we lay them entirely aside in wounds penetrating the cavity of the breast. I know that it is the opinion of many practitioners of eminence, that tents of every kind should be entirely exploded; but I also know, that patients, who might otherwise have been saved, have frequently suffered by this rule being too generally adopted. Thus, in the case now under consideration, as long as the matter of an abscess in the thorax continues to find an easy vent, and to be discharged freely either by the wound which first produced it, when this is sufficient for the purpose, or by a perforation made for drawing it off, when this is found to be necessary, there is no cause whatever for employing tents; and in such circumstances, indeed, it would be highly improper to use them. But when the opening into the thorax heals too quickly; when, in consequence of this, the matter of the abscess does not find a free vent, and symptoms of oppression in the breast supervene; in such circumstances, the propriety of preserving a passage for the matter must be self evident. Repeated experience has convinced me, that this may be done with much ease, by introducing a piece of common bougie into the opening, or a short tube of silver, and allowing it to remain for a few hours, as often as a tendency in the parts to heal seems to make it necessary. By a neglect of this means, and by allowing such sores to heal, which is now the most frequent practice, much mischief has often been done; and, on the contrary, I know different instances of people enjoying very good health by a proper attention to this circumstance;

stance; who constantly experience much inconvenience from allowing the openings into the chest to become much contracted; and in whom, therefore, the complete healing of them would in all probability be attended with fatal effects. Some inconvenience, no doubt, will arise from a constant discharge of matter; but not greater than what is daily experienced from a common issue, which the opening we are now speaking of nearly resembles: And at any rate, when a patient knows that his safety depends upon such a discharge, he will very readily submit to it.

We shall now proceed to the last section upon this subject, the consideration of air collected in one or in both the cavities of the chest.

S E C T I O N V.

Of Air extravasated in the Thorax.

AIR collected in either of the large cavities of the chest, produces the same symptoms of oppression on the lungs and heart, as those which occur from the presence of water, blood, or matter; it therefore becomes equally an object of chirurgical management.

Collections of air may be produced in the thorax by different causes.

1. We know that the process of putrefaction tends to extricate air from every body in which it takes place; so that air may be collected in the thorax, from any part of the organs contained in it being seized with mortification. This species of the disorder, however, will seldom fall under the care of the surgeon: for the affection by which it is produced, will not in general yield to any remedies that may be employed for removing it; and unless the mortification be removed, no advantage can be expected from any operation.

2. Air

2. Air may pass into one or both of the cavities of the chest, from a rupture produced in the investing membrane of the lungs by any violent exertion in coughing, laughing, crying, &c.

3. The erosion of the surface of the lungs by ulceration, or by purulent matter in contact with them becoming acrid, may open a passage for air into one or other of these cavities.

4. Wounds penetrating the substance of the lungs have sometimes produced collections of air in the chest. But in such instances, the wound must be inflicted with a small pointed instrument pushed in an oblique direction. No instrument carried forward in a direct line into the lungs, will produce collections of air, as all the air which escapes from the lungs will pass out at the wound: But in the case of an oblique wound, the air may readily be prevented from escaping by it, as the parts will naturally fall together; and in this event they will operate in the same manner as a valve, and so the air must necessarily be collected in one or other of the cavities.

5. The point of a fractured rib wounding the lungs, has frequently been productive of the same effect; and a fracture of any of the vertebræ, may operate in the same manner.

These several causes may occasionally induce collections of air in the cavities of the chest; but this complaint ensues more frequently from fractures of the ribs than from any of the others.

The symptoms produced by air effused in the thorax, differ only in this respect, from those which occur from serum and purulent matter, that they come more quickly to a very alarming height, there being instances of death having been induced in the space of a few hours after the fracture of a rib, merely by air collecting in such quantities between the pleura and lungs as totally to obstruct respiration; and in many instances, perhaps in the greatest proportion of all that occur, along with this collection of air in the chest,

chest, the cellular substance of the breast becomes inflated; and if means are not soon employed to prevent it, the air insinuates itself through every part of the body.

It is truly astonishing to observe, how quickly this accident of a fractured rib, by wounding the surface of the lungs, will in some instances induce the most alarming symptoms.—The patient at first complains of a tightness in the breast, attended with oppression in breathing, along with pain in the parts chiefly affected.—In a gradual manner, this difficult respiration becomes more distressing:—The patient cannot breath in a recumbent posture, and is always easiest when erect and leaning somewhat forward:—The face becomes flushed and much swelled:—The pulse is commonly feeble, and at last becomes irregular:—The extremities become cold; and if relief is not quick obtained, the patient is sure to be carried off with every mark of suffocation.

The emphysematous swelling of the chest and other parts, which sometimes occurs here, is easily distinguished from watery effusions, by the crackling produced on pressure; the sensation it communicates being nearly such as is received from pressure upon a dry bladder when nearly filled with air. For the removal of this symptom, scarifications have been employed. By making several incisions, each about half an inch in length, along the course of the swelling, a good deal of air may be evacuated, especially if the air contained in the swelling be frequently pressed towards these openings. A considerable quantity, too, of the air collected in the thorax, will be drawn off by the same means: for as soon as any part of it passes off from the cellular membrane, its place will be immediately supplied from the chest; and if the quantity which escapes by the wound in the lungs, is not greater than what is discharged by the scarifications, the whole in this manner may soon be removed. But it frequently happens, that the air forced

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ed out from the lungs, is much more than can pass off by any number of scarifications that can be made; and in this case, any relief obtained for the most material symptom, viz. the oppressed respiration, is very inconsiderable.

Till of late, patients in this situation were almost constantly left to die by suffocation; for when scarifications failed in evacuating the air, and even this remedy has not been long in use, practitioners were not acquainted with any other means of relief.— But we now know, that in all such cases, where the oppression of the lungs is great, and where the symptoms are evidently induced by air collected in the chest, that the same remedy should be employed for removing it, as is found to succeed in collections of any other fluid, viz. the operation of the paracentesis; and it has accordingly of late years been performed in different instances, and always with complete success; the tension in the breast, difficulty of breathing, and every other symptom, being immediately relieved on a perforation being made through the pleura.*

With a view to prevent the inconveniences which result from the external air finding a free access to the cavity of the chest, it has been proposed to make the opening with a trocar instead of a scalpel; and by entering the instrument in an oblique direction, this purpose would no doubt be very effectually answered.

When the chest is completely filled with air, and if any certainty could be obtained of no adhesions taking place between the lungs and pleura, the operation might be performed with perfect safety, and with more ease by the trocar than with any other instrument. But as we can never know with precision whether the lungs adhere or not, we are, for these and other reasons mentioned in a preceding part of this chapter, induced to think that the operation may be done with more safety by the scalpel. And if the directions we

have

* This operation for the evacuation of air from the chest, was first proposed by Dr. Monro, about the year 1760, in his lectures in this University.

have given are attended to, of retracting the skin as much as possible from the part to be perforated; of introducing a canula immediately into the opening of the pleura, as soon as air begins to be evacuated; and of drawing the retracted skin over this perforation into the chest, as soon as it is thought advisable to withdraw the canula; the operation may be done with more certainty of avoiding all manner of injury to the lungs, in the event of their adhering to the pleura, and probably with equal success in every respect, as when the trocar is employed.

The practice, therefore, which in every case of this nature we would incline to follow, is, in the first place, to make several incisions along the course of the swelling, each of a half inch in length, and of such a depth as to pass entirely through the skin into the cellular membrane: and if these do not afford relief, which, however, they will frequently do, to proceed immediately to perforate the cavity of the chest, in the manner we have directed, and as near as possible to the part where the injury was received, when the disorder has been induced by an external accident, and if this be not near to the back bone; in which case, the perforation ought to be in the same part which we have directed in collections of water, of blood, and of matter. And when a violent exertion in coughing, crying, or laughing, has produced it, the particular seat of the complaint will in general be pointed out by some degree of pain in the part where the rupture of the external coverings of the lungs have occurred.

CHAPTER

 CHAPTER XXIII.

Of Bronchotomy.

WHEN respiration becomes so much obstructed as to endanger the existence of the patient, and when this is found to proceed from some local affection of the superior part of the wind pipe, an operation commonly termed Bronchotomy is employed for relief.—But as this consists in an opening made into the trachea, and not into the bronchiæ, it ought more properly to be named Tracheotomy.

This operation has in general been supposed to be of a more formidable nature than it really is; and this has prevented it from being so frequently employed as it ought to be.—By many practitioners, it is said to be seldom if ever necessary; and even some authors of eminence have asserted, “that it is useful only in that species of angina, where the throat is exceedingly enlarged by the swelling of the thyroid gland and parts adjacent:” these are the words of Mr. Sharpe in his treatise on this subject.*—But it is evident, that in this instance Mr. Sharpe has wrote without considering the subject sufficiently: for, although a swelling of the thyroid gland may become so considerable as to compress the trachea entirely, and may thus render bronchotomy necessary, yet this is surely a very rare occurrence; few practitioners can probably have met with it; and there are not many, I presume, who have not had occasion to perform the operation

* Operations on Surgery, chap. xxxi.

eration on other accounts.—The danger which was formerly supposed to attend it, is not now so much dreaded, and accordingly it is more frequently employed; but still there is much reason to think, that it should be oftener practised than it has hitherto been.

The causes which may induce a necessity for performing this operation are:

1. Any spasmodic affection of the muscles of the larynx, when it arrives at such a height as to endanger suffocation: In some species of catarrh, the mucus of these parts becomes so very acrid, as to irritate the glottis in a most sensible and disagreeable manner. Even from this kind of irritation, it is evident by the sense of suffocation which sometimes occurs, that a considerable degree of contraction is produced in the glottis: but this takes place in a much more alarming degree, from a piece of hard substance of any kind slipping below the epiglottis into the larynx; inso-much, that instances of suffocation have occurred from this cause alone. Among others of this kind which might be recited, a remarkable history is recorded by Bonetus, of a child dying from a piece of bone having passed into the trachea arteria; and it has often happened, that children, and even older people, have been suffocated by pieces of nut shells, crusts of bread, &c. passing into the trachea.

It has been alleged, that no alarming degree of contraction in the glottis can ever probably occur; and it has even been said, that the muscles with which it is furnished, are not adequate to this effect. This opinion, however, originates entirely from the very relaxed state in which these muscles are always found after death; which is not by any means a fair method of judging; for we know well, that all the muscles in the body are found in a relaxed state after death, however severely they may previously have been contracted.

2. A piece of bone, flesh, or any other firm substance, being lodged in the pharynx or in the upper part of the œsophagus; and being too large to pass down to the stomach, may by its bulk press so much upon the posterior and membranous part of the trachea, as to produce a total obstruction to the passage of air into the lungs.—Different instances have occurred in this place, of suffocation being induced by a piece of flesh lodging in the superior part of the pharynx: for in such instances, it commonly happens that patients are irrecoverably dead before any assistance can be procured.—I have myself met with two instances of this, in both of which the utmost certainty was obtained of respiration having been obstructed for a few minutes only; and yet neither of the people recovered, although all the means usually employed in such cases were immediately put in practice.—But in both, there is every reason to think bronchotomy would have proved effectual, had it been possible to procure assistance more speedily.

The event of these two cases, as well as of some others of drowned people, in which respiration had been obstructed for a very short period only, and in which every method now known was put in practice for their recovery, makes me conclude, that few, if any, have ever recovered in whom respiration has been totally obstructed for more than a few minutes.

After all the attention that I have been able to give to cases of this nature, I would say, that a complete interruption to breathing, for the space of five minutes only, must, in almost every instance, prove fatal. We have heard indeed of many instances of drowned people being recovered after being half an hour, nay even hours, under water: but these accounts of the time which bodies have remained immersed are seldom very accurately obtained, from the general inclination in bystanders to exaggerate, as well as from other causes; so that little or no credit is in general due to them.

3. Polypous excrescences in the nose have been known to fall so far into the pharynx as to endanger suffocation ; and it very commonly happens that tumors of this kind, which originate either from the uvula or from the superior part of the pharynx, are attended with this effect : in all of these, when extirpation by ligature is to be attempted, if the tumors are large, it is with much difficulty that the necessary apparatus is applied. This, however, may be greatly facilitated by a previous opening of the trachea, which admits of an easy respiration while the ligature is forming round the basis of the tumor.

4. Tumors of a firm nature, particularly those of the scirrhus and fleshy kinds, even when seated externally, have been known to compress the trachea so much as to obstruct respiration almost entirely : When such swellings reach so far down as to cover all the accessible part of the trachea, and which, in the latter stages of the tumor termed Bronchocele, is too frequently the case, this operation is rendered inadmissible ; but in all such affections much benefit may be derived from it whenever it is found to be practicable.

5. An instance is mentioned by Doctor Richter of an inflammation of the tongue arriving at such a height as to obstruct the passage to the fauces entirely ; and different instances have occurred of mercurial salivations, when carried too far, inducing such a tumefied state of the glands in the mouth and throat, as to be attended with the same effect. In one case of this kind which I met with several years ago, and in which the glands of the throat were naturally large, such a total obstruction was produced to the passage of the air, as rendered bronchotomy absolutely necessary. In this instance, such a quantity of mercury had been quickly thrown in, that the swelling of these glands arrived at an alarming height in the space of a few hours from its commencement ; and although all the remedies usually employed in such cases were put in practice, none of them had any effect ; the operation was,
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contrary to my opinion, delayed till the patient was almost completely suffocated ; but he revived instantly on the perforation being made.

6. Swellings of the amygdalæ and contiguous parts that do not terminate speedily in suppuration, when they arrive at any considerable bulk, are very apt to induce an obstructed respiration ; and may thus render bronchotomy necessary. It is not such tumors, however, as originate entirely from inflammation that most frequently proceed this length : hard swellings of the amygdalæ, when attacked with inflammation, are sometimes known to produce a total obstruction in the fauces, which none of the usual remedies will remove ; and which therefore points out the propriety of this operation. But in real inflammatory tumors of these parts constituting the angina inflammatoria of authors, unless the glands have been morbidly enlarged before the commencement of inflammation, the swelling will seldom, or perhaps never, proceed to such a height as to require it : and when swellings of this kind arrive at a considerable bulk, it will almost constantly be found to depend on their having gone into a state of suppuration ; when relief may be obtained by means of a more simple nature than bronchotomy, namely, by discharging the matter contained in the tumor by an incision or a puncture. A common scalpel, wrapped all up with a piece of linen except at the point, is generally made use of for scarifying or puncturing the amygdalæ and other parts of the fauces ; but no precaution whatever will render this a safe instrument for these purposes. In Plate XXIV. is represented a lancet concealed in a canula, which every surgeon ought to be possessed of, as by means of it any part of the throat may be scarified with safety.

7. Among the means employed for restoring the circulation in people who have been long under water, or where respiration has been obstructed in any other manner, blowing air into the lungs, and repeatedly discharging it, is perhaps more to be depended on

than any other; for the action which is thus given to the lungs is very readily communicated to the heart itself. The usual method of throwing air into the lungs in such cases, is merely by blowing forcibly into the mouth while the nostrils are compressed; or by means of a curved tube inserted at one of the nostrils, so as to make its extremity terminate immediately above the glottis.

But although one or other of these methods may on some occasions answer the purpose of filling the lungs with air, yet I know from experience that it will not commonly succeed. In two different instances of people who had been each of them a few minutes under water, several attempts of this kind were made for throwing air into the chest. But, either from some contraction of the epiglottis, or of the superior part of the larynx, none of them were found to succeed; and as bronchotomy was in both cases obliged to be performed for effecting it, we are therefore warranted in mentioning this as one cause which may render it necessary.

When, from any of the causes we have mentioned, respiration becomes so much obstructed as to endanger the patient's existence, bronchotomy ought to be immediately employed; and the method of performing it is this.

Whenever it is found necessary to have a patient firmly secured during an operation, he should always be placed upon a table; and as this is a matter of much importance in bronchotomy, we prefer a table to a chair. The patient being laid upon a table, with his head drawn back and limbs secured by assistants, a longitudinal incision should be made with a scalpel through the skin and cellular substance on the middle and interior part of the trachea, beginning at the inferior part of the thyroid cartilage, and continuing it downwards for the space of an inch. The sternothyroidei muscles are thus brought into view; and being separated from one another, a considerable portion of the
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the thyroid gland is in this manner laid bare. As this gland is plentifully supplied with blood vessels, and as a division of any of these proves very troublesome, and on some occasions even dangerous, some attention is necessary to guard against it. This, however, may commonly be easily done, by avoiding the inferior portion of the gland where the two lobes of which it is composed unite, and finishing the operation at the upper part of it where they separate. In order, too, to guard as much as possible against the inconvenience which arises from the division of the arteries of this gland, the incision ought to be done very slowly; for, on some occasions, they are of such a magnitude as to be perceptible to the naked eye before being cut, and in such instances they may always be avoided.

The cellular substance lying between these portions of the gland being cautiously removed, the trachea is thus laid bare; and if no large blood vessel has been divided, the operation may be immediately finished, by making an opening between any two of the cartilages. But if any large artery has been cut, it must be secured with a ligature before going further. Authors differ much in their opinion respecting the best manner of finishing this part of the operation. By some it is recommended to make an opening with a scalpel, while others prefer for this purpose the point of a lancet; and by all, the perforation is advised to be of such a size as to receive a tube or canula of silver, through which a quantity of air may be transmitted fully sufficient for the purpose of respiration. But as much mischief occurs from blood getting into the trachea, by the convulsive cough which it induces; and as this can scarcely be prevented in the usual manner of performing the operation, it has been proposed to employ a cutting instrument adapted to a canula of a proper size for being left in the opening. Descriptions of instruments for this purpose may be met with in the

works of the ingenious Doctor Richter, of Gottingen,* which we have already referred to, and in the fourth volume of the Memoirs of the Royal Academy of Surgery of Paris, by Mr. Bauchot.

An instrument which I consider as an improvement upon these, is delineated in Plate XXIII. fig. 2. It is nearly of the form of a flat trocar, but not quite so long. The patient's head being still supported and somewhat drawn back, the point of the stilette must be made to penetrate the membrane between two of the cartilages; and the extremity of the canula being pushed fairly into the trachea, the stilette is to be withdrawn, and the canula afterwards secured by a piece of tape connected with it being tied on the back of the neck.

The instrument is here represented without incumbrances from the dressings; but before it is introduced, it should be passed through the centre of three or four thin linen compresses; which not only serve to cover the pledgit of emollient ointment with which the wound should be protected after the stilette is withdrawn, but by withdrawing one or more of these pieces of linen, which may be easily done without moving the instrument, merely by cutting up their sides with a pair of scissors, the length of the canula may thus be augmented at pleasure; and which, in the event of any swelling occurring about the wound, is found to be a very important precaution: For unless it be attended to, a very slight tumefaction on the sides of the fore will throw the canula entirely out. The canula should therefore be always of such a length as may obviate any inconvenience which might otherwise occur from this accession of swelling. For this purpose, it should never be less than two inches long: when it is first introduced, just as much of its extremity should be left uncovered by the compresses as admits of its passing easily into the trachea. If any swelling occurs,

* Vide Augusti Gottlieb. Richteri D. Medicinæ professoris Gottingensis observ. chirurg. Fascicul. secund. cap. iii.—Gottingæ, 1776.

curs, one, two, or more plies of the linen being cut off, will still admit of the canula penetrating to the same depth ; and, on the contrary, when it happens that the parts are somewhat tumefied at the time of the operation, as the quantity of tube lodged in the trachea might be too much increased by the swelling subsiding, the inconvenience which would otherwise ensue may be easily prevented, by a few additional plies of linen being inserted between any two of the compresses.

By experience we learn, that a double canula answers better in this operation than a single one. When one tube only is used, it is apt to fill with mucus ; and as it must frequently be taken out for the removal of this, respiration is in the mean time apt to be interrupted : but when a double tube is employed, the inner canula can be easily removed, cleaned, and replaced ; while every inconvenience that would otherwise result from it is prevented by the other being left in the opening. When, therefore, the outer canula of the tube is properly fixed, the other having been previously adapted to it, should be immediately pushed into it ; and the opening in the canula being covered with a piece of crape or fine muslin, to prevent the admission of dust, &c. the operation is thus completed.

As the intention of this operation is to obviate the inconveniences arising from an obstructed respiration, it is evident that the canula should be continued in the wound as long as the cause exists which gave rise to it. If a piece of bone or any other substance has passed into the trachea, and if this cannot be extracted at the opening newly made, a curved probe should be introduced at it, in order to ascertain the situation of the extraneous body ; and this being done, another perforation directly above it becomes absolutely necessary. By this means, this cause of the disorder may, in some instances, be removed, and when obstructions of a different kind are found to have produced it, the means best adapted for their removal should be immediately employed. But till this is completely accomplished,

plished, the canula must be continued : and when at last it is thought proper to withdraw it, the skin should be immediately drawn over the orifice and retained there by a piece of adhesive plaster, by which means a cure of the fore will soon be obtained.

Dr. Richter, among other improvements upon this operation, advises the canula to be curved ; but, in the different instances in which I have had occasion to perform this operation, none of the inconveniences occurred which the Doctor supposes may proceed from employing a straight one : on the contrary, I have found the straight canula answer every purpose ; and as a tube much curved cannot have another exactly fitted to it to be occasionally inserted and withdrawn, this I think is a sufficient reason for not adopting the curved canula which Dr. Richter proposes.

To such as have not had opportunities of performing this operation, the attention we have desired to a proper regulation of the length of the canula may appear to be unnecessary. This, however, is far from being the case ; and much embarrassment would ensue from negligence on this point. The means we have recommended for this purpose are simple, are at all times easily procured, and upon trial they have been found to answer. But a very neat and ingenious contrivance for the same intention has long been exhibited by Dr. Monro in his course of Surgery ; and of which he has been so obliging as to admit of a delineation being here given. It is represented in Plate XXIII. fig. 1.

Plate XXIII.

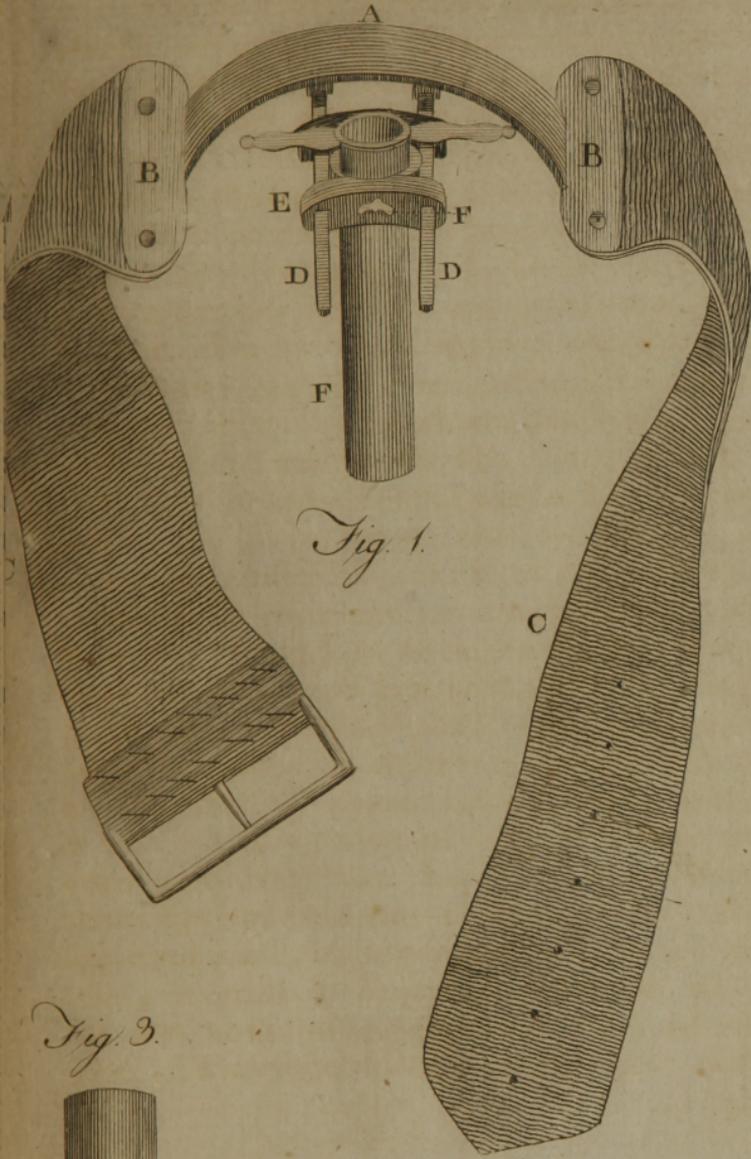


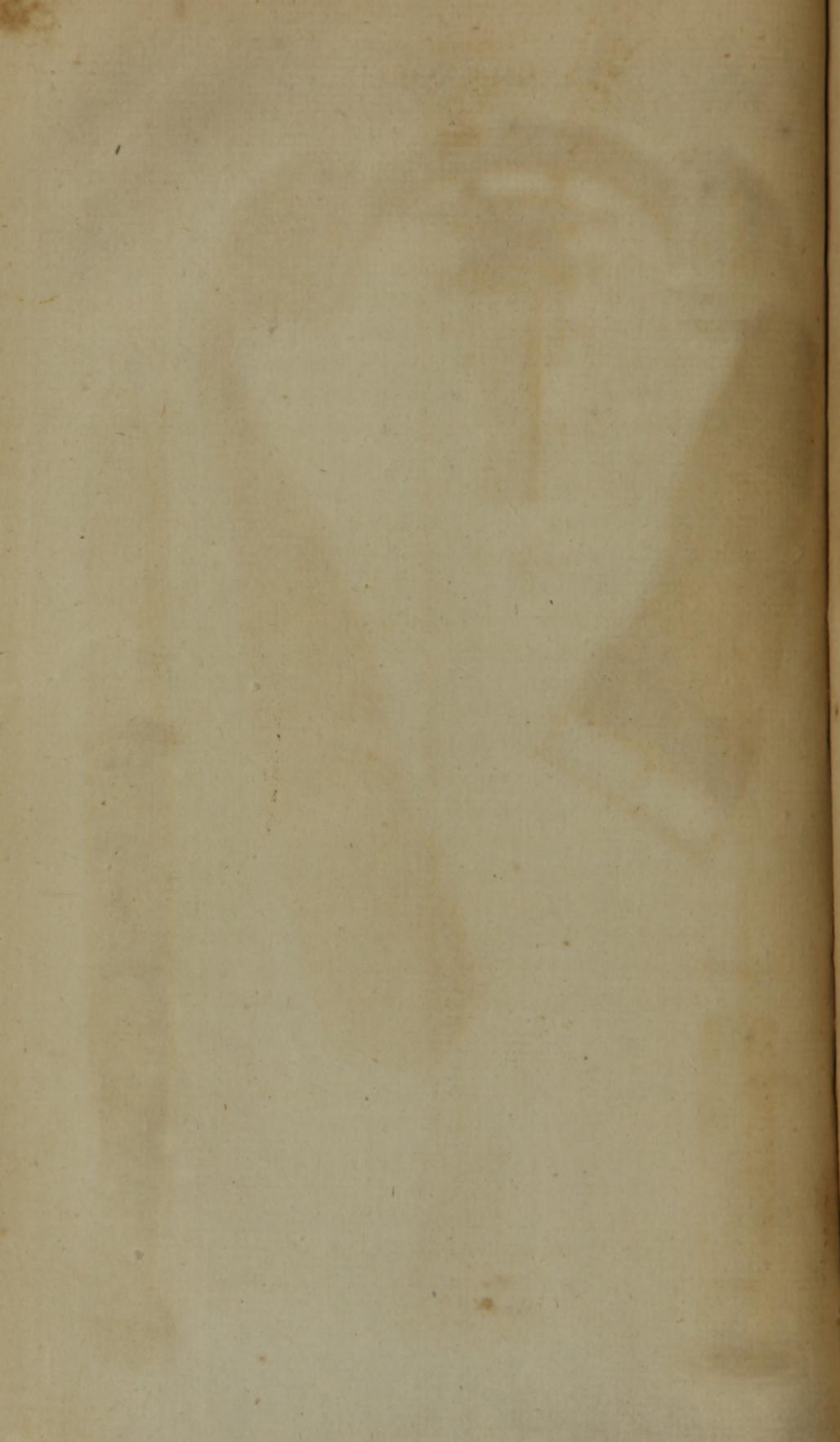
Fig. 1.

Fig. 2.



Fig. 3.





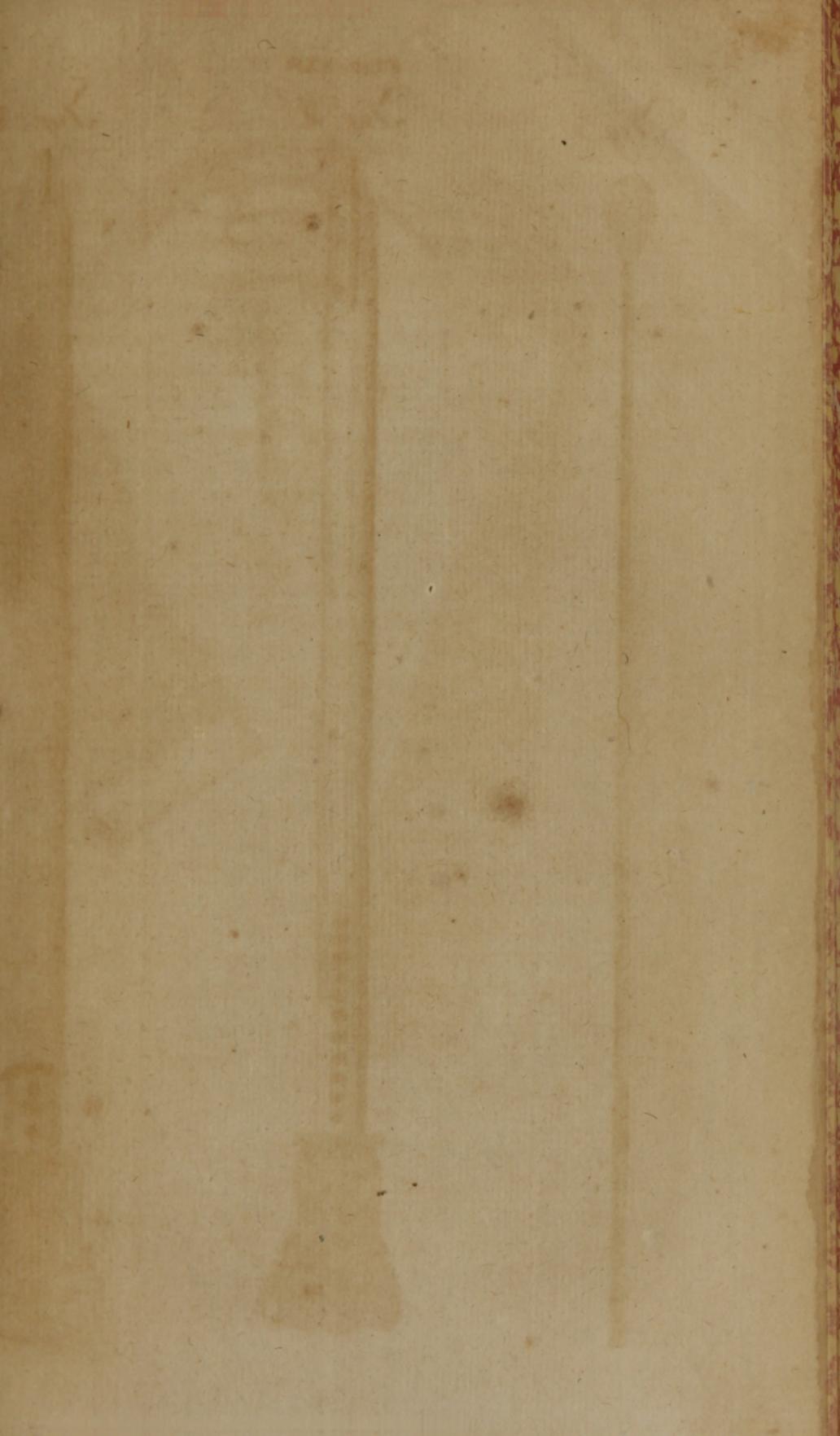


Fig. 1.



Fig. 2.

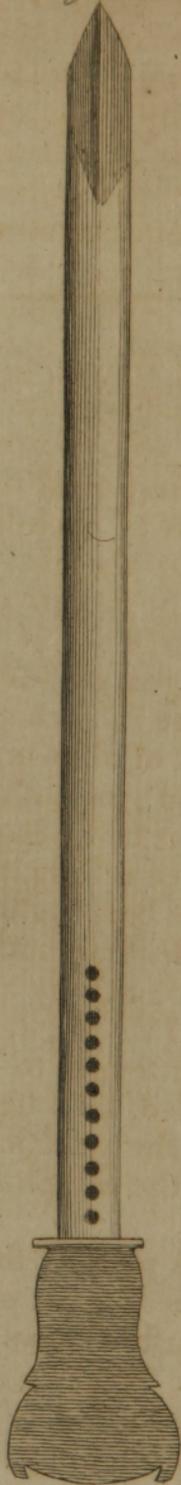


Fig. 3.



 CHAPTER XXIV.

Of Oesophagotomy.

SUBSTANCES are frequently taken into the pharynx, which, in passing into the œsophagus, are found to be too bulky to be forced down to the stomach by the muscular exertion of the parts at which they stop. When any part of such substances can be observed on looking into the pharynx, they are in general easily removed by a pair of forceps: but when they have passed entirely out of the pharynx, and are lodged in the œsophagus, no advantage can be derived from this; and we are in such circumstances reduced to the necessity either of allowing the substance to remain where it is fixed; of pushing it into the stomach; or of extracting it by laying the œsophagus open.

When the substance resting in the œsophagus is of a soft texture, such as bread, cheese, or even flesh, the easiest and most prudent method of getting free of it is, to push it into the stomach by an instrument termed a Probang, Plate XXIV. fig. 1. This is much safer and easier than to attempt to bring it up, as is frequently recommended, by a strong vomit; for if this should not succeed, the exertion of vomiting in this obstructed state of the œsophagus would be very apt to do mischief.

But when a pin, a piece of sharp bone, or any other firm substance, is fixed in the passage, we should by no means attempt to push it down; for, by doing so, if it does not go into the stomach, any point or roughness with which it is furnished, may be pushed directly into the substance of the œsophagus.

We think it necessary to observe, that this is a point of importance, and ought therefore to meet with attention. In every case of obstruction of the œsophagus, proceeding from some foreign body being fixed in it, it is almost the universal practice to endeavour to push it into the stomach. When the obstructing substance is of a soft yielding nature, this may commonly be done with safety; but for the reason we have mentioned, it will very frequently do mischief when it is of a hard texture. In every case, therefore, of this kind, if the pain produced by the obstruction be not great; if the breathing is not materially affected; and if the passage is still so pervious as to admit of the necessary food and drink going down to the stomach, no attempt should be made for removing it; for we know from experience, that, in most instances, every thing of this kind is at last carried down, either by some degree of dissolution taking place in the substance itself, or by some partial suppuration forming in the œsophagus, by which that part of the extraneous body which was fixed in it is effectually loosened.

But where the obstruction of the œsophagus happens to be so complete as to prevent the passage of nourishment into the stomach, or when breathing is much interrupted by it, if it be not found practicable to remove the obstructing cause by other means, it comes to be a question whether any attempt should be made for taking it out by an incision. As the œsophagus lies deep, being covered with the trachea, and as different blood vessels of some magnitude lie contiguous to it, it has always been very justly considered as dangerous to make an incision into it; and in general it has been laid down as an established maxim never to attempt it.

But although no practitioner would think it advisable to perform this operation without some reason of importance, yet in such instances as those we allude to, where much danger must ensue, from any material
interruption

interruption being formed either to the passage of food into the stomach, or of air into the lungs, it would surely be preferable to give the patient a chance even from this doubtful remedy, than to allow him to meet a certain and miserable death.

Notwithstanding a very general prejudice which prevails against this operation, I think we are sufficiently warranted in recommending it in those cases of obstructions in the œsophagus that cannot be otherwise removed; and our opinion is founded on the following circumstances: Wounds in the œsophagus, whether inflicted by accident or design, have been frequently cured, different instances of which have fallen within my own knowledge; and of which the most remarkable was the case of a man who, in an attempt to destroy himself, cut the trachea on the right side completely through, and likewise penetrated the œsophagus: and among other instances recorded by authors of wounds in the œsophagus being cured, one is mentioned by Bohnius; in which from the food passing freely out at the wound, it was evident that the œsophagus was injured, and yet a cure was easily accomplished.

By various experiments, this operation is found to be safely practicable on dogs and other animals, in which the structure of the parts concerned is nearly the same as that of the human body: It has been repeatedly done on the dead subject, without any injury to the contiguous large blood vessels: And, lastly, there are at least two instances upon record, of its having been performed with safety and success on living subjects.* We have therefore no hesitation in saying, that cases may occur in which it may be proper to cut into the œsophagus.

Besides those obstructions arising from the causes we have mentioned, many instances have occurred in practice of the œsophagus being so completely stopped

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* Vide Memoires de l'Academie Royale de Chirurgie, tom. iii. p. 14. Paris, 1756.

up by constrictions and tumors, as to prevent all communication between the mouth and the stomach.

When these are situated in the superior part of the œsophagus, making an opening into it may be sometimes advisable, with a view to the conveyance of nourishment into the stomach : any advantage, however, to be expected in such cases from the operation, will in general prove merely temporary, as diseases of this nature have hitherto resisted every attempt that has been made for removing them.

By many anatomists the œsophagus is represented as lying evidently to the left side : if it does stretch to the left, it is in a very inconsiderable degree ; but this consideration may render it proper to prefer the left side for this operation ; the method of performing which is this : The patient being secured in the manner we have desired for bronchotomy, and his head being drawn back and kept firm by an assistant, an incision should be made with a scalpel at least two inches in length, directly through the skin and cellular substance, keeping close by the side of the trachea, and commencing about half an inch above the part where the obstructing substance is fixed when this can be done ; and where this is found to be impracticable by the obstruction being within the cavity of the chest, the incision should commence about an inch and a half above the breast bone.

The cellular substance being freely divided, the sterno-thyroidæi and sterno-hyoidæi muscles, together with a portion of the thyroid gland, will be brought into view : By a flat blunt hook, one assistant should pull the muscles gently to the left side, while another by the same means pulls the trachea somewhat to the right, so as to admit of the œsophagus being brought into view. If any large blood vessel is unavoidably divided, it should now be secured by a ligature ; and this being done, the operator is to proceed to open the œsophagus. When the piece of bone or other substance fixed in the passage is discovered by the finger,

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the perforation ought to be made directly upon it; and the cut, which ought always to be longitudinal, being made of a sufficient size for extracting it, this should be immediately done with a pair of small forceps. But when the cause of obstruction is found to lie within the cavity of the chest, a circumstance which will no doubt add to the hazard of the operation, the œsophagus ought in this case to be opened immediately above its entrance into the chest; care being taken, in order to give sufficient room for what is to follow, that the opening in the œsophagus be extended upwards, to the full height of the external incision. This being done, a large firm probe should be introduced in order to determine the seat of the obstruction, when by means either of a pair of straight forceps when it is found to be near at hand, or of crooked forceps when more deeply seated, the substance producing the mischief should be laid hold of, and cautiously extracted.

The operation being now finished, all our attention is to be given to the treatment of the sore, and nourishment of the patient. When the operation has been performed for some disease in the superior part of the œsophagus, till this is either removed by medicines, or by an operation, which in cases of compression from tumors may sometimes be done, our principal object is the conveyance of nourishment to the stomach: In such instances, there is a necessity for preserving the opening in the œsophagus. But when the operation has been performed for the purpose of removing a foreign substance fixed in the passage, as soon as this is accomplished, nothing should be omitted that can tend to produce an immediate reunion of the divided parts. If, in such circumstances, the patient be allowed either to eat or drink much, the opening in the œsophagus will be found difficult to heal, and may become fistulous. It will therefore be more prudent to recommend a total abstinence from solid food for several days, and to convey nourishment by injecting strong

strong broths by the anus, and allowing very small quantities of milk or soup to be now and then swallowed: By this means, by preventing the patient from moving his neck, and by treating the wound in the same manner with similar affections in other parts, we know from experience, that a cure may at last be expected; and at any rate, if the contrary should happen, and if the wound should remain fistulous, or even if death should succeed, still the operator will have the consolation of having attempted every probable means for the safety of his patient. In addition to what we have already said of the propriety of this operation in particular cases, we may remark, that the danger attending it is by no means so great as is commonly imagined. If the incision be made as we have directed, close by the side of the trachea, no injury can be done to any of the larger arteries or veins: The only arteries we have to be aware of, are those branches of the laryngeal artery which supply the thyroid gland. By proper caution, the principal arteries of the gland may be in general avoided; but if they should happen to be divided, they may commonly be secured by ligatures, especially if the external incision be sufficiently free. By proceeding with caution, too, that branch of the eighth pair of nerves, which from its inverted direction has been termed the Recurrent Nerve, and which runs close by the side of the œsophagus, may be generally avoided; and even in the event of some branches of it being divided, all the bad consequences that would probably ensue, would be some degree of weakness in the voice; for the muscles of the larynx, in which they are chiefly spent, do not depend entirely upon them.

CHAPTER XXV.

Of the Amputation of Cancerous Mammæ.

CANCERS have been known to attack almost every part of the body ; but they are more frequently met with in the breasts of women than in other parts.

In a former publication, we entered into a full consideration of the subject of cancer : We are now, therefore, to refer to that work, for the description, and diagnosis, as well as for the medical treatment of the disease ; and in this chapter, we are only to relate the removal of cancerous tumors of the mammæ by amputation.*

A real cancer is perhaps the most formidable disease to which the human body is liable : Wherever it may be situated, its consequences are to be dreaded : but more especially when seated on the mammæ. Various causes have been assigned for cancerous affections proving more malignant in this situation than in others : But the obvious reason of it is, that the breast, being entirely glandular, is more liable to cancers of an extensive size than other parts ; by which means, the blood is more liable to be infected by absorption, as a greater number of absorbents necessarily serve to convey matter from the surface of a large sore, than from one of a smaller extent.

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* The publication we here allude to, is, a Treatise on the Theory and Management of Ulcers, &c. Part II. Sect. viii.

We have elsewhere shown, that cancer, on its first appearance, is perhaps, in every instance, a local affection only ; that the cancerous diathesis is produced not by any original affection in the constitution, but by absorption from a local ulcer ; and hence we concluded, that every cancerous sore should be removed by immediate amputation, wherever this can be practised.

This, we think, ought to be an established maxim in the treatment of all cases of cancer wherever they are situated ; but from their being, as we have said, more apt to infect the general system, when seated on the mammæ, than on other parts of the body, this is an additional reason for early amputation in every cancerous affection of the breast.

As every scirrhus gland in this part is apt to degenerate into a real cancer, and as indurations of this nature have hitherto resisted the effects of every other remedy, we should on every occasion advise their removal by early amputation : This, we know, is a point with respect to which practitioners are not universally agreed ; as it is alledged by some, that scirrhus glands in the mammæ have been known to remain in an indolent, inoffensive state for a great length of time ; and therefore, that their removal ought never to be attempted till they have actually proceeded to a state of ulceration.

But this opinion, which is evidently founded in timidity, has been the cause of much unnecessary distress to such individuals as have followed it ; and has brought the operation of amputating cancerous breasts into a degree of general discredit which it does not merit. There is no fact of which I am more convinced, than that many more would recover by means of the operation, were it employed in a more early period of the disease, particularly while the glands are still in a scirrhus state, and before any matter is formed in them ; and as instances of their remaining in an indolent state for any considerable length of time are
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very rare, no dependence should be placed on their doing so. It is not a single instance or two, on which, in matters of this kind, an opinion ought to be formed: It is the result of general observation which ought to direct us; and every unbiassed practitioner must confess, that what we have here asserted respecting this matter, is, at least in general, well founded.

The propriety of early amputation of scirrhus breasts being admitted, and the practice established, it may possibly happen in a few instances, that scirrhus tumors of this part may be removed, which might have remained in an indolent state for some time longer. But as this will not frequently happen; as we have no means by which we can judge with certainty, between such cases as might remain for some time in this indolent state, and those, the progress of which would prove more rapid; and especially, as the advantages derived from early amputation are unquestionably great; no hesitation should occur in putting it universally in practice.

When practitioners, therefore, have an opportunity of amputating cancerous or scirrhus breasts early, they ought always to embrace it. It often happens, however, from an improper delicacy in patients, as well as from other causes, that practitioners are not consulted till the disease is far advanced. But although the advantages to be derived from the operation will in general be in proportion to the previous duration of the disease; yet on all occasions, even in very advanced stages of cancers, it is right to advise it, provided the parts affected can be completely removed. When, indeed, this cannot be effected, from the cancerous parts lying too deep, or from their being immediately connected with organs essentially necessary to life, by which amputation of the one cannot be performed without considerable injury being done to the other; in such circumstances, as the operation would not be of any real utility, it should not be recommended: For, as all the diseased parts could not

with propriety be removed, and as the cancerous virus is of a very affimilating nature, it would answer no beneficial purpose to amputate only a portion of them. But in every instance where the parts affected can be safely separated from the sound, as nothing but their removal can afford any chance of safety, we must again say, that no hesitation should occur in advising the operation. We shall now proceed to describe the method of performing it.

In every surgical operation it should be an established maxim to save as much skin as possible. Such portions of the common teguments as are really diseased, or that adhere firmly to the parts below, ought by all means to be taken away; but it can never be proper to remove more than this: For it is now universally known, that the cutis vera is never regenerated; and when destroyed, that the parts underneath are afterwards covered by a thin scarf skin only. This, however, is not the only objection to an extensive removal of skin: In every operation where much of it is destroyed, the wound which remains is necessarily much more extensive, and a cure is therefore much more tedious in effecting, than when little, or perhaps no skin has been taken away. Indeed, this is so much the case, that in operations where no skin has been removed, cures will be sometimes accomplished in a few days, which by the removal of much skin in the usual way of performing the same operation would be protracted to a great number of weeks.

This practice of removing much skin in the amputation of tumors, seems to have originated from an idea which has long and very universally prevailed, that the skin by much distention is apt to loose its tone so entirely as not to be able to recover it again; and therefore that in every such instance, a considerable part of it ought to be taken away. This, however, is by no means the case; and whoever will adopt a contrary practice, will find, that it rarely if ever happens, that a tumor becomes so extensive as to destroy the elasticity

lasticity of the skin which surrounds it. Inflammatory tumors, indeed proceed frequently with such rapidity to a considerable bulk, as to distend the skin more quickly than it can properly bear, and at last very commonly terminate in a complete rupture of it.— But in almost every other variety of tumor, the progress of the swelling is so extremely slow and gradual, that the natural contractile power of the skin is seldom or never so far destroyed by it, as to prevent it from recovering its tone again on the cause producing the distention being removed: And in cases of scirrhus or cancerous breasts, this contractile power of the skin is commonly so remarkable, that even when the breast is much enlarged, and when all the glandular part of it is removed, the skin, if it has been preserved, almost constantly contracts to the size of the remaining sore; so that in every case of this nature, none of the skin should be removed that is not either actually diseased, or adhering so firmly to the parts below, that it cannot be separated from them.

In proceeding to the operation, the patient must be either firmly seated in an arm chair, her head being supported with a pillow by an assistant behind, whilst her arms are properly secured by an assistant on each side; or when no objection is made to it by the patient, no position answers so well as placing her upon a table: In this manner, she is more easily secured; faintings are less apt to occur; and the surgeon proceeds with more ease through every part of the operation, than when she is seated in a chair. But in whatever position the patient may be placed, the surgeon should for certain be seated: Surgeons, indeed, perform this operation most frequently while standing before the patient; but no operator will ever attempt it in this manner, who has once experienced the advantages which result from doing it as we have directed.

In the first place, we shall suppose the operation to be performed for a scirrhus affection of the mamma,

while the skin is still perfectly sound, and without any firm adhesion to the parts underneath. In these circumstances, an incision should be made with a scalpel through the skin and cellular substance, from one extremity of the tumor to the other; taking care to direct the scalpel so as that it may avoid the nipple, by carrying it an inch or so to one side of it. When the disease has extended, as it sometimes does, beyond the mamma towards the sternum, as this commonly throws the longest diameter of the tumor across the body, it is necessary that this external incision run in a direction corresponding to the length of the tumor, by making it to commence at one side of the mamma, and to terminate at the other. But when the mamma alone is diseased, the external incision should run in a perpendicular direction, commencing at the most superior part of the tumor, and finishing at the most depending point of it. By this means any matter which may form during the cure is freely discharged; which is not the case when the incision runs in a transverse direction, unless the inferior portion of the teguments be afterwards divided from above downwards; which, in such cases, should always be done: For although, in some instances, a cure is easily obtained, even when this precaution is not attended to, yet in general some inconvenience would be experienced from the neglect of it.

The skin and cellular substance being thus freely divided, they should now be separated from the diseased parts below by a slow and steady dissection; and as soon as this is accomplished, the teguments should be kept asunder by assistants till all the glandular part of the breast is dissected from the pectoral muscle and other parts with which they are connected. With a view to preserve the pectoral muscle as much as possible from being cut by the scalpel, the arm of the affected side should be kept extended somewhat above a horizontal direction; by which means all the fibres of this muscle are preserved in a state of extension, and
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are thus less liable to be injured during the operation than when they are allowed to be much relaxed.

It often happens, indeed, that the diseased parts adhere to the pectoral muscle; and, on some occasions, although it was not previously suspected, even the periosteum of the ribs is found to be affected. In such instances, as there is a necessity for all the diseased parts being removed, no hesitation should be made in using every proper freedom with the pectoral muscle, as well as with any other part to which the mamma adheres; but whenever the removal of the parts affected can be accomplished without any violence to these parts, it ought by all means to be done.

On the mamma being entirely separated, the operator should examine with much accuracy, not only the surface of the sore, but underneath the edges of the divided skin; and if any indurated glands are discovered, they should all be removed. We ought to be particularly guarded and attentive in this part of the operation; for unless all the diseased glands be removed, no advantage whatever will be derived from it.

We have desired that the whole glandular part of the mamma be removed. Even where a small portion of it only is diseased, the whole of it should be amputated: for no good purpose can be answered by a portion of it being left; and in many instances some detriment ensues from it by the disease breaking out again in some part or other of the remaining glands. When indeed it is found, that a single loose gland only is affected, this may be taken out without any detriment to the rest of the breast; but whenever the disease is in any degree extensive, the whole mamma should be removed.

The next step in the operation is to secure the divided arteries, which should always be done with the tenaculum. As the arteries of the mamma are frequently small and numerous, much attention is necessary to discover them. All the coagulated blood should be effectually cleared away by a sponge and

warm water ; and if the patient is faint, a glass of wine or some other cordial should be exhibited ; by which means it often happens, that small branches of arteries are discovered which otherwise would have escaped notice, and which afterwards might have been productive of much hazard and inconvenience.

The blood vessels being thus secured, and the surface of the sore cleared of blood, the divided teguments must now be brought together ; and, in order to secure them exactly in their situation, ligatures should be introduced at those points where the operator sees that they will answer the purpose most effectually. I have sometimes employed slips of adhesive plaster for this purpose ; but nothing retains the parts so properly in their situation as ligatures ; and the pain with which they are attended is too trifling to be mentioned.

In securing the teguments in the manner we have directed, care must be taken to leave all the ligatures of the arteries hanging an inch or two out from the wound, so that they may be withdrawn at the end of three or four days ; which in general may be easily and safely done when they have been applied with the tenaculum.

In order to promote the adhesion of the teguments to the parts underneath, a moderate and equal degree of pressure should be applied over the whole by means of the napkin and scapulary bandage ; but before applying it, the parts should be all covered with a piece of soft lint spread with any emollient ointment, and over this there should be a thick compress either of lint or of soft old linen.

In this manner, when no portion of the teguments has been removed, as the whole sore will be covered with skin, a cure will be obtained by a process which surgeons in general have termed "the first intention ;" that is, without the formation of matter, merely by the adhesion of the teguments to the subjacent muscles.

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But it does not often happen that the operation is advised whilst this very favourable mode of practising it is admissible. In general, before a practitioner recommends amputation of a breast, and almost always before a patient consents to it, a considerable portion of the external teguments are so much diseased, as to render it necessary to remove them along with the glandular part of the mamma; or, if the skin be not actually diseased, it commonly adheres so much to the most prominent part of the breast, that it cannot be separated from it. In either of these events, some portion of the skin must be removed along with the mamma; and the easiest method of doing it is this: A longitudinal incision should be made, in the manner we have directed, through such parts of the teguments as are perfectly sound, whilst that portion of the skin which is in any degree diseased, or which adheres firmly to the glandular part of the breast, should be separated from the sound skin, by a circular or oblong incision, with which the longitudinal cut ought to communicate; and this being done, the operation is to be finished in the manner we have pointed out, by dissecting off every part that is indurated, along with that portion of the skin that has been surrounded by an incision such as we have mentioned.

In the after state of the sore, a material difference takes place between the operation we have now described, and that in which no necessity occurs for removing any portion of the skin. Where none of the skin is removed, the divided teguments, on being drawn together, cover the sore completely; an adhesion commonly takes place over the whole; and the cicatrix which ensues is very inconsiderable: But when any portion of skin is removed, a sore is always left, which not only renders the cure tedious in proportion to the quantity of skin taken away, but the remaining cicatrix is necessarily of the same size; by which a tenderness is left in the site of the disease,
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which I am convinced has often some influence in giving rise to a return of it.

The fore which remains after the operation we have last described, ought to be treated with the very mildest dressings. If any hemorrhagy occurs from the surface of the fore immediately after the operation, which is not removed by the ligatures applied upon the larger arteries, dry lint is, for the first dressing, the best application; but for all the after dressings lint covered with any emollient ointment should be preferred to every other remedy. An application of this kind never creates any pain, which dry lint very commonly occasions; and it admits of a more quick formation of granulations than any dressings of an irritating nature.

We have hitherto been supposing, that the disease occupies the mamma only; but it often happens, that the lymphatics leading from the breast to the armpit are both indurated; and that the glands in the armpit itself are much indurated and enlarged. In some instances too, a number of diseased glands are found to run from the breast to the clavicle, and to spread in considerable clusters along the under edge of that bone.

In such circumstances, the amputation of the mamma itself must be managed in the manner we have already advised; but besides this, an incision through the skin and cellular substance should be made to run from the farther extremity of every portion of hardened glands, and to terminate in the principal fore produced by the removal of the mamma. Thus, when the glands in the armpit are affected, although they might frequently be pulled out by a hook insinuated below the sound skin at the fore in the breast, and made to penetrate one or more of the glands to be removed; yet it answers the purpose better in every respect, to lay the glands first bare by an incision in the manner we have directed, and then to dissect them cautiously out with the scalpel. In the course of the dissection, a good deal of assistance may be obtained from passing a strong ligature through the largest of the glands; by which
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the whole cluster with which it is connected may be considerably detached from the parts below, so as to admit of their being more easily cut out with the scalpel: and in many instances these indurated glands run so near to the axillary artery, as to render it highly proper to use every probable means for rendering the dissection safe and easy.

In like manner, when a cluster of diseased glands is found to extend towards the clavicle, or in any other direction, after the teguments have been freely divided, the glands themselves should be totally removed; and both here and in similar affections in the armpit, the divided teguments should be brought together, and retained in their situation, either by compression alone, or when this does not appear to be sufficient for the purpose, by the introduction of one or more sutures or ligatures.

The point which we wish to inculcate most particularly respecting this operation is, the propriety of saving as much skin as possible. The necessity of this had rarely, if ever, occurred to our forefathers: And accordingly the common practice has been, to remove all the skin corresponding to the morbid parts underneath: by which much unnecessary pain is produced; a very extensive and very ugly sore occurs; and a cure is always very tedious in being accomplished. Instead of which, by the means we have recommended, although it will not often happen that the sore can be entirely covered with skin; yet on every occasion, a considerable part of it may for certain receive this very material advantage, by which the extent of the sore will be always much diminished; a cure will be proportionally more quickly effected; and by the cicatrix being less extensive, the risk of the patient suffering from future injuries will also be less.

The propriety of saving as much skin as possible, not only in this operation, but in every other where an extensive sore is commonly left, particularly in amputation of the extremities, has always appeared to me

to be a matter of such importance, that, from the time of my entering on the operative part of business, I have taken every opportunity of putting it in practice. Ever since the year 1772, I have managed cancerous breasts in the manner I have now mentioned, that is, by endeavouring to save as much skin as possible; and the advantages derived from it have been very considerable.

Till of late, the only means put in practice for securing the skin in its situation, so as to effect an adhesion between it and the parts underneath, was compression by the napkin and scapulary bandage, excepting in a few cases in which adhesive plasters were employed. But as ligatures give very little pain, and as they retain the parts more certainly in their situation than any other means, I now employ two, three, or more, according to the extent of the divided parts; and they always answer the purpose completely.

In the amputation of limbs, where it is evidently of much importance to have the remaining sores as completely covered with skin as possible, I have, during the above mentioned period, taken every opportunity of performing the operation in such a manner as has accomplished this very effectually. Within these few years Mr. Alanson of Liverpool, to whom the public is much indebted for the pains he has taken to improve this operation, has proposed another method of effecting this, by which the stumps may indeed be sufficiently covered; but objections occur to this mode of operating, which do not apply to the operation which I now allude to. These, however, we shall have an opportunity of considering more particularly in a subsequent part of this work; and shall now shortly observe, that the most exceptionable part of Mr. Alanson's operation seems to be, the removal of a portion of muscular substance at the extremity of the stump, by which the bone is not so effectually covered as when the whole is allowed to remain, and by which the matter which is formed in the
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course of the cure is apt to lodge in the hollow produced by this excavation of the muscles ; at least this has been the result of our trial of this operation in the Royal Infirmary here ; and, for the reason we have just mentioned, namely, a hollow being formed towards the extremity of the stump, this, it is probable, will not be an uncommon consequence of this operation.

These observations on the amputation of limbs are rather out of place ; but as they naturally arise from the subject I have been treating ; as the practice to which they relate is at present a frequent subject of medical conversation ; and as the chapter in which they ought to appear, will not have a place in this volume ; I flatter myself I shall stand excused for having slightly touched upon them here.

CHAPTER

 CHAPTER XXVI.

Of Affections of the BRAIN from External Violence.



SECTION I.

General Remarks on Affections of the BRAIN from External Violence.

AFFECTIONS of the Brain produced by external violence, often induce a very complicated set of symptoms; are attended with imminent danger, and give much embarrassment to practitioners: Accordingly, both with respect to the hazard with which they are attended, and the difficulty which occurs in the treatment of them, there is not perhaps any class of diseases to be compared with them. Wounds and bruises of the head, which at first exhibit no marks of danger, often induce a train of symptoms which elude the skill of the most experienced practitioner; and, without admitting of any mitigation, proceed to a fatal period, ending only with the death of the patient.

The very intricate nature of these disorders has excited the attention of practitioners from the time of Hippocrates downwards; but although some material improvements have been introduced into this branch of practice by the industry and observation of modern surgeons, yet whoever is accustomed to the treatment of these complaints will allow, that our knowledge of them is still very deficient. Authors of the last and preceding

preceding centuries have proposed modes of treatment in affections of the head, which modern practitioners do not admit; whilst in various points of importance surgeons of our own times differ materially from one another.

This uncertainty which prevails with respect to the nature and treatment of affections of the head proceeds from different causes; the principal of which appears to be the following.

I. The necessity of a sound and entire state of the brain for the purposes of life and health, together with the peculiar delicacy of its structure, make injuries, which in other parts of the body would have no bad effect, when inflicted on this organ productive of the most alarming consequences.

II. The brain being surrounded with a firm covering of bone, it is always difficult, and in many cases impossible, to obtain an exact knowledge of the nature of the affection, and of the parts more immediately injured: Inasmuch, that while the attending symptoms often lead us to presume that the brain has suffered, when no external marks of injury appear, we are frequently at a loss to determine where the instruments necessary for the relief of the patient should be applied: For this reason we have not, perhaps in any instance, so much cause to regret our very limited acquaintance with diseases, as in those affections of the head of which we are now treating; in which discoveries are often made upon dissection after death, a knowledge of which, if obtained a day or two sooner, might have put it in our power to save some valuable lives.

III. The most material impediment to our successful treatment of diseases of this class, is the impossibility of obtaining an easy and free access to them, even when we know with some certainty the parts chiefly injured. For, the brain being on all sides surrounded with bone, we can rarely accomplish so extensive an exposure of the parts affected as the proper treatment of them requires.

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IV. The manner in which diseases of the head from external violence have been commonly described, has had a considerable effect in rendering this part of practice perplexed and intricate. Authors who have wrote upon the subject, have, till of late years, attended more to the consideration of the causes which induce diseases of the head, than to the real nature and treatment of the affections themselves: Occupied almost entirely in describing the former, they have very universally passed over the latter with too much remissness.*

Thus, the various contusions and wounds to which the head is exposed, have been particularly described; and every variety of fracture which can possibly happen has been mentioned with a minute accuracy. The most trifling differences that can occur have been distinguished by particular appellations, and much ingenuity has been exercised in describing the extent with respect to length and breadth, and every other circumstance relative to the figure of a fracture: points of very little importance; and which, when so much insisted upon, tend to perplex not only the younger, but even the more experienced part of the profession. Nothing can set the impropriety of such distinctions in a stronger point of view, than our observing daily that no advantage is derived from them. It is the effect which fractures and other injuries have upon the brain, which we ought to consider, and not their external appearances.

If indeed the effects produced upon the brain by a fracture of the skull could be determined by the size and figure of the fracture, it might be proper to pay attention to the description of it: But every practitioner knows that this is not the case. Fractures of
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* The French authors upon this subject, were the first among the moderns who wrote upon it with any kind of precision. And among these, that judicious practitioner Monsieur Le Dran stands particularly eminent: I need scarcely observe too, that the public are much indebted to our countryman Mr. Pott, for his valuable work upon this subject.

the smallest size will in some instances be attended with the most dangerous symptoms, whilst in others those of the greatest extent produce no alarming appearance whatever. As long as it was imagined that the danger induced by accidents of this nature was in proportion to the size and figure of a fracture, we need not be surpris'd at the attention with which these circumstances were treated; but now that we know that no advantage can be derived from distinctions of this kind, we shall not consider it as necessary to dwell particularly upon them.

These are the circumstances which render the management of affections of the brain from external violence uncertain. In the subsequent part of this chapter, I shall endeavour to point out the means best calculated to extricate this part of practice from such uncertainty: but before proceeding to do so, it will not be considered as impertinent our giving a concise anatomical description of those parts which are most apt to suffer from injuries done to the head; by which means the subject will be rendered more clear and intelligible.

SECTION II.

Anatomical description of the Brain and surrounding parts.

THE brain and cerebellum, with their membranes the dura and pia mater, have for their protection a covering of bone, the Cranium.

The Cranium consists of eight bones, forming an oblong vault or box, flattened on the sides by the superior firmness of the lower part of the temporal bones, and by the constant action of the temporal mus-

cles : It is more capacious on the back part than before, the lobes of the brain being here more extensive.

The bones of the cranium or skull are, the frontal bone, the two parietal bones, the two temporal, the occipital, the sphenoid, and ethmoid. The first six of these are said to be proper to the skull, the two last being considered as common to it and to the face. The os frontis forms all the anterior or fore part of the cranium, the ossa parietalia the middle and upper part, and the os occipitis the posterior part of it : The ossa temporum form the lower part of the sides of the cranium ; and the sphenoid and ethmoid bones form the centre, or what is commonly termed the Basis of the Skull ; but as these two last mentioned bones lie so deep as to be entirely out of the reach of any surgical operation, any injury to which they may be exposed must in almost every instance prove fatal.

The other six bones are connected together by joints, or indentations, termed Sutures, which are five in number, the coronal, sagittal, lambdoid, and two squamous. The coronal suture extends over the head, from within a short space of the external canthus of one eye to within an equal distance of the other on the opposite side of the head : and in its course it serves to unite the frontal bone to the anterior edge of the two parietal bones. The sagittal suture unites the parietal bones on the superior part of the skull, by running almost in a direct line from the middle of the frontal bone to the middle of the os occipitis : In some instances this suture proceeds along the whole extent of the os frontis, and terminates immediately above the nose, by which that bone is divided into two equal parts ; and it has been said that instances have occurred of the occipital bone being divided in a similar manner. This, however, is confessedly a rare occurrence.

The lambdoid suture, so called from its resemblance to the Greek letter Λ , begins where the sagittal suture terminates, at the middle of the superior edge of the occipital

FIG. 1.

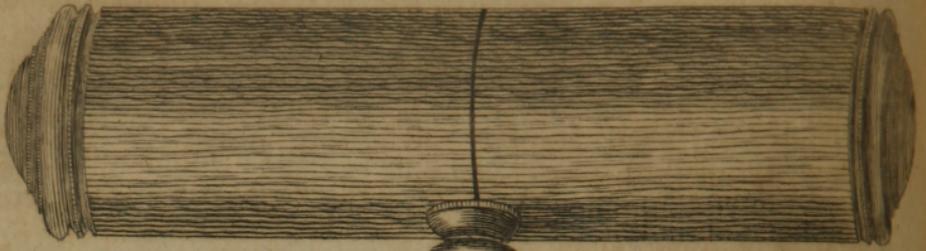
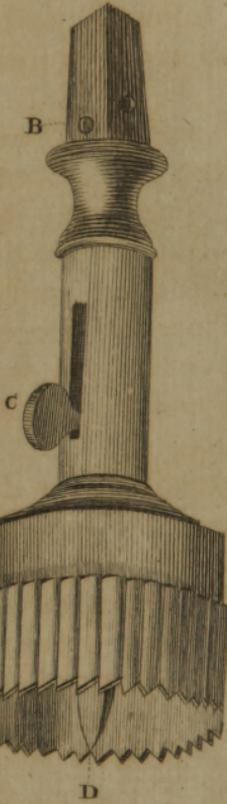


FIG. 2.



A



FIG. 3.

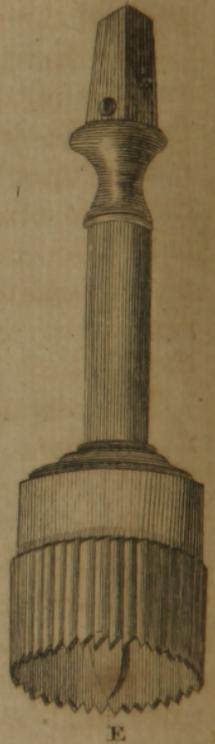
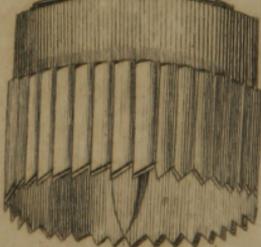


FIG. 4.



D



E

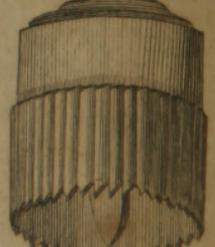


FIG. 5.



capital bone; and its two crura or legs stretching down to the basis of the skull, serve to unite this bone to the posterior edge of the two parietal and temporal bones. It is in the course of this suture, namely, the lambdoid, that these small irregular ossifications, termed ossa triquetra, are most commonly met with. In some instances they penetrate the whole thickness of the bone; but in others, they are chiefly confined to the external lamellæ of the skull, being scarcely to be observed internally.

The last futures we have to mention are the two squamous, which serve to unite the superior part of the temporal bones to the under and corresponding parts of the ossa parietalia.

In young people these five futures are almost universally met with, and it is necessary that practitioners should be well acquainted with their direction: but it is proper to observe, that in older subjects some of them are often wanting. Instances are even said to have been met with in which all the futures were completely obliterated; but this we believe to be a very rare occurrence. The sagittal and coronal futures, are those which are most frequently wanting.

Various advantages have been supposed to be derived from the formation of the skull by separate bones; but what particularly relates to our subject to mention is, that at the futures, a more direct communication by means of blood vessels takes place between the membranes of the brain and the teguments of the skull than could otherwise have been admitted; and by means of these futures too it is supposed that fractures will not spread so extensively as if the whole cranium was formed of one bone only.

There is reason indeed to think, that some advantage is in this manner derived from the skull being formed of different bones; as in the early stages of life, while the bones are not firmly connected together, fractures do not so readily pass across the futures as they afterwards do: But nature must surely have

had some other intention in this mechanism, otherwise the more perfect adult would not probably be deprived of an advantage which the earliest period of childhood enjoys in greater perfection; and although we have said, that the sutures have evidently some influence in young people of stopping the progress of fractures, their effect in this respect is very inconsiderable; for daily observation evinces, that fractures pass from one bone of the skull to another even while the sutures remain in every respect entire: A circumstance which every young practitioner especially should be aware of; for from many observations to be met with in some of our older writers, we would be apt to imagine that fractures rarely if ever traverse the sutures, which however they are frequently found to do.

The bones of the skull are for the most part composed of two lamellæ or tables, which are separated from one another by a kind of bony net work, or cancelli, commonly termed the Diploë. The external table is every where considerably thicker than the internal, which is firm, compact, and more brittle than the other; a circumstance which readily accounts for an occurrence which is sometimes met with in practice, namely a fracture and even a depression of this internal table of the skull, while the external surface of the bone remains entire: But it unfortunately happens, that the discovery of this is seldom or never made, till it is too late to reap any advantage from it; I mean, not till after the death of the patient.

In the directions given by authors for the application of the trepan, we are commonly desired to proceed with much caution in carrying the instrument through the inner table of the skull, while we are told that no danger can ensue from proceeding quickly in the first part of the operation till the outer table and diploë are fairly penetrated. This however proceeds upon the supposition of the two tables of the skull with the intermediate diploë being at all times to be distinguished

tinguished from one another. Now we know, that this is by no means the case; for the diploë diminishes gradually by age, and in many instances it has been so completely obliterated, as to take away entirely the appearance of two tables of the skull over the whole upper part of the head: And besides, there are some parts of the skull where the diploë is naturally wanting, particularly in different parts of the os occipitis, owing to the pressure produced upon this bone by the muscles with which it is covered. It is also wanting at the under part of the os frontis, where the two lamellæ of this bone separate immediately above the eyebrows in order to form the two cavities of the frontal sinuses; whilst in general it is more distinctly observed over all the superior part of the frontal bone, and through the whole extent of the ossa parietalia, than in any other part of the skull.

The external surface of all the bones which compose the superior part of the cranium is in general very smooth and equal, as is also the internal surface of the same parts of these bones, excepting the temporal bones and some part of the ossa parietalia, in which several deep furrows are commonly met with, produced by the pulsation of the arteries of the dura mater. But although the upper part of the skull is commonly smooth, almost the whole under part of it is very rugged and unequal. This inequality on the outside seems to be calculated for the better attachment of the different muscles which move the head: and on the inside it serves the purpose of supporting the different parts of the brain and cerebellum.

Almost the whole of the occipital bone is very unequal both in its external and internal surfaces; this is likewise the case with all the inferior part of the temporal bones, and with the under part of the os frontis; and therefore it is obvious, that none of these situations are so proper for the application of the trepan, as the more smooth and equal parts of the skull.

The skull is externally covered with the common teguments of the body, the skin, and cellular substance; with the frontal, occipital, and temporal muscles, and an aponeurotic expansion formed by a combination of the tendinous fibres of all these muscles; and more immediately by the pericranium, a very strong membrane which adheres firmly to every part of it, but particularly at the sutures.

It has by many been supposed, that the cavity formed by the bones of the skull is not naturally completely filled. This, however, is now known to be an erroneous opinion; for every part of this cavity is occupied by the brain and cerebellum, with their investing membranes the dura and pia mater.

The dura mater, which is a strong inelastic membrane, adheres every where to the internal surface of the skull by an infinite number of small vascular filaments, as is evident by those innumerable points of blood which appear over the surface of this membrane, and through the whole internal surface of the skull, on the cranium and dura mater being forcibly separated from one another.—This adhesion, however, of the dura mater to the cranium is much more firm at the sutures than in any other part, owing to the blood vessels which pass out here being not only more numerous, but of greater magnitude than in the rest of the skull. In other parts of the head, any vessels which pass from the dura mater to the skull seem to be chiefly intended to supply the internal table and the diploë with blood; but at the sutures an evident communication takes place by means of blood vessels between the external coverings of the skull and the membranes of the brain; a circumstance which practitioners ought to be aware of, as it not only serves to explain many of the phenomena which occur from injuries done to the head, but likewise points out the most probable means of guarding against them. By our knowledge of this part of the anatomy of the head we learn, that the sutures are not the most eligible part for the application

plication of the trepan : On the contrary, that this operation should never be performed in the course of a future, if the same intention can be answered by applying the instrument on any other part ; and that, by the firm adhesion of the dura mater to the skull at the futures, matter or blood collected on the surface of that membrane on one side of a future, will not be evacuated by a perforation made on the opposite side of it.

The dura mater, the firmness of which renders it extremely proper to support the brain by its different productions, is of too hard a texture to be immediately connected with that very delicate organ. It is therefore every where lined with another soft membranous expansion, the pia mater, which is immediately applied over the whole surface of the brain and its convolutions.

The great quantity of blood sent to the brain and its coverings is supplied by the carotid and vertebral arteries, and is again returned by the jugular veins ; but before reaching these veins, it is emptied into a number of sinuses or reservoirs, formed by productions or duplicatures of the dura mater : These sinuses all communicate with each other. They are very numerous on the back part of the head ; but the most material for surgeons to be acquainted with, are the longitudinal, which runs along the middle and upper part of the head directly in the course of, and firmly attached to, the sagittal future ; and the two great lateral sinuses, in which the longitudinal sinus terminates at the middle and upper part of the cerebellum ; at which part these two sinuses commence, the one going to the right and the other to the left, and passing down to the basis of the skull, they there terminate in the jugular veins.

This general account of the anatomy of these parts will serve to render the consideration of the injuries to which they are liable more clear and intelligible ; while a more minute description of them would not only be

incompatible with the nature of this work, but would not be in any respect necessary for our subject; for the most exact description that can be given of the different parts of the brain would be of no advantage to practitioners in the treatment of those affections to which it is liable. We may in general observe upon this point, that the brain is an organ essentially necessary for life; and that its parts cannot be deranged, either by wounds, contusions, or compression, but with the utmost hazard: For although we sometimes meet with instances of the brain being much injured, and even of parts of it being evacuated at wounds, without any important consequences ensuing; yet these are rare occurrences, and are by no means sufficient to invalidate this general observation, that a sound and entire state of this organ is highly necessary for the purposes of life.

I shall now proceed to treat more particularly of the nature of those injuries to which the parts that have just been described are liable; and in doing so, instead of enumerating in separate sections, as has commonly been done, the various causes of affections of the head, and the symptoms produced by each of these, I mean to consider the general effects which such causes produce upon the brain, and to point out the manner in which they appear to operate, together with the means which from experience have been found most effectual in preventing a fatal termination of them.

All the symptoms of affections of the brain from external violence seem evidently to originate from one or other of the following circumstances; namely, from compression of the brain, from commotion or concussion, and from inflammation. These we shall proceed to consider in separate sections, in the order they are here mentioned; and as far as the intricate nature of the subject will admit, we shall treat of them as distinct and unconnected with each other: For although we are not to expect that the symptoms arising from the
circumstances

circumstances now enumerated, are always distinctly and precisely marked, and without connection with each other; yet it frequently happens that they are so, and it is in their separate uncombined state only that any description can be given of them. Practitioners of experience must indeed know, that causes frequently occur, by which all the affections of the brain we have mentioned are induced at the same time in the same patient: And in such instances, the symptoms which they produce are no doubt so very confused as to be with much difficulty distinguished: Thus, a stroke upon the head, attended with symptoms of concussion, is frequently accompanied with those which proceed from compression; and these again are in some instances succeeded by all the symptoms of inflammation.

The appearances which are induced by the various combinations of these can be learned only from practice and observation; but an accurate knowledge of them as they occur in a separate and unconnected state, will contribute much in directing the proper treatment of them under whatever form they may occur.

S E C T I O N III.

Of Compression of the Brain from External Violence.

A GREAT variety of symptoms are enumerated by authors as indicating a compressed state of the brain from external injuries; but the most frequent, as well as the most remarkable, are the following: Giddiness; dimness of sight, stupefaction; loss of voluntary motion; vomiting; an apoplectic stertor in the breathing; convulsive tremors in different muscles; a dilated state of the pupil, even when the eye is exposed to a clear light; paralysis of different parts, especially

especially of the side of the body opposite to that part of the head which is injured ; involuntary evacuation of the urine and fæces ; an oppressed, and in many cases an irregular, pulse ; and when the violence done to the head has been considerable, it is commonly attended with a discharge of blood from the nose, eyes, and ears.

Some of the milder of these symptoms, such as vertigo, stupefaction, and a temporary loss of sensibility, are frequently induced by slight blows upon the head ; And as they often appear to be more the consequence of a shock or concussion given to the substance of the brain, than of compression induced upon it ; so they commonly soon disappear, either by the effects of rest alone, or of the other means we shall afterwards have occasion to point out. But when any of the other symptoms take place, such as convulsive tremors ; dilatation of the pupils ; involuntary passage of the urine and fæces ; and especially when much blood is discharged from the nose, eyes, or ears, we may always conclude with a good deal of certainty that much violence has been done to the brain, and that compression in one part or another is induced upon it.

In the anatomical description of the cranium and brain, we observed, that the cavity of the skull in a state of health is completely filled by the brain, no vacuity whatever being left between them : It therefore necessarily follows, that compression of the brain will be produced by whatever tends to diminish this cavity.

A diminution of the cavity of the skull may be effected by various causes ; by fractures attended with depression of any part of the bones of which it is composed ; by the forcible introduction of any extraneous body through both tables of the bone ; and by the effusion of blood, serum, pus, or any other matter. The same effect may be likewise produced by the thickening of the bones of the head in the lues venerea, and
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by water collected in the ventricles of the brain in cases of hydrocephalus internus.

These two last mentioned causes, however, proceed from, and are connected with, diseases which it is not our business in this place to consider. The effusion of pus or any other kind of matter not evidently either blood or serum, must always be the consequence of inflammation, and will be taken into consideration in a different section. And as the introduction of extraneous bodies into the brain must always be attended with a fracture and depression of some part of the skull, the consideration of the one is necessarily connected with that of the other. We shall now, therefore, proceed to speak more particularly of fractures attended with depression, and shall afterwards consider the other general cause of compression of the brain, effusion of blood or of serum.

§ 1. *Of Compression of the Brain from Fractures attended with depression of the Skull.*

Fractures of the skull, as we have already observed, have been distinguished by a variety of appellations, according to their figure, extent, &c. But to retain these distinctions could answer no good purpose; and as it might embarrass the younger part of the profession, we do not mean to introduce them.

The only general distinction of fractures which it is necessary for us to retain is, into those which are attended with depression, and those which are not. All the variety of the latter we mean to comprehend under the denomination of Fissures; but the consideration of these belongs more properly to a different section.

Fractures of the skull may be produced in various ways: By falls from a height; by blows with sharp or blunt instruments and by missile weapons, such as stones, balls, &c. thrown from a distance.

Authors who have entered minutely into this part of the subject observe, that much advantage may be derived

derived in the treatment of fractures, from a knowledge of these circumstances; and that we may even ascertain with some precision, the degree of violence that has been done to the brain, from being acquainted with the cause which produced the injury.

But although it is proper for every practitioner to inquire into the nature of the cause by which a fracture has been effected, yet we are by no means to imagine that any material advantage is to be derived from this source: we know indeed, that a fracture of the skull produced by a blow with an obtuse or blunt instrument, or by a fall from a considerable height, is frequently attended with more alarming symptoms than a fracture of the same extent produced by a sharp instrument. This, however, is far from being universally the case; and as it is impossible to ascertain the extent of any injury done to the brain by this circumstance, little or no dependence should be placed upon it.

In the management of fractures of the skull attended with depression, the indications are,

1. To discover as exactly as possible the site, the course, and the full extent of the fracture.
2. To obviate the effects of the injury done to the brain, by elevating or removing all the depressed parts of the bone.
3. To endeavour to complete the cure by the application of proper dressings, and attention to the after treatment.

These are the objects which in accidents of this nature we ought to have in view. In many instances, we are prevented by the situation of the fracture and other circumstances from effecting them; but in others, when these indications can be accomplished, we are frequently able to afford more certain relief to patients, than it is ever in our power to do in the treatment of any other malady.

- In fractures of the skull, the teguments corresponding to the injury done to the bone, are frequently cut, lacerated,

lacerated, or even altogether torn away. When this is the case, the state of the bone is at once rendered evident; the fracture is immediately discovered, and the surgeon is left at liberty to employ the most proper means for obviating the effects of it: But when the skin and other teguments are entire, it often happens, even when from a concurrence of circumstances we are tolerably certain of the existence of a fracture, that much difficulty occurs in ascertaining it.

When any external mark of injury is met with, particularly when a tumor is observed in any part of the head, with evident appearances of its proceeding from a recent contusion, the attending symptoms will in all probability be found to originate, from a fracture directly underneath; and on the bone being laid bare, in the manner we shall afterwards mention, the course of the fracture will in general be discovered.

But every practitioner knows, that injuries done to the head frequently produce affections of the brain, and even fractures of the skull, without leaving either tumor or any other external mark by which they can be discovered. In this situation, the whole head should be shaved, when it will sometimes happen, that an inflammatory redness of a particular spot, which could not be observed till the hair was removed, will lead to a discovery of the part affected. But when no tumor, inflammation, or any other mark of injury is discovered, we may on some occasions be directed to the seat of the accident, by pressing firmly over the whole head; and if we find upon repeated trials, that pressure produces more pain in one particular part than in others, a circumstance of which we may be convinced if the patient moans much upon pressure being applied to it; and if he puts up his hand or draws away his head on this trial being repeated, we may conclude with much probability that this is the seat of the injury.

In circumstances, such as we are now considering, so fraught with danger to the patient, and so perplex-

ing as they frequently are to practitioners, nothing that can throw light upon the nature of the case should be overlooked. If the patient raises his hand, and applies it frequently upon or near to the same part of the head, even this will merit attention; for in this manner the site of a fracture has, in some instances, been discovered.

When therefore the symptoms of a compressed brain are evidently marked, we ought, without hesitation, to proceed to examine the state of the cranium, wherever appearances clearly point out, or even where they lead us only to conjecture, where a fracture is. We do this by laying the bone bare by making an incision with a scalpel through all the external coverings of the skull.

In performing this operation, when the bone is previously found to be much injured, which in some instances is the case even when no laceration occurs in the skin directly above it, the incision through the integuments should be made with much caution; otherwise the brain may be hurt, either by the knife pressing in some portion of detached bone upon it, or even by the point of it passing in between two of the separated pieces. But when the bone upon which the incision is made, is not either broke into different pieces, or when the edges of the fractured pieces have not receded from one another, and do not in any degree yield to pressure; the division of the skin and other teguments may be then performed with freedom, by cutting through the whole of them down to the bone, with one stroke of the scalpel.

The sole intention of this operation is to bring those parts of the bone which have been injured clearly into view; but although the means of effecting this should be extremely simple, a very painful and severe method of doing it has been commonly recommended. It has been in general supposed, that in fractures of the skull, the parts affected cannot be sufficiently exposed, either for the purpose of tracing the course of the fracture,

fracture, or, when necessary, for applying the trepan, unless a portion of the skin and other teguments be altogether removed : And with this view, some have advised a crucial incision to be first made, and the corners to be cut off. Others have recommended an incision of the form of the letter T ; while by many we are directed to remove a circular or oval piece of the teguments at once.

Various objections, however, occur to all of these. They not only produce a painful wound, which is commonly very difficult to heal ; but by exposing a considerable part of the skull, tedious exfoliations sometimes take place, which might have been prevented ; and the covering which nature afterwards provides for the denuded bone never answers the purpose so completely as the teguments which were removed. Even all of these objections, however, to the practice we have mentioned, should be considered as trifling, and should not be regarded, if by more simple means we could not discover the extent of fractures, and if we could not likewise by the same means apply the trepan, or any other remedy which the treatment of them might require. But as both of these objects can perhaps in every instance be accomplished by a less exceptionable method, the other ought to be laid aside.

Upon a simple incision being made in the manner we have directed, the teguments always retract so considerably as to admit of a very free examination of the now denuded bone ; and if a fracture is discovered, the course of it may be always traced just as effectually by this incision being extended along that part of the bone in which it is found to run, as if a considerable portion of the teguments was removed : And the same retraction of the divided parts will in almost every instance admit of the application of the trepan. In a few cases, where the bone is fractured in different directions, it may be necessary to remove a small corner of the teguments which have been divided : but
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this I know from experience is never the case; and where the fracture is found to be so, a very small portion only of the scalp should be taken away.

Upon the teguments being divided, if the skull is found to be fractured and depressed, the nature of the case is thus rendered clear and obvious; and the means which we shall afterwards point out for the treatment of fractures attended with depression, should be immediately employed. But even in cases where no outward appearance of a fracture is met with, and where no tumor, discolouration, or other external mark of injury is discovered, if the patient continues to labour under symptoms of a compressed brain; if the pericranium has been separated from the bone; and especially if this last has lost its natural appearance, and has acquired a pale white or dusky yellow hue; the trepan ought to be applied without hesitation at the place where these appearances mark the existence of some injury. We shall afterwards endeavour to show, that, by this means alone, blood or serum, which may have been effused, and by which the compression may be induced, can be removed: for it would be highly improper in cases of this nature, to trust to the absorption of the extravasated fluids, as by some we are advised to do; the chance of a cure from this quarter being extremely doubtful.

Again, although no mark either of fracture, or of any disease underneath, should appear on the external table of the bone newly laid bare, yet there is a possibility that the internal table may be fractured and depressed. This indeed is not a common occurrence, but various instances of it are recorded by authors: I have met with it in different cases; and other practitioners, on whose accounts I can place the most perfect confidence, likewise mention it.

We formerly observed, that the internal table of the skull is thinner and more brittle than the external: how far these circumstances will explain the fact we have now mentioned, I will not pretend to say; but
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this is certain, that the injury done to the brain by a fracture and depression of the internal table of the skull will be as great, and will prove as certainly dangerous as if the whole thickness of the bone had been beat in upon it : This is therefore another motive for the application of the trepan in every case accompanied with symptoms of a compressed brain, even where no external mark of depression is discovered.

It will happen indeed in many instances, that no relief will be obtained from the application of the trepan, even where the symptoms are evidently such as proceed from a compressed state of the brain, induced either by a depressed portion of bone, or by extravasation of blood or serum. This want of success from the operation of the trepan may proceed from a concurrence of causes which we shall afterwards have occasion to mention : but the most fatal in general of all of them, is that which we commonly term a Contra fissure, and what the French term a Contre coup ; in which the skull is fractured and sometimes depressed, and blood or serum perhaps effused on the surface of the brain, at a part very distant from that which received the blow, and where alone there is any apparent or external mark of mischief.

Many have doubted the reality of such an occurrence ; for, as it cannot be easily accounted for, so it is alledged that it has rarely or perhaps never been met with. As it is not our intention in this work, to enter into minute theoretical discussions, we shall not attempt to explain the manner in which contra fissures of the cranium may be produced ; and shall just shortly observe, that doubts upon this point can have been entertained by speculative writers only ; for every practitioner of experience must have met with different instances of seeing the existence of contra fissures clearly ascertained.

I will not pretend to say, that a blow received on one side of the head will necessarily and certainly produce a fracture or other mark of injury on the opposite

side ; neither does it appear, that the part exactly opposite to the place where the blow has been received, will suffer more readily than other parts of the head, at the distance of only two or three inches from it. All I wish to establish upon this point is, that the skull may be, and frequently indeed is, fractured in parts not immediately contiguous to those upon which the blows producing the fractures were inflicted ; and that this often happens when no external mark can be discovered upon the teguments corresponding to such fractures, and while the bone remains perhaps altogether entire on the part which more immediately received the injury.

We shall therefore consider it as matter of fact, that the skull in many instances is liable to be fractured in parts at some distance from those which have more directly received an injury ; and some advantage we think may be derived from having this in our view. In ordinary practice, if no benefit is reaped from the application of the trepan ; if there is no fracture discovered of the internal table of the skull, or no extravasation on that part of the brain newly denuded by a removal of a piece of the bone ; and if blood letting, laxatives, and the other means usually employed, do not remove the symptoms of compression ; it is in general concluded, that they depend, either upon a concussion of the brain, or on extravasation in some of the internal parts of it where the effects of an operation cannot reach ; and accordingly the patient is left to his fate, without any attempt being made for his relief.

In this, however, I think we are liable to much just censure and blame : For although a patient in such circumstances must undoubtedly be considered to be in great danger, and although the chance of his recovering by any means that can be employed is very inconsiderable, yet still he ought to receive this chance : Nothing we can probably attempt will add to the hazard of his situation ; so that if there is the least probability

bility of any advantage being to be obtained from any thing in our power to accomplish, it ought not to be omitted.

The whole head should be again examined with much accuracy; and by pressing firmly, slowly, and deliberately, over every part of it, if even the smallest degree of sensibility remains, the patient will complain, either by moans or signs with his hands, when pressure is applied to any part that is fractured. I have seen different instances of fractures being detected in this manner, which in the ordinary way of searching for them would have escaped notice.

In whatever part of the head the patient complains, on pressure being applied to it, the skull should be laid bare by an incision in the manner we have mentioned. If both tables of the skull are fractured and depressed, the cause of all the mischief will thus be discovered: But even although no such depression or fracture should be met with in the external lamella of the bone; as there is at least some chance of mischief being met with underneath, either from a fracture of the internal table or from extravasation, and as nothing can possibly save the patient but the removal of this, the trepan ought to be immediately applied; and wherever there is the least reason to suspect, either from pain being induced from pressure applied in the manner we have directed, or from any other circumstance, that mischief may be concealed, as long as relief has not been obtained by what was previously done, the operation ought still to be repeated, as being the only means from whence any advantage can be derived.

This, however, leads to a point which will require a farther and more extensive discussion; I mean, the effects produced upon the brain by the removal of a portion, or perhaps of different portions, of the cranium, by the trepan.

By many of our older writers on this subject it is said, that the use of this remedy must always be at-

tended with considerable hazard ; and in support of their opinion, they not only adduce a variety of facts, but employ much ingenious reasoning on the probable influence of the air finding a free access to the surface of the brain, an organ which nature has taken particular pains to protect from it.

Practitioners of modern times, however, have adopted a very different opinion upon this point ; and they even go so far as to say, that no bad effects can be ever produced by the application of the trepan considered abstractedly ; and that in fact this operation never proves dangerous of itself, and is occasionally only apparently so, by being employed for the removal of symptoms, for which this as well as every other remedy is altogether inadequate. In consequence of this, the trepan, in every injury to which the head is exposed, is applied with much freedom : In most instances, probably with much propriety ; but in others, I am convinced, with very dangerous consequences.

In our practice we should endeavour to avoid both extremes. For, although I am perfectly clear and decided upon the propriety of applying the trepan wherever it is indicated by symptoms of a compressed brain ; and where these symptoms must in all probability prove fatal, if the cause which produced them is not soon removed ; yet I am equally satisfied, that it is the presence of such symptoms only which ought to indicate this operation ; and that it should never be employed, as it too frequently has been, merely for the prevention of them.

In the one case, no additional risk can be incurred by the use of the trepan ; and as the patient will in all probability suffer if it be not employed, no doubt should be entertained of advising it : But, as I am perfectly convinced, from attentive observation of the effects of this operation upon the brain, that it is by no means an innocent remedy, and on the contrary, indeed, that it is frequently productive of dangerous symptoms which otherwise would not have appeared, I would

I would never think of advising it but for the removal of symptoms already induced ; that are evidently of a dangerous tendency ; and that cannot be obviated in any other manner.

We shall again, in a subsequent part of this chapter, when treating of fissures, have an opportunity of entering upon this subject more minutely. In the mean time, as we are presently to describe the operation of the trepan, I thought it proper in this general way to mention the opinion I had formed of the nature of it.

Having thus considered the first general indication to be kept in view in the treatment of fractures attended with depression of the skull, we now proceed to the consideration of the second, which comprehends the means best adapted for the removal or elevation of a depressed portion of bone. We have already seen, that some variety occurs in fractures attended with depression ; and the means employed for the removal of them, are likewise various.

In accidents of this kind, it sometimes happens, that the corresponding teguments are either altogether removed by the cause which produced the injury, or at least are so much lacerated as to admit of a free examination of the bone ; but when it is otherwise, and when the teguments are either not divided in any part, or are not sufficiently laid open, the first object of the surgeon, as we have already observed, should be, to get the head shaved, and then to divide the skin and other teguments with a scalpel through the whole extent, and directly upon the course of the fracture or other injury. If a fracture is met with, and if it is found to proceed in a straight line, this incision should have the same direction : Or if it takes an angular course, the incision should likewise do so ; for the sole object of the one is to bring the other as completely as possible into view.

In making an incision in the manner we have now mentioned, it frequently happens that one or more blood vessels are divided, which continue for some

time to discharge freely ; and these we are commonly directed, before proceeding farther, to secure by ligatures. If the patient is naturally weak, or if a sufficient quantity of blood has been already evacuated, this will no doubt be proper : But as the membranes of the brain are commonly much injured by depressions of the skull, and often suffer from much inflammation ; and as nothing in general proves so effectual in removing or preventing this as a plentiful discharge of blood from the contiguous parts ; the arteries which have been divided by the incision should be always allowed to bleed in proportion to the patient's strength, when they will commonly retract, and give no farther trouble ; but if they still continue to discharge, they can be easily secured by a proper application of ligatures.

It is scarcely necessary to observe, that as patients in every ailment bear the loss of blood easiest in a horizontal posture ; so in the operation of which we are now treating, it is of importance to attend to this. In most cases of this kind the patient is commonly indeed allowed to remain in bed ; but the head and body being supported, as is usually done, by assistants, all the advantages to be derived from a horizontal posture are thus in a great measure lost ; and besides, the height of a bed is not in general sufficient for admitting of that freedom and ease to the operator which such a tedious operation, as this very commonly proves, evidently requires. For these reasons, nothing answers so well as laying the patient upon a firm table of an ordinary height ; and his head being placed upon a pillow, it can in this manner be preserved more firm and steady than by any other means, while at the same time all the advantages of an horizontal posture are obtained.

The larger arteries which have been divided being stopt, either by ligatures or any other means, we are commonly directed to delay the remaining steps of the operation, either for a few hours, or perhaps till the following

following day, in order to have all the oozing from the smaller vessels entirely removed: But as soon as the principal vessels have been secured, any discharge from the rest of the wound proves very insignificant; and as it may always be easily commanded by the edges of the incision being covered with dry lint and moderately compressed by an assistant, and as the pressure on the brain should always be removed as quickly as possible, the operation should be in general finished immediately.

The extent of the fracture being determined in the manner we have mentioned, and the blood from the incision being entirely stopt, we are now to endeavour to elevate the depressed portion of bone: The propriety of this measure is sufficiently evident: It has been admitted by practitioners of every age; but they have differed much in the mode of effecting it.

The practitioners of the last and the preceding centuries were in general timid in every operation of importance, and especially in such as were performed upon the head; and as they were commonly averse, as we have already remarked, to expose any considerable part of the brain, they endeavoured to elevate depressions of the cranium, either without penetrating the bone at all, or by means of very small perforations only.

For the purpose of perforating the skull, a kind of circular saw, which has commonly been termed a Trepan, and of which we shall give a delineation, was always employed; but the opening formed by it was so very small, that it required a great number of applications of it, even in ordinary cases, to accomplish the views of the operator: Many inconveniences ensued from this; to remedy which, various improvements upon this instrument were suggested, and fig. 1. Plate XXVII. represents the result of all of these. Thus improved, it removes a much larger piece of bone at once; and as it is entirely cylindrical, it penetrates

the skull more easily than a conical saw, which till of late was the only form in use.

In one circumstance, however, relating to this instrument, modern surgeons have not made any improvement, but have rather injured it materially by forming it so as to render the operation of perforating the skull with it both more difficult and more tedious than is necessary. The instrument delineated in Plate XXVII. cuts the bone not only more quickly, but, in the hands of those accustomed to use it, with perfect safety. The timidity of some operators, however, has made them imagine, that this instrument cannot be used but with considerable hazard of passing too suddenly through the bone at the end of the operation, by which the brain would be unavoidably injured; and they have accordingly invented another, which necessarily divides the bone very slowly, and which they therefore suppose will perform the operation with more safety. This instrument is termed a *Trephine*, and is delineated in Plate XXVI. fig. 1. It is not, however, possessed of any advantage over the other, not even that of being more safe for perforating the bone: For the same degree of force must be applied by the operator with each of them; and it has this very material defect, that it requires more than double the time to perform the same operation that is necessary with the *trepan*. It has, now, however, been long almost the only instrument employed for this purpose in many parts of Europe, especially in Britain; so that the prejudice in favour of it may probably continue it in use: but whoever will attend to the principles on which the *trepan* and it are formed, will soon see that the *trepan* is greatly preferable.

When it was necessary to penetrate the skull, the *trepan*, in its then unimproved state, was formerly the instrument chiefly employed. Others indeed were used for the purpose of forming openings in the bones: But they were so extremely rude and unmanageable, that it is not necessary to give any description of them; and

PLATE XXVI.

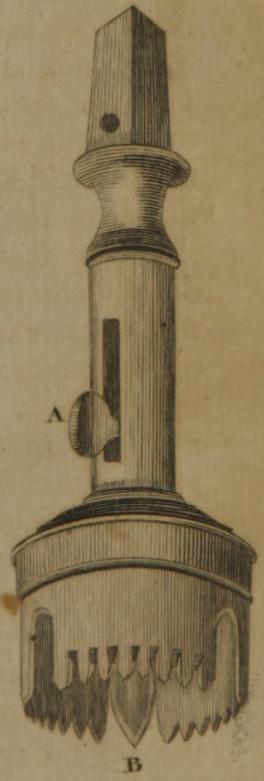
FIG. 1.

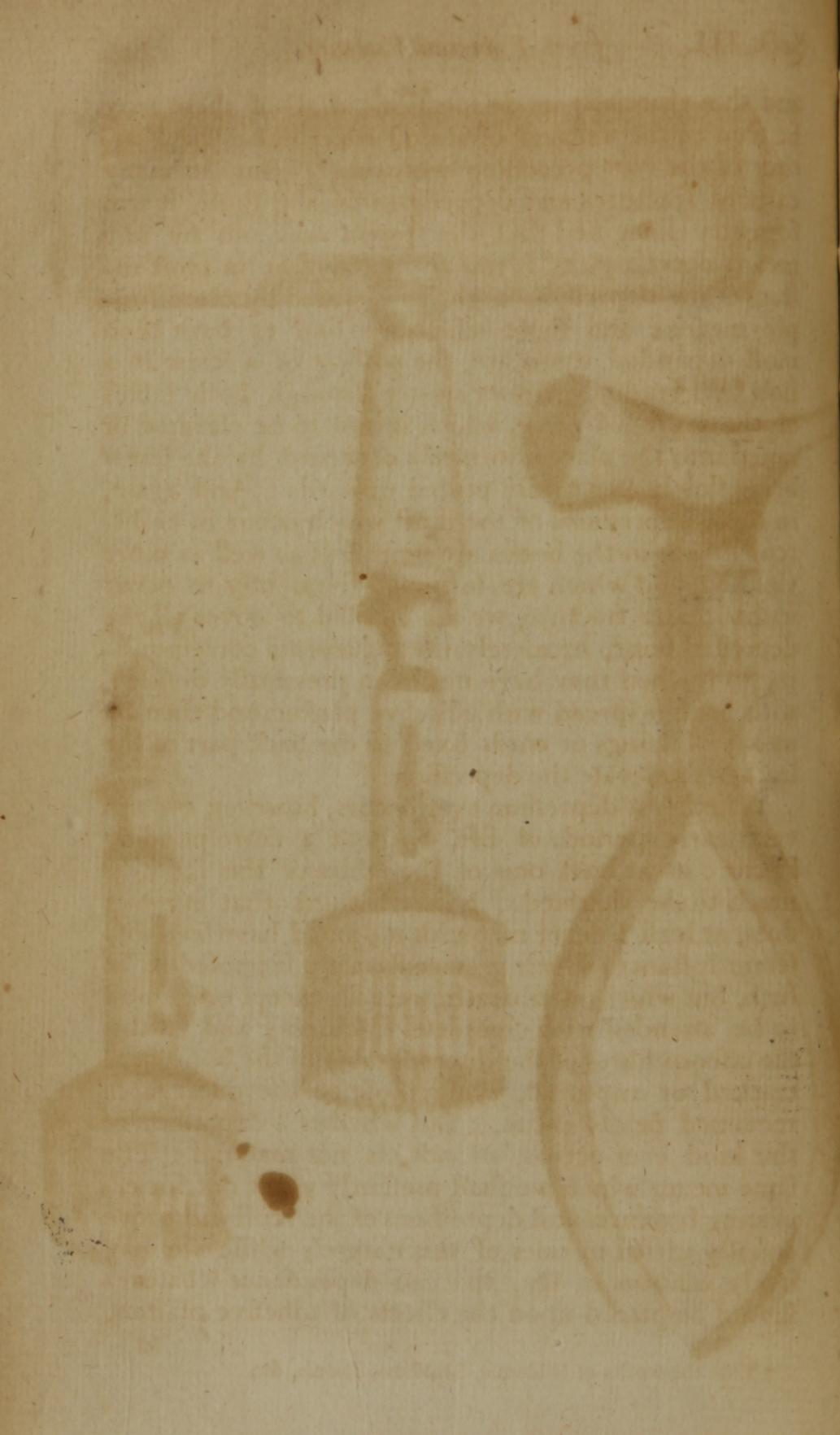


FIG. 2.



FIG. 3.





and this especially as delineations of all of them may be seen in the writings of almost every chirurgical author of the two preceding centuries.* But, in many cases of fractures and depressions of the skull, it was formerly imagined that the trepan was not by any means necessary, as it was supposed that in most instances the depression might be elevated by more simple means; and those which we find to have been most depended upon are, the passing of a screw in a slow and gradual manner nearly through both tables of the depressed piece, which is now to be elevated or raised into the place it formerly occupied, by the screw being slowly and firmly pulled upwards: And again, in those depressions of the skull which occur in children, in whom the bones are more soft as well as more yielding, and which are supposed frequently to occur without any fracture, we are advised to cover all the depressed bone, or merely the teguments corresponding to it when they have not been previously divided, with leather spread with adhesive plaster, and then by means of strings or cords fixed to the back part of the leather to elevate the depression.

Whether a depression ever occurs, however, even in very early periods of life, without a corresponding fracture of at least one of the tables of the skull, is much to be doubted. I rather think that it never does, at least I never met with it; and I have seen different instances which previously were supposed to be such, but which, after death, were all except one found to be attended with complete fractures; and in this the osseous fibres of the internal table of the bone were cracked or ruptured, while those of the outer table remained nearly entire. But whether a depression of this kind ever occurs, or not, is not material: The same means which we shall presently point out for elevating fractures and depressions of the skull will prove equally useful in cases of this nature; while we may freely venture to say, that no dependence whatever should be placed upon the effects of adhesive plasters,

as

* Vide the works of Hildanus, Scultetus, Dionis, &c.

as they are evidently very inadequate for the intended purpose.

With respect to the utility of a screw for raising depressed portions of the cranium, the powers of such an instrument would no doubt in many instances be fully sufficient for elevating the depression; but as it could neither remove any sharp points of bone which might be beat in upon the brain, nor serve to evacuate any effused blood which frequently accompanies fractures attended with depression, this means of removing depressed portions of bone will never probably be received into general use. It has commonly too been objected to this instrument, that it cannot be introduced but with considerable hazard of forcing the depressed piece of bone upon which it is applied farther in upon the brain; and therefore that much mischief must thus be induced by it. In many instances, however, the screw might be employed without any injury being done in this manner: for the force necessary to pass forward a screw is very inconsiderable; so that unless where a portion of bone is altogether detached from the rest of the cranium, a screw might frequently be introduced into the depressed piece with little or no hazard of forcing it in upon the brain. If therefore the other objections I have adduced to it were not material, the latter, in various cases, would not be of much importance. And as some practitioners may incline to have it in their power in particular instances to employ an instrument of this kind, I have thus thought it right to give this account of it.

We shall now proceed to describe the practice of modern surgeons in fractures attended with depression of the skull, together with such improvements as it may appear to admit of.

The fractured part of the bone being brought into view by the division of the teguments in the manner we have directed, and the flow of blood being likewise stopped, the exact situation of the depressed piece or pieces of the cranium is next to be attended to. In
some

some instances the depressed portion of bone is altogether separated from the rest of the skull: In others, it adheres at one or two points: Whilst in several cases, a fissure or rent is discovered with one side of the bone beat down below the plane or level of the other.

When a portion of the cranium is broke into several pieces, as they would not probably unite, either with one another, or with the surrounding bones, we are in general desired to remove them: But when there is only one piece of bone depressed, and especially if this adheres at a point or two to the contiguous bones, practitioners have in many instances attempted to replace it, in order, as they say, to avoid that exposure of the brain which the removal of a large portion of the cranium must always occasion; and they allege as a justification of the practice, that in some instances it has been found to succeed, by the fractured and depressed part uniting firmly with the sound bone.

It is not, however, the unexpected success of a particular kind of treatment of a few cases by which we are to be directed: It is the result of general observation only by which our practice should be determined. Whatever may have occurred to a few individuals, while they have endeavoured to preserve detached portions of the cranium, practitioners of experience and observation will allow that more real advantage is in general to be derived from a contrary management.

It happens almost universally, when one or more pieces of the skull are either entirely or nearly separated from the rest, that blood in a greater or smaller quantity is effused upon the surface of the brain, or upon the dura mater, through the whole extent of the detached portions; so that, if any part of these is allowed to remain, neither this extravasated blood, nor the matter which afterwards forms, can find a free vent; and if any of the replaced pieces should not afterwards

terwards adhere, as would frequently be the case, a good deal of trouble would thus be produced to the practitioner as well as to the patient. But the removal of the separated pieces obviates every inconvenience of this kind. A free vent is thus given to any blood that may be presently effused, or to the matter which may form in future; the state of the dura mater, and if necessary of the brain itself, may be freely examined; and inflammation and gangrene also, to which these parts are liable from accidents occasioning fractures, are thus more effectually guarded against than they could be by any other means.

We would not mean, however, to recommend this practice of denuding any considerable part of the brain, excepting in those cases where a portion of the skull is entirely separated from the rest, and where the detached piece would do more harm by being allowed to remain, than can probably occur from removing it.

When the depression is formed by different small portions of bone, the whole of them may in some cases be easily removed with the common forceps; and by removing that portion first, which appears to be most detached, the rest will thus be loosened, and will therefore be more easily taken out. But it sometimes happens even when several portions of bone are beat in, and very commonly when the depression is formed either of one piece entirely separated, or of a portion of the skull forced in upon the brain without any of it being altogether detached, that the depressed pieces cannot be either removed, or even raised into a level with the rest of the skull, in any other manner than by making one or more perforations in the contiguous sound bone, for the purpose of introducing an instrument termed a Levator, with a view to elevate the portion forming the depression.

It is for this purpose chiefly that the trepan is employed: Hence it is evident, that this operation becomes unnecessary whenever the depressed pieces of bone can be removed in the manner we have mentioned;

tioned; the sole intention of it being thus accomplished by more simple, and in general by more effectual means. But when the depressed portions of bone are so firmly connected together that they cannot be elevated but with some risk of wounding the brain or its membranes, a circumstance which frequently happens, the trepan ought without hesitation to be employed. We shall now therefore describe the method of applying it.

In books of surgery, particular directions are commonly given with respect to the parts of the skull which may with safety be trepanned; and much pains have been taken to point out those which ought to be avoided. In practice, however, limitations of this kind can seldom be attended to, as we must always perform the operation near to the part where the depression occurs, so that a choice of situation is very rarely in our power: But as it appears from the anatomical description we have given of the different parts which may be concerned in this operation, that it may not only be performed with more safety in some parts than in others, but with more real prospects of advantage, practitioners should be so far directed by this, as to avoid, as far as can possibly be done consistently with the advantage of the patient, all those parts from whence much risk might occur from a perforation being made in them. The parts which with this view we would wish to avoid, are, almost all the under part of the temporal and parietal bones; all the under part of the occipital bone; the inferior part of the frontal bone; and the whole course of the longitudinal sinus. The internal surfaces of the greater part of the two first of these bones are furrowed, as we have seen, with the large arteries of the dura mater; a considerable part of the occipital bone is not only very unequal, but various sinuses are immediately covered by it; the frontal sinuses lie in the inferior part of the frontal bone; and although we know that wounds of the longitudinal sinus do not alwas prove mortal,

mortal, yet as it transmits a great quantity of blood, we should at all times be cautious in injuring it.

These are the parts of the skull which in this operation we would wish to avoid, and which we ought by no means to touch when our intention can be answered equally well by perforations made in the contiguous parts. But when the depressed pieces of bone are so situated as to render it impossible to raise them without applying the trepan over these parts, as the patient would certainly suffer if the depression was not speedily removed, no delay should be allowed in applying the trepan wherever this can be done with any probability of success. We are not wantonly and unnecessarily to perforate the skull where parts are situated which it might prove hazardous to wound; but when the life of a patient depends upon the operation, no practitioner, it is hoped, will ever decline it when it is possible to perform it.

Of all the situations we have mentioned, the most inconvenient for the application of the trepan, is, the back part of the head upon the occipital bone, and the frontal sinuses immediately above the orbits. Beneath the former we have seen that several large sinuses are dispersed, and both the external and internal surfaces of this bone are very unequal. And again, the two lamellæ of the frontal bone are separated so far from each other by the frontal sinuses; and the internal surface of the bone at this part is so very unequal, that no practitioner would make choice of it for forming a perforation in. But cases may occur, in which it may be proper to apply the trepan in both of these places: Wherever a fracture or any other cause of a compressed brain is so situated that relief cannot be otherwise obtained, and where the patient must otherwise die, no difficulty should deter us. The muscles of the occiput may be dissected off from the part where the trepan should be applied: And, with caution and attention, a perforation may be made through the frontal sinuses.

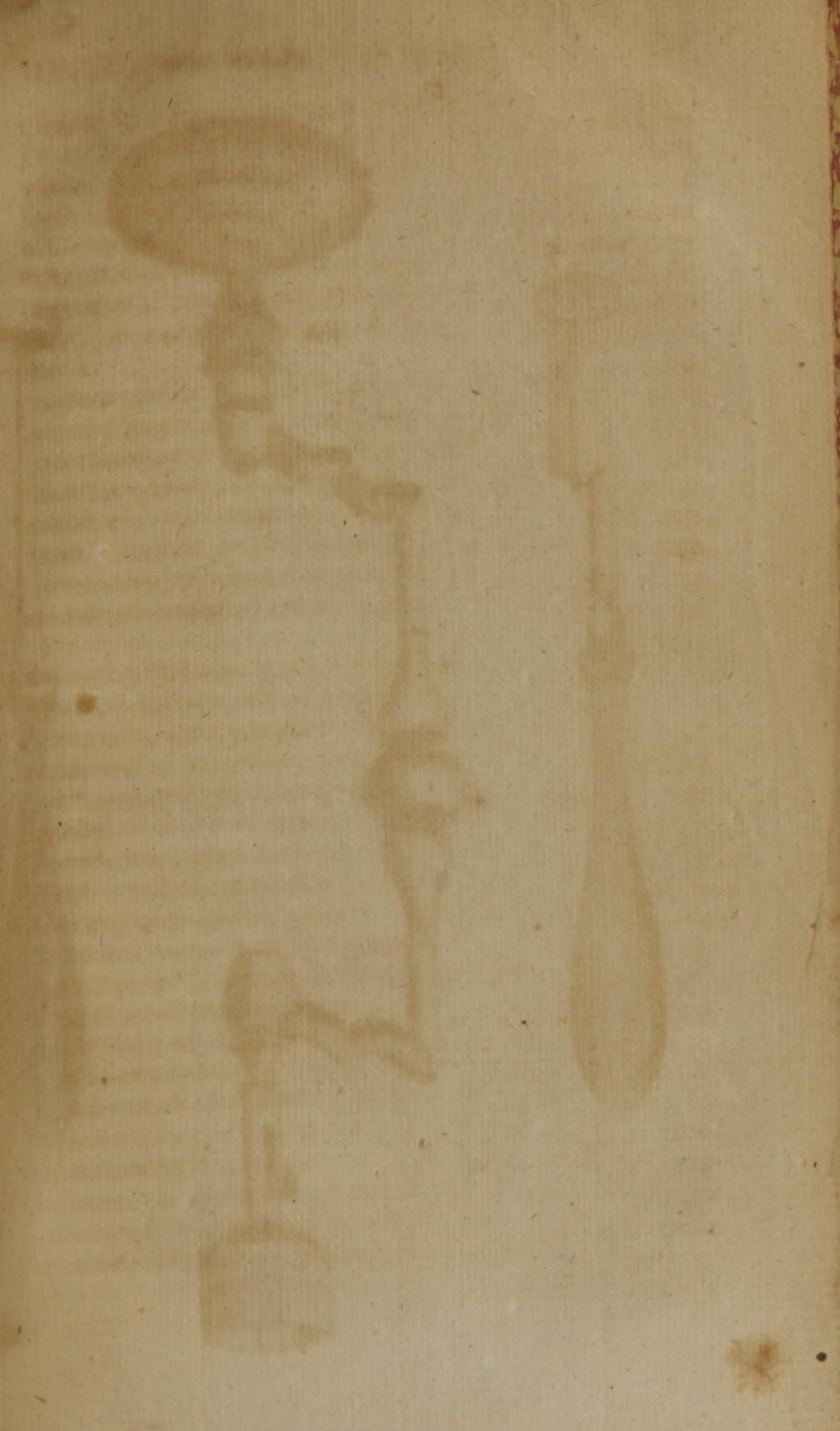


FIG. 2.



FIG.

1.

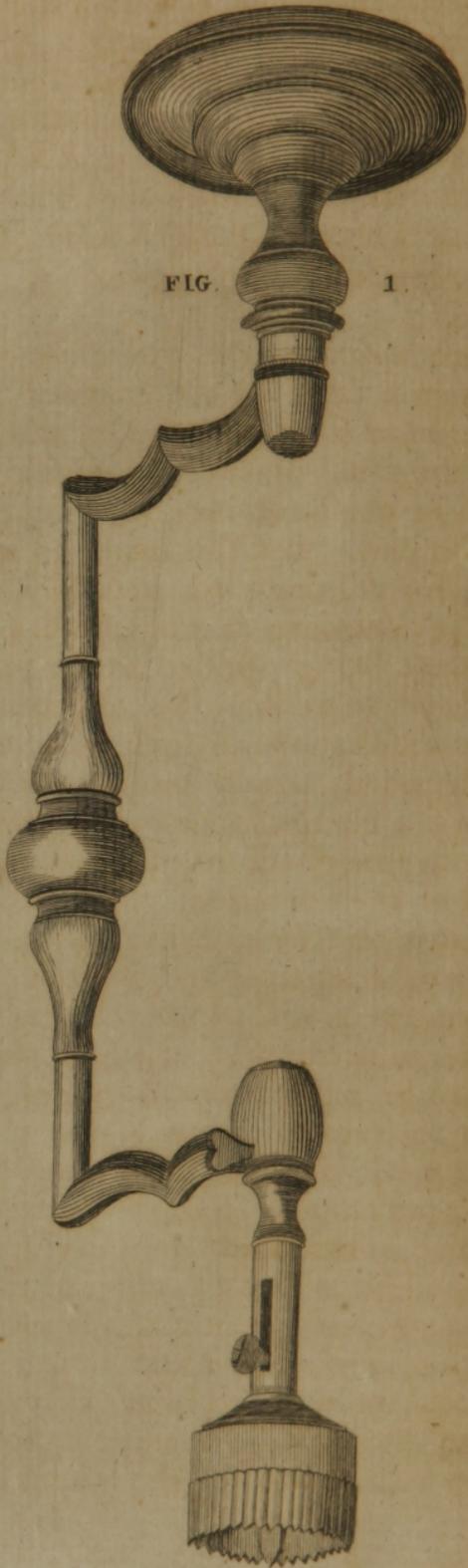


FIG. 3.



The instruments in common use for the operation of the trepan are the following : A Raspatory for the purpose of removing the periosteum, represented in Plate XXVII. fig. 3. A Perforator, Plate XXV. fig. 5. The Trepine itself, Plate XXVI. fig. 1. An instrument termed a Lenticular, Plate XXVII. fig. 2. A pair of Forceps, Plate XXVI. fig. 2. and an Elevator represented in figures 1, 2, and 3. Plate XXVIII.

In proceeding to the operation, after the patient is laid upon a table in the manner we have directed, with his head firmly secured by assistants, if we were to follow the usual practice, we should lay a considerable portion of the skull bare round the part intended to be perforated. But this ought by no means to be imitated ; for although it is necessary to remove as much of the pericranium as may admit of the head of the instrument being applied as frequently as it can be needed, yet more than this ought not to be removed : tedious exfoliations of such parts of the bone as are thus denuded, would most probably be the consequence : a circumstance which not only renders the cure extremely tedious, but which adds to the real hazard of the operation.

We are, therefore, either with a scalpel or with the raspatory, to separate and remove just as much of the pericranium as will admit of a free application of the trepan ; and the part at which this should be done, ought to be exactly at that point where the greatest resistance seems to occur to the elevation of the depressed piece of bone ; and in order to receive every possible advantage from the perforation, it should be so formed as to include not only the fracture or fissure, but if possible a small portion of the depressed piece. The weight and pressure of the instrument during the operation, ought no doubt to rest almost entirely on the sound undepressed bone, as much injury might be done to the brain by making it press much upon the piece which forms the depression : but it very commonly

monly happens, that a small segment of the opening may be made with perfect safety upon the depressed bone; and as the advantages which result from this in the subsequent steps of the operation are considerable, it ought in perhaps every instance to be attempted.

The pericranium being removed, a small hole is then to be made in the undepressed bone with the perforator, care being taken to have it so near to the fracture, that the head of the trepan, to be afterwards applied, may include a portion of the depressed piece. As soon as this hole is sufficiently large for receiving the point of the pin in the centre of the circular saw, this should be inserted into it, by which the saw is firmly preserved in one place, till several turns being made with it, an impression of a sufficient depth is formed in the bone for retaining it, when the pin should be removed: for by projecting past the edge of the saw, it might injure the membranes of the brain before the perforation was properly completed; and as the sole purpose of this pin is to fix the instrument during the first part of the operation, it becomes unnecessary as soon as a cut is formed in the bone sufficient for retaining it.

The surgeon should now proceed to finish the perforation by pressing upon the instrument with a moderate and equal firmness: For if more pressure be applied to one side of it than to another, the division of one part of the bone will be sooner completed than that of the rest; a circumstance which should be guarded against as much as possible, for reasons too obvious to be mentioned. If the trephine is employed, all the pressure and force necessary for turning the instrument is applied by one hand of the operator; the saw is made to cut by forming half a circle only, or scarcely so much; and the perforation is finished by moving the saw backward and forward till the whole thickness of the bone is divided: But when the trepan is made use of, the surgeon applies all the pressure that

is necessary upon the head of the instrument with one hand, while he turns the handle of it with the other. Some operators indeed make the pressure upon it with their forehead, or with their chin; but it is much more easily and more equally applied with one hand, than it possibly can be in any other manner. By the trepan the saw is made to move always in the same direction, by which it cuts more easily, and performs the operation in one third of the time that is necessary with the trephine. When only one perforation is required, this is not indeed an object of much importance; but as it often happens that several perforations are necessary, and as the operation is of consequence fatiguing to the operator and distressing to the patient, that method of operating ought surely to be preferred which renders the operation more easy, provided it is at the same time equally safe. Now, for the reasons we have mentioned, it is perfectly obvious, that the trepan operates with much more ease than the trephine; and whoever has seen the operation done with them both, will confess that it likewise does it with as much safety: For in the hands of those accustomed to use it, there is no more risk, as has been commonly alleged, of wounding the brain by passing too suddenly in upon it with this instrument, than there is with the trephine. If the surgeon is cautious, there is no hazard of this with either of them; and if he be not attentive to what he is about, the trephine will be productive of as much mischief as the other: But independently of this consideration, the trepan operates with so much more ease than the other with respect to the patient, that even on this account it should be preferred. When the trephine is employed, the patient's head is frequently so much jolted by the unequal motion of the instrument, as not only to be productive of much uneasiness when the patient is in any degree sensible, but likewise to have some influence in promoting that inflammatory state of the dura mater which the violence done to it by the depressed bone has al-

ready induced, and from which more real danger is in many cases to be dreaded than from the depression itself.

Some practitioners, very sensible of these advantages of the trepan, but dreading the risk of its passing too suddenly in upon the brain, commence the operation with this instrument, and finish it with the trephine.* This is far preferable to the usual method of performing the operation entirely with the trephine; but those who have fully experienced the advantages of the trepan, will employ it for the whole operation.

But which ever of these instruments are employed, the operator should proceed with great steadiness, and with as equal a degree of pressure as possible till the perforation is completed. For this purpose, the instrument should be frequently taken out, and the depth of the cut should be examined by introducing the point of a probe, or often a sharp pointed quill, in the form of a toothpick: If the perforation is found to go deeper in one part than in others, care should be taken to accommodate the pressure so as to preserve the cut equally deep in every part, or nearly so, to the last.

At each time of removing the instrument, while the surgeon is employed in discovering the depth of the cut, and in clearing it of blood and particles of bone, an assistant should have the charge of cleaning the saw with a small brush: Or, what answers still better than this, there may be two instruments with the saws exactly of the same size; so that while one is employed by the surgeon, an assistant may be cleaning the other.

When the instrument has reached the diploë, attention to this circumstance of cleaning the saw frequently becomes more especially necessary, as the blood discharged from this part of the bone and the spongy cancelli of which it is composed, if they are not often removed, tend considerably to obstruct the progress

* This, I believe, was first suggested by our present celebrated Professor of Anatomy, Doctor Monro, to whose ingenuity, surgery, in many points of importance, is much indebted.

progrès of the operation: But we ought not to expect to meet always with the diploë; for as it is altogether wanting in some parts of the skull, and as it becomes in every instance more inconsiderable by age, so it is evident that it is not to be found in every case. The general direction, therefore, which is given for performing the first part of this operation freely and speedily till the diploë is met with, cannot with safety be admitted: Every step of it should be done, as we have said, with steadiness; but with such caution, as to prevent every chance of the brain or its membranes being injured by the instrument being pushed forcibly in upon them.

But if caution is necessary in the first, it becomes much more so in the latter part of the operation: So that in proportion to the progrès of the saw, it ought to be more frequently removed; and as soon as the point of a probe, or a sharp quill, is found to pass entirely through at any one part of the cut, the pressure should be altogether removed from this point, and should be equally applied over the remaining uncut part. By proceeding cautiously in this manner, the bone will soon become loose in different points; and on this being discovered, it may either be taken out by the forceps represented in Plate XXVI. fig. 2. or the points of two levators being insinuated into the bottom of the cut formed by the saw, one on each side of the piece to be removed, it may in this manner be easily and safely taken out.

We here think it necessary to remark, that practitioners in general are too anxious about the total separation of the piece of bone by means of the saw, before any attempt is made to remove it, from a fear of injuring the dura mater if any splinter should be left by forcing it out before it is altogether cut through: With a view to avoid this, they direct us to proceed with the saw till the bone is entirely separated; and in order to bring it out with the last removal of the instrument, the head of the saw till very lately has al-

ways been of a conical form, by which mechanism, we are told, the piece of bone will very commonly be taken out along with it.

But, however plausible the reasons for this practice may appear, it ought by no means to be adopted; for it rarely or never happens, that the piece of bone taken out by the trepan is of an equal thickness in every part; so that if the saw be continued to divide one side of it long after the other has been cut through, the dura mater immediately under the point which was first divided, must for certain be lacerated by the teeth of the instrument; notwithstanding all the caution that can be employed: Of this I have seen such a number of instances, even in the hands of very expert surgeons, that I have no hesitation in considering it as an improper practice. Indeed, in various cases, where the operation has been supposed to have been very properly performed, the mark of the saw has after death been very evidently discovered on the dura mater over the whole circle of the perforation. Instead of proceeding with the saw, therefore, till the piece of bone is entirely separated, it will always be safer to force it out in the manner we have mentioned, as soon as it is discovered to be loose at one or two points; and even although some small fragments or splinters of bone should be left, no disadvantage would ensue from this, as they can be easily removed with the common forceps without any injury being done to the dura mater.

In addition to what we have said respecting the form of the saw, we may remark, that the cylindrical shape is in every respect preferable to the conical, which in some parts of Europe is still used. We have already observed, that it is not by the figure of the instrument that we are to avoid the danger of wounding the dura mater and brain, but by proceeding through every step of the operation with very great caution; and while the conical saw is not necessary for removing the piece of bone newly divided, it does not pene-

trate the bone with the same ease as a cylindrical saw, neither is the piece of bone taken out by it so large, unless the size of the instrument be considerably larger than any that has yet been employed.

This circumstance, we must observe, of the size of the opening to be made by the instrument, is an object of importance, and ought to meet with particular attention. For, as the intention of perforating the skull, is to relieve the brain from a state of compression, produced either by depression of the skull, or by extravasation of blood or some other fluid; as this is much more effectually performed by a large than by a small opening; and as the pain and hazard of the operation are the same in both, a large opening is always preferable. The perforation made by the head of the trepan should never in an adult be less than an inch in diameter.

The piece of bone being taken out, as we have directed, with the forceps; if any splinters or points are found to remain, they may likewise be removed with the forceps, or with the lenticular, but the latter is seldom necessary: This being accomplished, we are now to proceed to the main object of the operation, to elevate the depression of the cranium.

If the depressed piece of bone was prevented from being raised or taken out, as often happens, merely by its being firmly wedged in at one point; and if the trepan has been made to include this point, as it ought always to do; the whole piece, as it is thus entirely or nearly separated from the rest of the skull, may be now easily removed with the forceps; or if it still adheres at another point or two, the trepan must be again applied at each of these before any attempt should be made to remove it. But when the depressed portion of bone is not so much separated from the rest as to render it proper to remove it, our next object is to raise or elevate this into a level with the rest of the skull. The point of the instrument we have already mentioned, termed a Levator, being introduced at the opening newly made, and being pushed in below the edge of the depressed bone, by pressing down the oth-

er end of the levator, a very considerable degree of force may thus be applied; and if the depression is not firmly wedged in, it commonly proves sufficient for raising it: But when the depressed piece is either of considerable extent, or gives much resistance at one or more points, before any attempt is made with the levator, the trepan should be again applied wherever it may appear to be in any degree necessary; and by a proper use of the levator at these different openings, the depression must be effectually raised.

The levator in common use, however, is not the instrument we wish to recommend: For as it is always made to rest upon the opposite side of the perforation, all the pressure employed for elevating the depression falls upon the contiguous parts of the skull, by which a considerable degree of violence is in many instances done to it; and as we have it in our power to accomplish the same intention in an easier manner, the other ought to be avoided. By having the levator fixed upon a pin supported by a small frame upon two feet, and the frame being placed at a proper distance from the wound, the pressure that is made by this means falls upon a sound part of the skull: It is not confined to one point, and consequently no inconvenience arises from it; neither does there any difficulty or embarrassment occur from the application of it; for it is perfectly simple in its construction, and may be moved with much ease from one part of the head to another. The instrument we have here represented is nearly the same with the levator of the celebrated Mr. Petit of Paris.

As the great object of this operation is to remove the depression of the skull, together with any other cause of compression that may occur, we have taken different opportunities of pointing out the necessity of keeping this always in view. And for the same reason we now think it necessary to observe, that the utmost attention is requisite on the part of the operator, to the raising or elevating of every part of the bone

PLATE XXVIII.

FIG. 1.

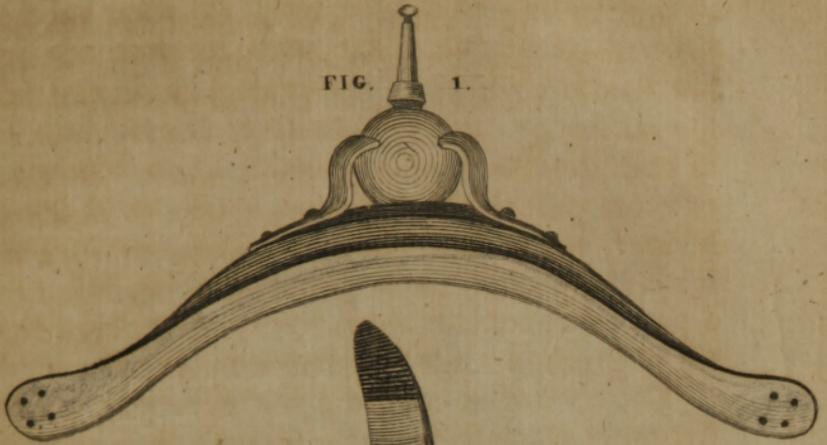


FIG. 2.



FIG. 3.

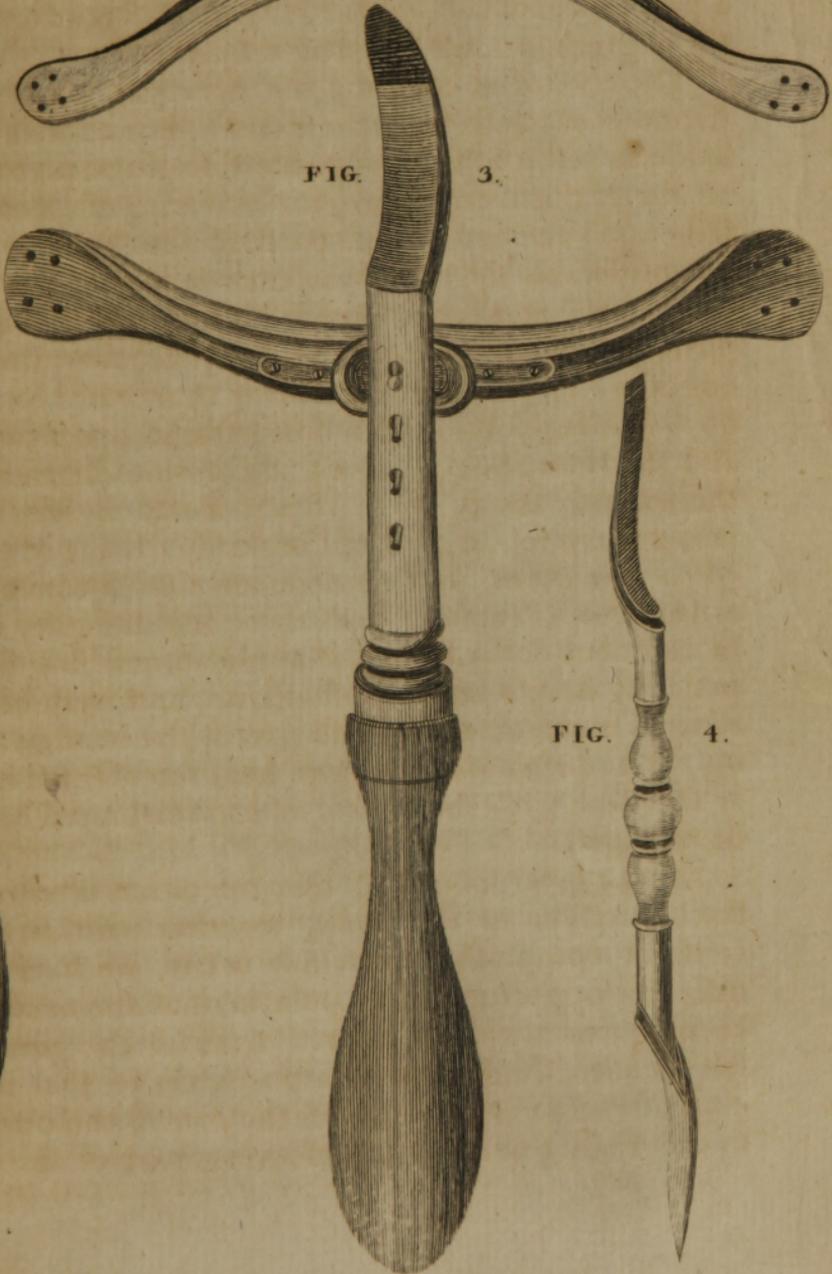
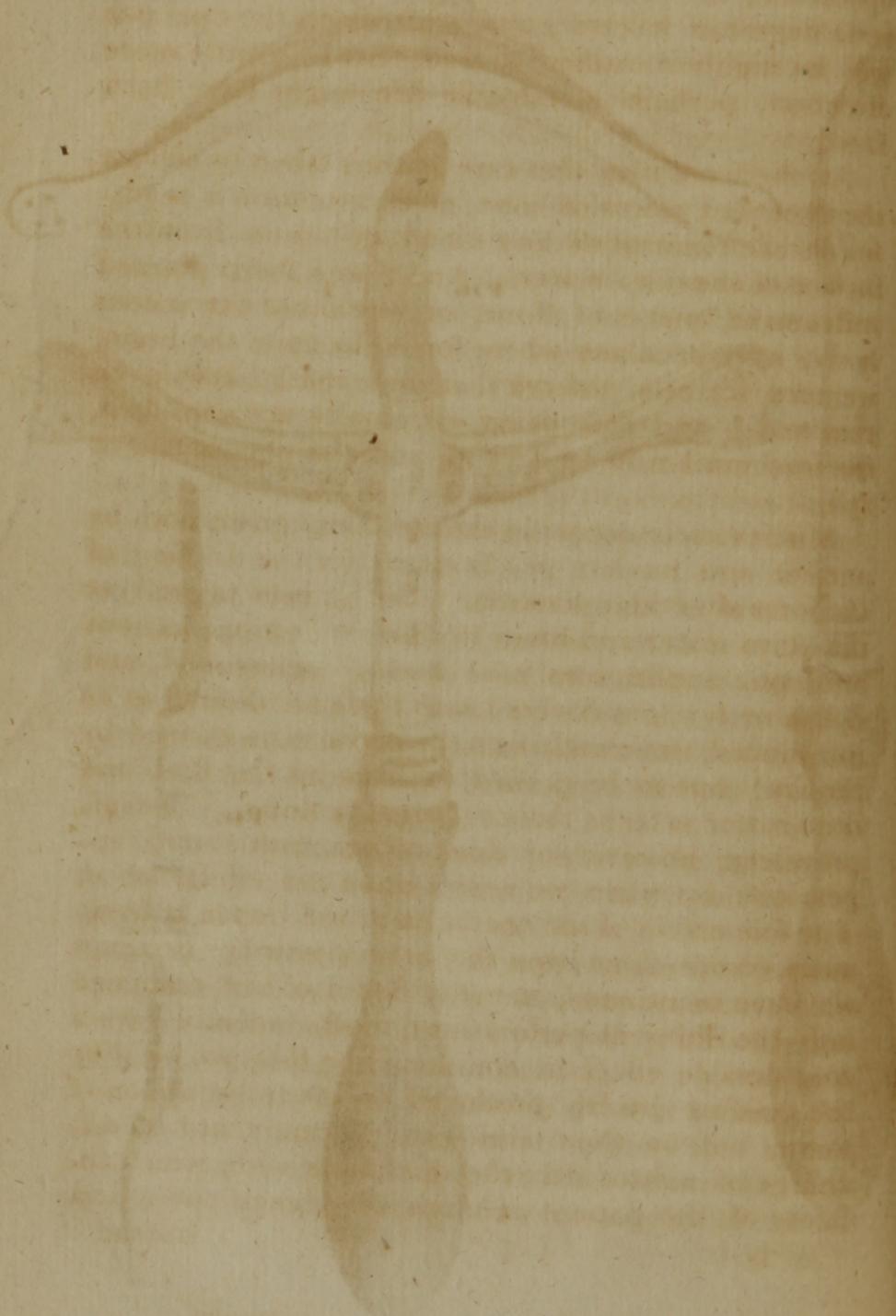


FIG. 4.



Main body of faint, illegible text, likely bleed-through from the reverse side of the page.



in which any degree of compression is perceived : For if any portion of it should be overlooked, and should be allowed to continue to press upon the brain, little or no advantage will be derived from the rest of the operation ; the patient will continue in nearly the same degree of hazard ; and after death the operator will be highly mortified to find, that by a little more attention, perhaps a valuable life might have been saved.

At the same time that care is thus taken to elevate the depressed pieces of bone, much attention is requisite in the removal of any blood or serum from the surface of the dura mater. And if any sharp pointed instrument, pieces of stone, or any other extraneous body, have been any where forced in upon the brain, we need scarcely observe that these must likewise be removed ; and this being effectually accomplished, the sore must now be dressed, and the patient laid to rest.

Much variety occurs in the directions given both by ancient and modern practitioners for the dressing of the sores after this operation. With a view to preserve the dura mater and brain from mortification, various antiseptic applications have been recommended, and dossils or syndons covered with these are desired to be introduced, not merely into the perforation formed by the saw, but to be pressed in between the skull and dura mater as far as this can be easily done. The impropriety, however, of this practice must at once appear obvious when we reflect upon the effects of it. The sole object of the operation of the trepan is to remove compression from the brain ; now the dressings we have mentioned, namely, dossils of lint crammed into the different perforations, must evidently have a considerable effect in counteracting this, not only by the pressure directly produced on the introduction of them, but by their serving to prevent that free discharge of matter after the operation with which the safety of the patient is often very much connected.

Instead of this the dressings ought to be of the mildest nature, and should be as loosely applied as possible. Dry lint is very commonly employed; but it proves much less irritating when thinly spread with a simple liniment of wax and oil; and no detriment ensues, as has been imagined by some, from the application of the unctuous substances to the brain. No tent or dossil, as we have just observed, should be inserted into the perforation; all that is necessary being to apply as lightly as possible over the sore, a pledgit of soft lint spread with an ointment such as we have mentioned; and this being covered with a compress of soft old linen, the whole should be retained with a common night cap, made so as to tie below the chin, and to be either pinned or tied of a proper tightness, on the fore or back part of the head. This supports the dressings with sufficient firmness; and it neither keeps the head too tight, nor prevents a free flow of matter from the sore; an inconvenience very apt to occur from the use of those bandages commonly employed after this operation.

The patient, on being removed to bed, should have his head placed in such a manner as to prevent the sore from being hurt; at the same time his position should be such as will most effectually contribute to the discharge of any matter that the sore itself may afford, or of blood or serum that may ooze out from the surface of the *dura mater*.

When the symptoms under which the patient has laboured have proceeded entirely from a depressed portion of the skull, and when this depression has been completely removed, it will very frequently happen, that some evident advantage will be immediately derived from the operation. From being perfectly torpid, with a deep laborious breathing, and a very considerable dilatation of the pupils, he will become less stupid and lethargic. He will begin to toss himself about in bed—to raise his eye lids—will make some feeble attempts to speak: His breathing will be less oppressed,

oppressed, and the pupils will contract as they usually do in health when exposed to a strong light. But although all these favourable circumstances should not appear in any remarkable degree immediately after the operation, we are not to despair of its success; for when the brain has been long compressed, we may readily suppose that it will not be able instantly to perform its various functions, even when the cause of the compression has been very completely removed: And, besides, it often happens, that together with a fracture and depression of the skull, the brain has received a violent shock or concussion; in which case, as the symptoms do not depend entirely on the compressed state of the brain, so we are not to expect them to be entirely removed on the cause producing this compression being taken off. But by a due attention to the treatment of these symptoms, in the manner we shall afterwards point out, they will frequently disappear in a slow and gradual manner, although no material alteration may be observed in them for a considerable time after the operation.

A surgeon ought not therefore to imagine, that all his business is over when the operation is finished; for this may be done in the most complete manner, and yet the patient will certainly suffer unless other means are employed for his relief: When the symptoms for which the trepan was applied are all evidently mitigated immediately on the depression of the skull being removed, and if the patient in the course of a few hours is still more remarkably relieved, there will be much cause to hope that he will do well without any other remedy being employed; and that quietness, keeping an open belly, and avoiding every cause of inflammation, will at last effect a complete cure: But when the contrary of this occurs, as is too frequently the case; and when the symptoms remain equally formidable after the operation as they were before, and especially if they do not become more moderate in the course of a few hours after the patient is laid to rest;

remedies

remedies of a different kind are then to be administered.

As the symptoms which in such circumstances are most to be dreaded originate from two different causes, and as the choice of remedies to be employed for the removal of them ought to be directed entirely by the nature of the cause which is found to subsist, much attention is necessary in discriminating them.

The causes I allude to are, inflammation of the membranes of the brain, and concussion of the brain itself.

In general, the symptoms which prevail here are all suspected to proceed from the same cause; they are supposed to be entirely of the same nature, and the same remedies are therefore employed for their removal. A little attention, however, would on many occasions render the impropriety of this practice evident: For although it frequently happens that the attendant symptoms are of a mixed nature, and depend so much upon a concurrence of both the causes we have mentioned, that they cannot be rightly distinguished, yet in various instances it is otherwise; and whenever an evident distinction is perceptible, much advantage will accrue to the patient, from practitioners directing their attention to it.

After all the evident causes of compression have been removed by the operation, if the pulse is found to be slow and soft, if the patient still remains torpid and lethargic, and especially if no contraction of the pupils is observed on the eye being exposed to a strong light, there will be much reason to suspect that these symptoms depend in a great measure, if not entirely, on commotion or concussion of the substance of the brain: For although the symptoms we have just enumerated, are all such as are very commonly induced by compression of the brain; yet we know that they are likewise a very frequent consequence of concussion: So that, when all the depressed bone and other obvious causes of compression are removed, we conclude

clude with much probability, that any symptoms which remain, when they are such as we have mentioned, depend more upon concussion than on any other cause.

But, when, instead of these symptoms, after the depression of the skull and other causes producing a compressed state of the brain are removed, there is, along with some return of sensibility, as indicated by the patient's becoming unmanageable and moving from one part of the bed to another, a firm, full, and somewhat quick pulse; if the eye is found to be inflamed, and especially if the pupil is observed to contract, and the patient to withdraw his head, on the eye being exposed to much light; there will in such circumstances be much cause to imagine that inflammation of the membranes of the brain has taken place. Indeed the dura mater, like every other membrane, is so susceptible of inflammation, that it is difficult to imagine how any part of the skull can be beat in upon it with violence, without irritating and inflaming it in a very remarkable degree; and if once inflammation is induced upon any part of this membrane, we know from experience that it readily and quickly extends over the whole of it; a circumstance which easily accounts for the high degree of inflammation, which in cases of this kind is often observed in the eyes, as likewise for the contraction of the pupils, and for the evident uneasiness always produced by the exposure of the eyes to much light.

When the bad symptoms which ensue from accidents of this kind are produced by an inflammatory state of the parts, the pulse, as we have said, differs materially from the pulse of a person suffering merely from concussion of the brain. From this last mentioned cause, the pulse is full, slow, and soft; but when inflammation takes place, the pulse, although frequently full, has a firmer stroke, and is commonly quick: And in this case the breathing, although it be not oppressed and laborious as it frequently is in cases of
compressed

compressed brain, is always more frequent than natural ; which is not commonly observed in patients labouring under the effects of concussion.

Although for the reasons we have mentioned, it may often be difficult or even impossible to mark the existence of these different sets of symptoms, yet an attentive observer will frequently be able to distinguish them ; and whenever this can be done, much advantage I think may be derived from it.

Practitioners of every age have recommended in injuries done to the head, to evacuate a good deal of blood ; and there is much reason to think that no general rule was ever better founded : But from attentive observation of the effects of blood letting in cases of this nature, I have great cause to imagine that surgeons of modern times frequently carry it too far. In real inflammatory affections of the membranes of the brain, the propriety of discharging much blood is obvious, and will not be disputed ; but whenever there is reason from the nature of the symptoms to imagine that they originate from concussion, blood letting, if it is recommended at all, should be practised with much caution.

Although the general structure of the brain with respect to its figure, size, and other circumstances, has long been well known ; yet it must be confessed, that our anatomical knowledge of this organ is still very deficient, nor do we understand with any kind of precision the manner in which it performs its various functions. Indeed our knowledge of this part of anatomy is so extremely lame, that we are frequently perfectly unable to discover by the most minute dissection any difference between the brain in its soundest state, and that state of it in a person evidently killed by a fall or blow upon the head, and in whom all the symptoms induced by the accident were such as indicated an affection of the brain alone. This, we must remark, is particularly the case in those who die from what we term a Concussion or Commotion of the brain. In such instances the brain we suppose to be
somehow

somehow or other deranged ; but it most frequently happens, that the most accurate dissection after death, cannot discover the nature of this derangement.

From this it is obvious, that the effect of concussions of the brain is not an excitement of inflammation ; for even the most inconsiderable degree of inflammation is readily discovered by dissection, and can scarcely indeed escape being noticed. Now, as it often happens that no appearance of inflammation in any part of the brain is discovered in those whom we suppose to have died from concussion, it is not unfair to conclude, that the effects of these two causes, inflammation and concussion, are distinct, and perhaps very opposite in their tendency.

From the circumstances we have mentioned of the effects observed upon dissection to be produced by these causes, and of the symptoms induced by the one being different from those which accompany the other, the conclusion we have formed with respect to their difference, might even upon these grounds be supposed to be well founded : But it is not upon speculation alone, that I would wish to rest either this, or any other opinion of much importance in practice. The idea was first suggested by the different effects which I had observed to proceed from blood letting in affections of the brain from external injuries. In many instances, great and evident advantages were derived from it, while little or no benefit was procured from any other remedy : But in others, instead of any benefit resulting from it, the patients became obviously worse after every repetition of the operation : The pulse, from being full, gradually became weaker ; and the strength of the patient commonly sinking in the same proportion, he seldom recovered from the effects of blood letting when practised to any considerable extent.

From these circumstances I have been led to think, that concussion of the brain operates upon the general system in nearly the same manner as syncope induced
by

by fear, inanition, or any similar cause, in the treatment of which blood letting is known to prove hurtful.

In what manner a blow upon the head or a fall from a height, in a full habit of body, and in a person otherwise in perfect health, who only a few minutes before could have supported the loss of much blood, should be able instantly to induce such a state of the system as cannot admit of any evacuation of this kind, I will not pretend to say : But that this is an occurrence which frequently happens, I am now from repeated observation convinced of ; and whoever will take the trouble of paying attention to this branch of practice, will find, that the opinion is by no means without foundation. He will find indeed, that all such symptoms as originate from inflammation, are more effectually relieved by blood letting than by any other remedy : But he will for certain observe, that all those which do not depend upon this cause, and which arise solely from the effects of concussion, instead of being relieved by this remedy, will be uniformly rendered more violent and more alarming in proportion to the quantity of blood that is evacuated.

So far however as my experience goes, the evacuation produced by purgatives, never proves so debilitating as to render them improper ; and as they have frequently a considerable influence in relieving the head in every affection of this nature, they should never be omitted, and should always be prescribed in such doses, and these should be as frequently repeated, as the strength of the patient may appear to admit ; but they should never be carried so far as to run any risk of inducing debility and languor.

In the following sections, we shall have occasion to enter into a more particular consideration of the symptoms induced by inflammation of the membranes of the brain, and by concussion of the brain itself : But these general remarks upon the subject were necessary in this place, with a view to explain the nature of our
practice

practice in the treatment of those symptoms which proceed from either of these causes when connected with a compressed state of the brain, and when accordingly the operation of the trepan is not found to afford such effectual relief as it otherwise would do. Postponing therefore a particular detail of the remedies to be used in cases of inflammation or concussion of the brain, we shall now shortly remark, that whenever the operation of the trepan fails in relieving the symptoms for which it was employed, as this will give much cause to suspect the existence of one or other of these affections, much attention will be necessary in discriminating the real nature of them. When inflammation is found to take place, blood letting, both general and local, will be requisite, together with smart purgatives, mild sudorifics, and a strict attention to an antiphlogistic regimen: But when the symptoms appear to originate from concussion, the only evacuation that can with propriety be employed is gentle purging; for in this case, as we have already remarked, and as we shall afterwards endeavour more particularly to show, blood letting, instead of proving serviceable, very constantly does mischief.

In both cases, as well as in every affection requiring the operation of the trepan, the patient should be kept perfectly quiet—little or no light should be admitted to his apartment—any food he is able to take should be of the mildest kind, and plenty of whey or of any diluent drink should be allowed.

In the mean time, the state of the wound should be duly attended to; for after the operation of the trepan, the membranes of the brain are particularly liable not only to inflammation but to gangrene. In other parts of the body, we know that nothing so certainly prevents inflammation and gangrene, at the same time that it tends to mitigate their violence when present, as a free suppuration being induced upon the parts affected; and whoever will attempt a similar practice in wounds of the head will find, that although, from the

nature

nature of the parts in which the affection is seated, it may not prove equally successful, yet that it will prove much more so than any other mode of treatment hitherto employed.

With this view, warm emollient poultices and fomentations should be applied over the dressings; and by taking care to renew them every two or three hours, it will commonly happen, that a plentiful flow of matter will take place from the perforations in the skull, by which any tension which occurred will soon be removed, at the same time that all the other symptoms will be rendered more moderate.

The dressings which are first applied after the operation, should consist, as we have said, of the mildest articles, and applications of the same kind should be continued during the cure. At each dressing, any matter that is formed on the surface of the sore may be easily removed by a piece of soft sponge or of lint, being introduced in a cautious manner into the perforations in the bone; and this being done, the sore should be covered as quickly as possible with a pledgit of any mild emollient ointment.

When the cure goes properly on, after any sloughs which have formed upon the surface of the sores have separated and fallen off, new granulations will appear upon the dura mater as well as upon all the rest of the wound; and these continuing to advance, the different openings made by the trepan will at last be completely filled up, and the whole being brought as nearly as possible to a level with the rest of the teguments, a cicatrix will in general be obtained by the same means that are found to prove successful in other parts of the body, which we have elsewhere fully treated of.*

In various cases, however, these granulations which in general arise from the dura mater only, although they have commonly been supposed to originate from the brain itself, instead of merely filling up the openings

* Vide Treatise on Ulcers, &c.

ings in the bone, push gradually out beyond the surface of the external teguments, so as to form distinct pendulous tumors.

These tumors or excrescences, when they arrive at any considerable bulk, prove sometimes troublesome, and various means have been proposed for preventing or removing them. As they have commonly been considered as productions of the brain itself, much caution, and even timidity, has prevailed in the treatment of them. Compression is the means most frequently employed for removing them, or rather for preventing them. They are sometimes kept down by different escharotics, and even by the stronger kinds of caustic. Some have proposed to remove them by ligatures, and others by excision with the scalpel.

Of all these, the mode by compression is most to be dreaded, and ought certainly to be avoided: For whether the tumors be productions of the brain or of the dura mater only, no pressure can be applied to them without affecting the brain; and it very commonly happens, that even the slightest degree of it induces head ach, sickness, and in some instances even convulsions. We should not therefore employ it in any case.

These tumors are of various degrees of sensibility. In some instances, they are painful, and cannot bear to be touched; whilst in others they appear to be nearly, if not altogether, insensible. In this last case, the most effectual kind of treatment is to prevent their rising to any considerable height, by touching them frequently with lunar caustic: And in a few instances where the insensibility is great, and when the tumor hangs by a small neck, a ligature may be applied to the root of it; and the noose being gradually tightened so as to destroy the circulation, it will commonly drop off in the space of a few days. It seldom happens, however, that we are under the necessity of employing these or any other means for the removal of tumors of this kind; for in general they begin to di-

minish as soon as the soft granulations in the perforations of the skull begin to acquire a firmer consistence; and by the time the ossifying process of this substance is completed, they commonly drop off solely by the pressure which is thus produced upon them. We should not, therefore, in any case, proceed quickly to the removal of such tumors; but whenever it is found that they do not fall off upon the different perforations being completely filled with bone, as the connection between them and the brain is then in a great measure cut off, they may accordingly be removed with more safety, either by excision, by caustic, or by ligature.

The cure being thus far completed, if the method we mentioned was adopted, of saving all the skin and other teguments, a very narrow cicatrix only will remain, and the parts will be nearly as firm as they were before: But when much of the teguments have been destroyed, as there is never any regeneration of them, the bone will be left covered by a thin cuticle only, with perhaps a very small proportion of intermediate cellular substance; in which case a piece of tin or lead lined with flannel should be fitted to the part, with a view to protect it from the effects of cold and other external injuries.

In injuries done to the head, when the symptoms which occur proceed entirely from a depressed portion of bone acting as a cause of compression upon the brain; if this can be removed in the manner we have mentioned, a due perseverance in the plan of management we have pointed out will in general accomplish a cure. It must be acknowledged, however, that accidents of this kind do not terminate in this favourable manner so frequently as we could wish: For, along with the depression of the skull, it often happens, as we have said, either that concussion of the brain takes place, or that there is a high degree of inflammation, with perhaps some tendency to gangrene; circumstances which are always attended with danger, and
the

the effects of which are always obviated with difficulty.

We have already in a general manner pointed out the means best calculated for this purpose, and will afterwards have occasion to treat of them more particularly: But in the first place we must proceed to consider the other general cause of compression of the brain, namely, extravasation.

§ 2. *Of Compression of the Brain from Extravasation.*

By whatever cause compression may be formed upon the brain, the symptoms which ensue from it are in general nearly the same; and as we have already entered into a minute consideration of these, it will not now be necessary to enumerate them. We shall only observe, that all the symptoms which depend upon a compressed state of the brain, may be induced with as much certainty, will be of an equal degree of violence, and will be attended with as much hazard, from effusions of blood, serum, or pus, as from the most extensive depressions of the skull. In general, indeed, extravasation within the skull is more to be dreaded even than depressions of great extent; for when a depressed piece of bone is of considerable size, the seat of the injury is at once pointed out, and by the use of proper means we frequently have it in our power to remove it; but in the case of extravasation, our means of ascertaining the seat of the injury being uncertain, so the effects of the remedies to be employed for the relief of the patient are the less to be depended on. When indeed compression of the brain is induced by a complication of these two causes, depression of a portion of the skull, and extravasation of blood or serum, the seat of the one is readily discovered by that of the other; but when it depends solely upon extravasation, it is always difficult, and on many occasions impossible, to discover the seat of it.

A complication of the two causes we have mentioned is far from being an uncommon occurrence: For

it happens most frequently, that every case of a depressed portion of the skull is accompanied with extravasation to a greater or lesser extent; but instances are likewise met with, of effusions of blood and of serum from external injuries, without any appearance either of fracture or depression.

We have already treated fully of the indications of cure in compression of the brain from a depressed portion of the skull: The same indications are applicable in cases of compression from extravasation.

After endeavouring to ascertain the seat of the injury, we are to make one or more perforations through the bone, in order to evacuate the collected fluid; and this being done, we are to guard against any effects which otherwise the accident might in future produce upon the brain and its membranes.

In cases of extravasation it sometimes happens, that the part in which the collection is seated, is pointed out by the mark of a blow upon some part of the head; and on the bone being laid bare, a fissure will in some instances be found in it, while in others no apparent injury is done to it, farther than a separation perhaps of the pericranium from the surface of the bone, although even this does not always take place.

When any of these circumstances, however, occur, we should consider the seat of the injury to be so far determined as to have no hesitation in fixing upon this spot for applying the trepan. Wherever there is an external mark of injury, although we cannot with certainty conclude that any effusion which occurs upon the brain will correspond exactly to it, yet it will more probably be met with at this place than in any other, and therefore the instrument should be applied directly upon the centre of it.

But it often happens, that no external mark is to be met with to lead to the seat of the injury; even after the whole head is shaved, and examined with the most minute attention, the skin will in various instances be found perfectly sound, without any appearance

ance either of tumor or discolouration. A patient, in such circumstances, we suppose to be in great hazard, from the brain being compressed in one part or another: Unless this compression be removed by an operation, he must in all probability die; in what manner then is a practitioner to conduct himself? The situation is truly distressing; but still, in my opinion, there should be no hesitation as to the line of conduct a surgeon ought to pursue, which should be quite the reverse of what is almost universally adopted.

It has hitherto been held as an established maxim, never to apply the trepan, in compression of the brain from external violence, where no external mark occurs to point out the seat of the injury, because the result of the operation is in such cases uncertain: But as compression of the brain, if it be not removed, must soon terminate in the death of the patient; and as it cannot be removed in any other way than by perforating the skull; in such circumstances, to leave any thing undone which would give even the smallest chance of saving the patient, shows a degree of indifference which is not in any other instance to be met with in the surgery of modern times. It is with truth indeed said, when no external mark of injury appears, that there must always be much uncertainty whether any perforation we may make will fall exactly upon the spot where the cause producing the compression takes place; that as the symptoms induced by a concussion of the brain, are in many instances extremely similar to those which depend upon compression, much dubiety must occur from our frequently not being able to say with precision, whether the symptoms which prevail depend upon one cause or the other; and it must be confessed, that in many instances, where the symptoms have previously been suspected to depend upon compression of the brain, that, on dissection, no vestige has been met with, either of depression of the skull, or of effusion of blood or serum.

All this I shall readily admit ; but what does it amount to ? Why, to no more than this : That where a patient is evidently in much danger, and is certainly to die if means are not employed by art for his relief ; wherever there is much uncertainty in the effects of these means, that it will be better not to put them in practice, but rather to leave the patient to his fate ! As long as the patient is in such a situation as can afford even a ray of hope that he may recover by other means, it would no doubt be improper to employ the trepan ; or if much additional risk was to be incurred by this operation, no practitioner of character would think of advising it with so small a probability of any advantage being to be derived from it.

But as a patient labouring under symptoms such as we are now describing, which cannot be relieved by any other means, must evidently be in very imminent danger, and in such desperate circumstances, as no additional hazard can be incurred from an operation, we ought certainly, in justice to the patient, to his friends, and to our own characters, to put it in practice. The chance resulting from it, we acknowledge will not be great : But as it is the only means from whence safety can be expected, by employing it, lives may be saved which otherwise would inevitably be lost ; and if a prognosis sufficiently guarded be given, which ought always to be done, no just blame could fall either upon the operator, or upon the art in general. If the friends of a patient in this dangerous situation, should be told of the hazard he is in ; that there is an operation by which he may have a small chance of recovering, but that this chance is by no means considerable ; even under such an uncertain prognosis, the operation would in most instances be submitted to ; and however unsuccessful it might prove, and although no extravasation, or other cause of a compressed brain, should be met with, such a prognosis as we have mentioned, would in every instance screen the operator from blame ; and having thus done all that could afford

ford even the least possibility of a recovery, the friends of the patient, as well as the surgeon himself, would surely have more cause of comfort than if no attempt had been made for this purpose.

We shall suppose, therefore, for the reasons now mentioned, that the trepan is to be applied on account of symptoms which accompany a compressed state of the brain; but where no external mark indicates the particular seat of the injury, it may be asked in what manner is an operator to proceed? As the cause producing the compression may exist just as readily in one part of the brain as in another, it may seem to be a matter of little importance in what part of the head the first perforation is made. This, however, is far from being the case: For as we are supposing the compression to be induced by blood or serum, and as these, while in a fluid state, are always passing as much towards the basis of the brain, as the intimate connection between the dura mater and the internal surface of the skull will allow; it will be proper to form the first perforation in the most inferior part of the cranium in which it can with any propriety be made, and to proceed to perforate every accessible part of the skull, till the cause of the compression is discovered. For this purpose there is no necessity, as we have already observed, to remove any part of the integuments: Wherever it is intended to perforate the bone, if an incision is made through the skin, muscles, and pericranium, immediately above it, they will always retract sufficiently for admitting the instrument; and this being all that is necessary, more should not be desired. If we are at last so fortunate as to meet with a quantity either of effused blood, or of serum, which in some instances is alone poured out, much care should be taken to discharge the whole of it; for which purpose, as blood, when coagulated, frequently adheres firmly to the dura mater, instead of one perforation, two, three, or more should be made at this part,

so as to admit of all the blood that is extravasated being effectually taken away.

But the operator in such circumstances should likewise recollect, that the blood, instead of being effused on the surface of the dura mater, may be collected within the cavity of that membrane; or it may even be contained within the pia mater, in immediate contact with the surface of the brain: For which reason the state of the dura mater should be examined with much attention after every perforation. If this membrane is found to be of its natural colour, and not more tense upon pressure than it ought to be, nothing farther will be necessary; but if it is very tense and elastic, and especially if it has that dark or livid appearance which indicates the probability of blood being collected underneath, it ought undoubtedly to be opened in order to discharge it. The best and easiest mode of effecting this is to scratch a small hole by repeated strokes with the shoulder of a lancet; and this being done, and the point of a pair of scissors with a slight curve being introduced within the dura mater, the opening may thus be enlarged to the full extent of the perforation in the bone; or if one incision across the perforation does not appear to be sufficient for evacuating the blood beneath, a crucial incision may be made, and if necessary, the corners thus produced may be entirely cut off.

Although we would not by any means recommend the division of the dura mater where it is not absolutely for the safety of the patient; yet in every instance where the operation of the trepan is advisable, if on perforating the bone there is reason to suspect that any fluid is collected either between this membrane and the pia mater, or even below the pia mater itself, as the intention of the operation would not otherwise be fulfilled, the collection, of whatever it may consist, ought immediately to be discharged. In such circumstances, unless we go to this length, we in fact do nothing; for the dura mater is so thick and strong,
that

that any blood or matter collected beneath would more readily spread inwards upon the brain, than burst out through the different layers of this membrane.

It has been objected to this practice, that few have recovered by it ; that there is a considerable risk of fatal hemorrhagies being induced by it ; and that the brain is very apt to protrude at the perforation in the bone after it has lost the support of its surrounding membranes.

That few have recovered by this means, I will readily allow : But this does not proceed so much from the opening made in the dura mater, or from its being particularly hazardous of itself ; but from the cause for which it is employed, being commonly attended with such real danger as puts it out of the power of art either by this or any other means to obviate the fatal effects of it.

With respect to hemorrhagies being apt to ensue from this practice ; although I have seen the dura mater opened in several instances by others, and have different times done it myself, I never knew an instance of any danger arising from it, not even when any of the sinuses have accidentally been laid open ; and although the brain will no doubt protrude more readily when the dura mater is divided, than it otherwise would have done, yet this we know is an occurrence which very frequently happens in every wound where much of the cranium is removed, and that considerable portions of the brain have been even discharged by wounds of this kind, without any apparent inconvenience ensuing.

The result therefore of all that has been said upon this point, is, that where the intention of the operation is fully answered merely by perforating the cranium ; where any portion of bone that has been depressed is thus completely removed ; or where any pressure produced upon the brain is found to proceed from blood or serum extravasated on the surface of the dura mater ;

mater ; as in any of these cases the cause of the patient's danger can be removed without penetrating this membrane, it ought not by any means to be injured : But whenever the bad symptoms which have prevailed are not relieved by the perforation of the bone ; or by the removal of any effused fluid that may be met with on the dura mater ; and when from the appearance of this membrane there is reason to suspect that any fluid is collected beneath ; it ought undoubtedly to be opened in the manner we have mentioned. Even although the inconveniences resulting from it were much greater than they have ever proved to be, when the patient's life is in all probability to depend upon it, something ought to be hazarded : But we have seen that the risk attending this part of the operation is by no means great ; so that whenever it is in any degree necessary, I should consider any practitioner as culpable who should omit it.

In this situation our ideas should be exactly such as we are directed by in the treatment of abscesses in other parts of the body. When a patient is suffering with matter collected in a particular part, no surgeon of experience will be deterred from going to the full depth of the collection merely from finding that it is more thickly covered than he had reason to expect before the skin and cellular substance were divided. He will proceed more slowly and with much caution ; but he will at last reach the seat of the disorder with as much certainty as if it had been much more superficial.

In like manner, when there is reason to imagine that matter is collected beneath the membranes of the brain, an incision should for certain be made through them. No additional risk can be incurred from this : Some few patients may be saved by it ; and, at any rate, it must always afford some satisfaction, not only to the friends of the patient, but to the practitioner himself, to think that nothing has been omitted from whence any advantage could probably be derived.

It will often happen, indeed, that neither this, nor any other effort of art, will obviate the danger of the patient. But when the principles upon which an operation is founded are evidently just; and when it appears upon mature deliberation, that a patient may be saved by it, and that he cannot escape by any other means; it is not the frequency of its success alone by which we are to be directed: The danger induced by the cause for which it is employed is the object we are to keep in view; and every practitioner who acts solely for the good of his patient, will at all times employ such means as are best calculated for the removal of this danger, without paying attention to any other consideration. If it were to be the object of surgery to operate only where certain success was to ensue, many lives would be lost that otherwise are saved; and in that case the practice we have now recommended, of applying the trepan in injuries done to the brain without some external mark to be directed by, would no doubt be altogether inadmissible: But as the safety of those intrusted to us ought to be our first and great object, and professional fame only a secondary consideration, whenever we are certain that death must ensue, if not prevented by the timely application of a proper remedy, although there may be very little certainty of this remedy proving successful, yet if it is the only means from whence there is any chance of safety, it ought undoubtedly to be employed. It is on this principle solely that we have advised the practice of perforating the skull in different places, when in cases of compressed brain the part chiefly affected is not pointed out by some external mark of injury: And although the opinion we have thus ventured to give is not agreeable to general practice, yet as this practice has ancient custom only for its support, being in every other respect apparently ill founded, the advantages which may accrue from a different mode of treatment, will only require, we think, to be thus fully pointed out in order to procure it a favourable reception.

Prejudice

Prejudice arising from and supported by ancient authorities, will here, as in most cases, have some effect in preventing a new proposal from meeting with much attention: but we think it probable, that no great length of time will be required to place it in a more favourable point of view.

Having already pointed out the plan of management to be adopted in the after treatment of those cases in which the trepan has been applied for the removal of a depressed portion of the skull, it will not again be necessary to enter upon the subject; for whatever the cause may be for which the operation is practised, the cure of the remaining sore must always be conducted in the same manner.

Having thus attended to the causes by which a compressed state of the brain may be induced, we shall now proceed to the consideration of commotion or concussion.

SECTION IV.

Of Concussion or Commotion of the Brain.

EVERY affection of the head attended with stupefaction, when it appears as the immediate consequence of external violence, and when no external mark of injury is discovered, is in general supposed to proceed from commotion or concussion of the brain; by which is meant such a derangement of this organ as obstructs its natural and usual exertions, but which does not leave such marks of its existence behind it as to render it capable of having its real nature ascertained by dissection.

Almost all the symptoms commonly produced by a compressed state of the brain, as enumerated in the third section, are in some instances found to occur
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from concussion : but those which are most frequently induced by this cause are, Stupor; torpor to a greater or lesser degree; a slow, soft pulse; and a dilated state of the pupils, even on the eyes being exposed to a strong light.

As it is not always easy, however, to determine from the symptoms which prevail what particular affection of the head may have taken place in consequence of external violence, we shall endeavour to mark as far as may be done, a distinction between concussion and inflammation, and betwixt concussion and compression, of the brain. This is an object of much importance, and requires our most serious attention.

There is not much difficulty, as we have seen in the last section, of distinguishing between those symptoms which proceed from inflammation, and those which originate from concussion. Such as proceed from concussion alone, commence immediately on the cause being inflicted; in the more violent degrees of them, the patient remains totally insensible; the pupils are much dilated, and do not contract even when the eyes are exposed to the strongest light; and the pulse, although sometimes full, is not hard nor strong, and it always becomes weaker on blood being evacuated.

Those symptoms again which originate from inflammation, seldom appear till a considerable time after the accident: By the description we shall give more particularly of them in the following section, it will appear, that they are materially different from those which occur either from a compressed state of the brain or from concussion; and in particular, that the pupils are not dilated; that the eyes, excepting in the more advanced stages of the disease, are very sensible to the impression of light: and that the pulse is firm and hard from the first, and does not become weaker on moderate evacuations of blood.

By these marks of distinction, as well as by other differences which an attentive practitioner may commonly notice, little uncertainty will ever prevail in determining

determining whether the symptoms which take place depend upon concussion or inflammation ; so that with respect to this point we may soon determine the mode of practice to be pursued. And again, we can easily distinguish slight cases of concussion from those symptoms which proceed from compression. Thus, when a person is knocked down by a blow upon the head, and quickly recovers from the more alarming effects of it, but remains for a considerable time giddy ; with slight pains in different parts of his head ; with tinnitus aurium ; weakness of sight ; some degree of imbecillity, and loss of memory ; if no other symptoms occur, and especially if the patient is able to walk about, as frequently happens even in high degrees of the symptoms we have mentioned ; we conclude from experience in similar cases, that they all proceed from commotion or concussion, and not from compression of the brain ; for the symptoms which proceed from compression are always of a more permanent nature, and uniformly continue till the cause which produced them is removed.

But in every accident of this kind attended from the beginning with more violent symptoms, and especially when the patient is rendered altogether insensible, if no external mark of injury is met with, there is always much difficulty in determining whether the symptoms which take place depend upon concussion or depression. Even the most experienced surgeons are frequently unable to determine upon this point with any kind of certainty. Indeed instances must have occurred to every practitioner, in which symptoms which were supposed to originate solely from concussion, have after death been found to proceed from extravasation, or perhaps from a fracture attended with depression of the skull which had not been previously discovered. And again, extravasation has in various cases been suspected to produce symptoms, when on dissection no vestige either of this or of any other morbid appearance could be discovered.

So far as my observation goes, the most material difference which occurs between the symptoms produced by these two causes, concussion and compression of the brain, is met with in the pulse and in the breathing. In a compressed state of the brain the breathing is commonly deep and oppressed, similar to what most frequently takes place in apoplexy; whereas, in patients labouring under commotion or concussion, the breathing is in general free and easy, and the patient lies as if he was in a sound and natural sleep. The pulse is commonly soft and equal, and not irregular and slow, as it is usually found to be when the brain is compressed. In cases of compressed brain, too, although little or perhaps no relief may be obtained from blood letting, yet no harm is observed to occur from it; for in such circumstances it may be prescribed in moderate quantities, without reducing either the frequency or strength of the pulse: Whereas in real concussion of the brain, the pulse, as we have already remarked, will frequently sink, and become much more feeble on the discharge of only eight or ten ounces of blood.

In doubtful cases, therefore, a quantity of blood should be immediately discharged: If the pulse, upon six or eight ounces being taken away, is found to be stronger and fuller than before; if the blood appears to be fizy; and especially if the patient becomes in any degree more sensible; we may conclude with much probability, that the symptoms which take place depend either upon extravasation; upon a depression of some part of the skull which has not been discovered; or upon some degree of inflammation: and as long as the pulse remains firm, or so long as any advantages are gained by it, we may with safety proceed to evacuate more blood.

But when the pulse, upon a few ounces of blood being discharged, becomes feeble, and especially if the patient becomes in other respects more weakly, as will almost always be the case when the symptoms depend
mostly

mostly upon concussion, as the nature of the case is thus rendered in some measure certain, any farther evacuation of blood should be immediately desisted from.

We have already endeavoured to show, that concussion of the brain appears to operate by inducing debility of the whole nervous system; our remedies, therefore, instead of tending to increase this, as blood letting very certainly does, should be directed with a view to support and strengthen the patient.

With this intention, in any other set of symptoms depending on debility, we would administer not only invigorating cordials internally, but would make use of stimulating applications outwardly; and as the symptoms of debility are as strongly marked in the case of which we are now treating as in any disease whatever, I am clearly of opinion, that cordials, and even stimulants, are equally necessary in the treatment of it.

Many practitioners have acknowledged, that although they have by general custom been induced to bleed freely in every case of injury done to the head, yet in many instances that no evident advantage has been derived from it, and in some that it has even appeared to do mischief. Having met with various instances of this, in which large evacuations of blood sunk the strength of the patient in the most alarming manner; and finding, indeed, unless where the symptoms were obviously of an inflammatory nature, that few if any, recovered when the practice of discharging much blood was carried as far as is usually done; I was induced in the first place to see what would be the event of making no evacuation of blood, but merely to trust to the effects of laxatives, and to a gentle moisture being kept upon the skin. Upon finding that no bad effects resulted from this, but on the contrary, that more patients recovered than had commonly done when a contrary practice was pursued, I was led to go somewhat farther in the prosecution of the same idea.

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Upon this principle cordials were given internally, and stimulants, particularly blisters, applied externally, in the same manner as is usually done in cases of debility proceeding from any other cause; and hitherto the effects resulting from this have been such as sufficiently warrant a continuance of the practice.

In every case, therefore, where concussion of the brain is found to be the cause of the symptoms which prevail, the practice I would wish to recommend is, to exhibit in a gradual manner such quantities of warm wine as we would judge to be proper for the same symptoms of debility induced by any other cause: As patients in such circumstances are apt to become cold, they should be kept warm by proper coverings: A blister should be applied over all that part of the head in which the skin has not been injured; sinapisms should be applied to the feet; and although strong purgatives would be improper, by tending to reduce the strength of the patient, yet gentle laxatives prove always useful, and should be regularly given so as to keep the bowels moderately open.

As wine is a cordial upon which we can place more dependence than on any other with which we are acquainted, it ought in this, as in every case where cordials are necessary, to be preferred. But although with due pains, by opening the patient's mouth, and putting it in with a spoon, it may in almost every case be exhibited; yet we now and then meet with instances in which it cannot be swallowed in such quantities as to have much effect: In this case the volatile alkali, ardent spirits, and other cordials of a stimulating kind, should be given.

In concussions of the brain, Mr. Bromfield has recommended the use of opiates; a circumstance which tends much to corroborate the idea we have endeavoured to establish of the nature of this affection, for few medicines act with more certainty as cordials than opium: when conjoined with antimonials, I have frequently found it prove serviceable; but although I

have upon such respectable authority employed opium by itself, I have not hitherto found it to prove so useful as wine : This, however, may proceed, either from my not having pushed the use of it so far as I ought to have done ; or from the few cases in which I have employed it having been such as would not have done well whatever remedy might have been used. I must, therefore, have farther experience of its effects before venturing to speak decisively about it.

In cases of this nature, issues are commonly advised ; but as more advantage I believe is to be derived from the stimulating powers of blisters, than from any discharge which they produce, instead of preserving a part that has been blistered open, by means of issue-ointment, as is usually done, I would rather prefer a repeated and frequent renewal of blisters on different parts of the head and neck. By this means, if any advantage is to be derived from drains, it will be received with as much certainty as from any kind of issue ; and by applying one blister always as another is nearly healed, almost a constant stimulus will be preserved.

When patients are recovering from accidents of this kind, a liberal use of the bark, with steel mineral waters, has sometimes proved serviceable. Gentle emetics have likewise proved useful ; and in several instances, when from shocks given to the brain, much languor, inactivity, and loss of memory, have continued more permanent than usual, electricity has been productive of good effects.

It must be remembered, however, when we recommend such a course, that it is expressly for the purpose of removing symptoms which originate solely from concussion, and which do not depend in any degree either upon a compressed state of the brain or upon inflammation : A circumstance which we suppose may be in general so far ascertained, as to render it obvious whether such a course be proper or not, merely by the effects observed to result from blood letting.

Attentive

Attentive observation of other circumstances might in some instances enable us to determine this point without the necessity of having recourse to this means of distinction; but where there is such room for uncertainty as frequently prevails here, and where the life of a patient is to depend in a great measure on the practice to be adopted, nothing should be omitted that can have any effect in establishing an accurate knowledge of his situation. In such circumstances, therefore, there is no room to hesitate; and we should always discharge as much blood in the manner we have mentioned, as is fully sufficient for determining the nature of the case.

This is the practice upon which we would wish to depend, when the symptoms which prevail arise from concussion alone: And accordingly we have not thought it necessary to mention the use of the trepan; for although this operation is very universally employed in every case of this nature, yet unless where symptoms take place of a compressed state of the brain, no good reason can be given for it. But when any kind of doubt remains upon this point, and especially when a patient continues in a state of insensibility, the trepan ought by all means to be employed; for as in these circumstances the danger could not probably be increased by it, even although the symptoms should afterwards be found to originate from concussion; and as it affords the only chance of safety on the supposition of their depending upon compression, practitioners would be highly blameable were they to omit it: And as the hazard of the patient must here be extremely great, perforations should be made in every accessible part of the skull as long as the cause remains undiscovered.

We now proceed to consider more particularly the effects of inflammation upon the brain.

SECTION V.

Of Inflammation of the Membranes of the Brain from external Violence.

INFLAMMATION in any part of the body always demands our attention, and more especially when it occurs in an organ of importance; for as its effects are in general violent and rapid, if they are not soon obviated they are in a short space of time commonly productive of mischief which cannot afterwards be removed. If this is the case in parts of less importance, it is more particularly so in every inflammatory affection of the brain.

Inflammation of the brain and of its membranes is attended with all the symptoms which commonly occur in inflammatory affections of other parts, while at the same time it is accompanied with symptoms peculiar to itself. By whatever cause it may be induced, the symptoms do not appear immediately; seldom indeed till several days after the injury is inflicted, and in many cases not till two, three, or more weeks, or even as many months, have elapsed; a circumstance, we must observe, which serves more certainly than any other to distinguish an inflammatory affection of the brain, and of its membranes, from every other ailment to which it is liable from external violence: For, while the symptoms of inflammation approach by slow degrees, the consequences of concussion of the brain take place immediately upon the injury which produces them being done; and this is likewise the case with those symptoms which depend either upon a depression of the skull, or upon an extravasation of blood or of serum.

At some uncertain interval, of two or three days, of as many weeks, or of months, as has been the case in some

some instances, from the time that the injury which occasions the inflammation has been received, the patient begins to feel an universal uneasiness over his head, attended with listlessness and some degree of pain in the part upon which the injury was inflicted, but of which perhaps he has not till now had any cause to complain.

The listlessness gradually increases—the patient appears dull and stupid—and the pain becomes more severe in the part at first injured; while the distress in the other parts of the head gives a sensation of fullness as if the brain was girded or compressed: The patient complains of giddiness and of nausea; which sometimes terminates in vomiting. He finds himself hot and extremely uneasy; his sleep is much disturbed—and he is not refreshed either with what he enjoys naturally, or by what is procured with opiates. The pulse is firm, or rather hard and quick, as it is almost always indeed in inflammatory affections of membranous parts: The face is commonly flushed—the eyes are from the beginning somewhat inflamed—and exposure to light creates a good deal of pain.

In some instances, where the attending symptoms are accompanied with a wound of any part of the head, this flushing of the face and inflammation of the eyes are attended with and seem to depend upon an erysipelatous affection proceeding from the sore: In which case the edges of the sore first become hard and tumefied, and the swelling, which appears to originate in the aponeurotic expansion of the muscles of the head, spreads very quickly over the whole of it, and especially over the fore part towards the eyelids; which in many cases of this kind become swelled to such a degree as to shut up the eyes entirely. This swelling is somewhat soft. It receives with ease any pressure that is made upon it; it is painful to the touch; and the skin over the whole of it has an erysipelatous appearance. This diffused swelling, however, altogether formidable in appearance to those not

much accustomed to this branch of practice, is not in general of such a dangerous tendency as that puffy circumscribed tumor to which the parts on which the blow was given are more especially liable; for it frequently happens that this erysipelatous swelling, which extends over almost the whole head, originates, not from any thing bad within the skull, but merely from the external wound in the tendons of the different muscles: In which case all the symptoms with which it is attended are very commonly easily removed by those means which in general prove most effectual for erysipelas in other parts. In a few instances, however, this symptom is likewise connected with, and seems to originate from, some affection of the dura mater; in which case its tendency is always of the most dangerous nature, and therefore requires our most serious attention.

In the course of a day or two from the time that these symptoms become formidable, the part which received the blow begins to assume some appearances of disease. If the bone was laid bare by the original accident, it is now observed to lose its natural healthy complexion; to become pale, white, and dry, either over its whole surface, or in particular spots, which by degrees extend over the whole; and the edges of the sore from the first commencement of the bad symptoms, become hard, dry, painful, and considerably swelled: But when the bone has not been denuded, and when none of the softer parts have been divided, but merely contused, they now begin to swell, become puffy, somewhat painful to the touch; and if the head be shaved, the skin over the parts affected will be observed to be of a more deep red than in the rest of the head; and if the swelled part be now laid open, the pericranium will in all probability be found to be detached from the skull, and a small quantity of a thin, bloody, and somewhat fetid ichor, will be found between this membrane and the bone; and the bone it-
self

self will be discoloured in nearly the same manner as if it had been laid bare from the beginning.

By the application of proper means, all these symptoms are in many instances removed ; but when they are either neglected from the beginning, or when they do not yield to the remedies employed, they are very constantly aggravated. The pulse still continues quick and hard ; the patient becomes more and more restless ; and in some instances, delirium takes place. He is in general extremely hot ; but at times is seized with slight shiverings, which gradually become not only more severe but more frequent, and they are very commonly attended with some degree of coma or stupor.

About this period all the symptoms which we have described become so much milder as not to be distinctly observed, or are altogether lost in those which now begin to take place. Paralysis of one side or the other is soon followed by deep coma ; the pupils are dilated, and are scarcely affected by the impression of light ; the urine and fæces are passed involuntarily ; subfultus tendinum and other convulsive symptoms take place ; and death is the certain consequence of this situation if the patient is not speedily relieved.

We have thus enumerated the symptoms which usually occur from inflammation of the membranes of the brain : Others which we have not mentioned may be met with in particular instances ; but those we have narrated occur most frequently, and they serve to mark the presence of the disease with sufficient precision.

Attentive observation will readily distinguish two sets of symptoms in those we have mentioned ; each of which is connected with and clearly points out a particular state or stage of the disorder : The one I would name the Inflammatory, and the other the Suppurative or Purulent state.

In the treatment of these affections, it is of the utmost importance to attend to this distinction. It

ought to serve indeed as the basis of our practice, in so far as the principal remedies to be used in the one state are improper or even altogether inadmissible in the other.

During the prevalence of the inflammatory symptoms, we rely much on the effects of blood letting; but we ought to abstain from this remedy when the disease has advanced to the suppurative state. It is in this state that the application of the trepan can alone give relief; while in the inflammatory stage, it is not only useless, but may even prove prejudicial. We shall afterwards, however, have occasion to consider this point more particularly.

External violence may induce inflammation of the brain in three different ways; by depressed portions of the cranium irritating the dura mater; by contusion; and by simple fissures or fractures of the skull not attended with depression. The first of these we have already considered, and shall now proceed to treat separately of the other two.

§ 1. *Of Contusion of the Head.*

It is not those slighter contusions which affect the teguments of the head only that we are now to consider; it is such as in their consequences prove formidable by communicating inflammation to the membranes of the brain.

A contusion of the head may be produced in the same manner with contusions of other parts; by falls, blows, and by stones or other missile weapons thrown from a distance. It may be attended with wounds of the skin and other teguments; or the skin, as frequently happens, may be left entire.

The immediate and most frequent effect of such blows upon the head as afterwards prove troublesome, is to deprive the person of his senses, and to leave some degree of giddiness, which continues for a longer or shorter period according to the violence of the injury.

ry. In a gradual manner, however, the patient recovers so as commonly to be perfectly well after a night's sleep; and unless a wound has been produced along with the contusion, he seldom or never complains of the part on which the injury was done till several days after the accident.

The time which in such cases intervenes between the blow being given and the commencement of the after symptoms is very uncertain: These symptoms all originate from inflammation, and this again will always make a slow or a rapid progress according to the violence of the cause, and according to the habit of body of the patient. Hence, in some cases, the inflammatory symptoms appear in the course of a day or two from the accident; whilst, in others, the patient continues perfectly well for two, three, or four weeks; and at last is seized with pain and inflammation of the part on which the injury was inflicted, and from which alone all the train of bad symptoms proceed which we enumerated above: Nay, instances have occurred of cases which proved to be extremely hazardous, in which no appearance of any thing morbid was observed on that part which received the blow and which afterwards inflamed, till the eightieth, ninetieth, or even till the hundredth day from the accident.

Hence it is evident, that much danger may occur from accidents of this kind which at first appear to be trifling: a circumstance which points out in a strong point of view, the propriety of paying the most exact attention to every injury done to the head.

In the treatment of contusions of the head, the indications to be kept in view are,

1. To employ those means which are known to prove most effectual in preventing inflammation.
2. When this is found to be impracticable, we should endeavour to prove the resolution of the inflammation by general remedies and topical applications.

3. When

3. When the inflammation cannot be carried off by resolution, and when suppuration has taken place, a free vent should be procured for the matter. And,

4. If the parts affected are attacked with gangrene, we should endeavour to remove it, and obviate the effects of it.

With respect to the first indication, we have to remark, that in slight contusions of the head we seldom have it in our power to employ any prophylactic remedies or means for preventing the accession of inflammation. Patients commonly recover speedily from the immediate effects of contusions, and, till the after symptoms commence, they seldom complain of any thing but a slight soreness on the part which received the blow. Practitioners are not always therefore informed of accidents of this nature; and when they are, they rarely get the patient to submit to any course that could probably prove effectual. But when this can be done, as it sometimes may in cases of more violent contusions, the means we would recommend are blood letting, both general and local, to a considerable extent; the use of laxatives, so as to preserve an open state of the bowels; the application of the watery solution of saccharum saturni to the part affected; a low diet, and total abstinence from every kind of exercise.

By these remedies the effects of many injuries of the head might be prevented: But practitioners, as we have already remarked, are seldom called till the bad symptoms have commenced; the particular treatment of which we are now to enter upon. And we are first to consider how we are to accomplish the resolution of inflammation of the brain. For this purpose, blood letting, purgatives, mild sudorifics, and opiates, are to be chiefly depended on, along with a proper local treatment of the injured part of the head.

In common practice, any blood to be evacuated in cases of this nature is taken indiscriminately from any part of the body: But by many of our older writers,
and

and even by some practitioners of modern times, we are told, that blood taken from the feet proves in general more effectual than the same quantity taken from any other part of the body.

This, however, is an idea built upon the erroneous doctrine of derivation and revulsion, which is now very generally rejected. Instead of this, we find that inflammatory affections of other parts of the body are most effectually relieved by local blood letting; and when blood cannot be taken from the part immediately affected, we always wish to take it from some blood vessel as contiguous to it as possible.

In like manner, in affections such as we are now considering, any blood to be discharged should be taken from parts as near to the seat of the injury as possible. When any considerable quantity has been discharged by the vessels divided in the operation of scalping, much advantage is commonly derived from it: A circumstance which strongly indicates the propriety of local blood letting in every case of this nature.

Upon this principle, when a sufficient quantity of blood can be procured by the application of leeches, or by cupping and scarifying as near as possible to the part affected, this mode of discharging it should be preferred: But when this cannot be done, it may be always accomplished by incisions or scarifications made in the part affected with a lancet or scalpel: A practice from which I have on different occasions experienced much advantage, and which I can therefore venture to recommend. When the skull is already laid bare by the accident which gave rise to the inflammation, or when the scalp has been divided in order to evacuate any matter collected beneath it, there will be no necessity for these scarifications; but whenever the teguments remain entire, or are only slightly injured, and are attacked in some particular spot with inflammation, scarcely any remedy will prove so effectual in removing it as scarifications; which should
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not be made merely through the skin, but with freedom into the parts beneath, with a view to divide the largest arteries of the part. In this manner any necessary quantity of blood may be discharged; which being taken from the vessels directly affected, proves always more certainly useful than any other mode of discharging it.

When this operation however is not submitted to, or when general blood letting may be judged advisable, it commonly proves most effectual to open the jugular vein or the temporal artery. With respect to the quantity of blood to be discharged, this must always depend on the violence of the symptoms and on the strength of the patient: but in circumstances such as we are now considering, as the patient's recovery or death is probably to depend on what is done in a very short space of time, blood letting, as being the remedy on which our hopes are chiefly founded, should be pushed immediately to as great a length as with safety can be done. Instead of taking away eight or ten ounces, and repeating the operation at the distance of a few hours as is usually done, I always think it right, as I have just observed, to be determined in this matter by the strength of the patient, and to draw off blood as long as the pulse continues tolerably firm. As long as it does so, no danger can occur from the evacuation; and so far as I am able to judge in every case of violent inflammation, it answers the purpose more effectually to take away perhaps twenty or twenty five ounces of blood at once, than to abstract even a larger quantity by repeated operations. In the course of a few hours, again, if the symptoms still continue violent, and if the pulse remains sufficiently full, it may be proper to discharge an additional quantity; but this likewise should be determined by the effects which occur from it.

Together with a plentiful evacuation of blood, the bowels should be freely emptied, by brisk purgatives when these can be exhibited; or when the patient
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cannot swallow them in sufficient quantities, stimulating injections should be frequently repeated. In every affection of the head, it is an object of importance to preserve a lax state of the bowels; but it is particularly necessary in all such as proceed from an inflamed state of the brain or of its membranes. It is not, however, an open state of the bowels merely which proves useful here. In order to receive much advantage from the practice, a smart purging should be kept up, by repeated doses of calomel, jalap, or by some of the neutral salts, when these can be swallowed.

As it is found in the treatment of every case of inflammation, that it proves highly serviceable to preserve a moist state of the surface of the body, this should be particularly attended to in an inflamed state of the brain. In general, a mild perspiration may be induced by the use of warm fomentations to the feet and legs, and by laying the patient in blankets instead of linen; but when means of this more simple nature do not prove effectual, medicines of the sudorific kind may be given; and of this class, none prove ever so powerful as a proper combination of opiates and emetics.

For this purpose, we find Dover's powder much recommended by a celebrated practitioner, Mr. Bromfield.* But although this operates in general as an effectual diaphoretic, it is very apt to induce sickness and even vomiting; an occurrence which in an inflamed state of the brain we would rather wish to avoid. I have for a long time, however, been in the habit of using as a diaphoretic a medicine very similar to this, which at the same time that it seldom fails in exciting sweat, rarely if ever produces sickness or vomiting. Dover's powder consists of a combination of opium with ipecacuanha: This is prepared with opium combined with an antimonial, the tinctura antimonii of different dispensatories, prepared with the
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* Vide Chirurgical Observations and Cases by William Bromfield, page 12. vol. i.

glass of antimony. To an adult, fifteen drops of this tincture with four or five of laudanum may be given every two hours, till a sweat is induced; when a very small quantity of the medicine being continued from time to time will serve to keep up a constant perspiration.

When much pain takes place, opiates should be exhibited in doses adequate to the degree of it. A general prejudice has till of late indeed prevailed against the use of opiates in every complaint of an inflammatory nature, and particularly in inflammation of the membranes of the brain; but this seems to have proceeded more from an erroneous idea respecting the proximate cause of inflammation, and of the *modus operandi* of opiates, than from actual observation of the effects produced by them. As the pain which accompanies every case of inflammation proves in many instances highly distressing, and as it evidently appears to have a considerable effect in aggravating all the other symptoms, the propriety of exhibiting sedatives for removing it is obvious; and opium being the most powerful remedy of this class, it has now been long used by many practitioners with some freedom in various cases of inflammation; and as I have frequently given it even in full doses with no inconvenience in inflammatory affections of the brain, but on the contrary with much real advantage, I can without hesitation recommend it in every case of this kind when it is indicated either by much pain or restlessness.

These are the internal remedies upon which we are chiefly to depend in every case of inflammation of the brain from external violence; but some attention is likewise necessary to the external treatment of the part affected, and more advantage I think may be frequently derived from this than in general is imagined.

Instances are often met with of inflammatory affections of other parts of the body being much relieved by drains or issues inserted in contiguous parts; and on the same principle I have long been in the habit of
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treating those affections of the head which we are now considering, in such a manner as most readily to induce a plentiful purulent discharge from the seat of the injury.

With a view to accomplish this, when the original accident is attended with a wound or a division of the skin and other soft parts, as the lips of the sore are commonly found hard, painful, and very dry, such applications should be employed as we find to prove most effectual in inducing the formation of matter: The sore should be covered with pledgits of lint spread with any emollient ointment, and soft emollient poultices of a moderate degree of heat should be laid over the whole: By this means, and especially by a frequent renewal of the cataplasms, so as to preserve a moderate but equal heat in the sore and contiguous parts, it commonly happens that a discharge of matter is induced; and this being attended with a diminution of pain and a removal of the hardness of the parts affected, all the other symptoms which take place are thereby in general either much mitigated, or perhaps entirely removed.

In such cases, again, as are not attended with a division of the teguments, as soon as there is any reason to suspect, from the parts which received the injury becoming pained and swelled at the distance of several days perhaps from the accident, that bad symptoms may supervene, the tumor should be immediately laid open, by dividing the skin and teguments down to the pericranium; and if that membrane is found to be separated and elevated from the bone, it ought likewise to be laid open: By this means any matter that is confined, and which otherwise might have done mischief, will be discharged; and by inducing a supuration upon the sore in the manner we have mentioned, the symptoms of inflammation, which would in all probability have become violent, may possibly be prevented.

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In the treatment of tumors of this kind, we commonly delay opening them till the fluctuation of a fluid can be distinctly perceived. In this, however, I think we are wrong; for any matter that is formed in these swellings is constantly of a thin acrid nature; so that to confine it for any length of time in close contact with the skull, must not only render the bone liable to become carious, but must incur some hazard of inducing and spreading the inflammation upon the parts within the skull: For as a very intimate connection takes place between the vessels of the pericranium and of the dura mater; and as it is evident, in affections of this nature, that the external parts are first affected, and that the dura mater becomes inflamed only in consequence of its connection with these, I have long thought it probable, that the confinement of acrid matter beneath the pericranium, is to be considered in every instance of this kind as the most frequent cause of the inflammation being communicated to the parts within the skull; and accordingly I have been in the habit of discharging it by a free incision, as soon as the least tumefaction on the part affected is observable; and evidently with much advantage.

In every case, indeed, of injuries done to the head, in which the symptoms do not commence till several days after the accident, as it is clear that the cause of the disorder has not originally affected the brain or its membranes, for if it did so its effects would be immediate, it is probable that it operates almost solely by forming some effusion externally between the pericranium and the skull: And as we know that membranous parts seldom or never afford good pus, any effusion which takes place must commonly be of a nature that will not readily proceed to the purulent fermentation; and will therefore be apt to acquire that kind of acrimony which is very generally met with in every fluid which has been some time extravasated in consequence of external violence, and which from its nature cannot be converted into pus.

If the original effusion has been considerable, an evident tumefaction will take place from the beginning: But it often happens, that it is in such a small quantity as scarcely to produce any perceptible swelling at first; in which case, as little or no tension occurs, the patient feels very little uneasiness in the part which received the injury till the effused fluid begins to turn acrid, which may happen sooner or later in different instances, according to the violence of the injury, and habit of body of the patient, as well as other circumstances. But as soon as it has acquired any degree of acrimony, the irritation produced by it on the contiguous parts, occasions pain, inflammation, and swelling; and as the pericranium and aponeurotic expansions of the muscles are very firm and strong, if this acrid matter be not soon evacuated by an incision, it gradually insinuates itself between those parts of the pericranium and bone beneath, which were not at first affected: And as this extends the effects of the disorder, so it not only produces an increase of the external swelling, but by means of the vascular connection we have mentioned between the pericranium and dura mater, the inflammation is at last conveyed to the parts within the skull; and as soon as these are affected, but never till then, the bad symptoms, which always occur upon the membranes of the brain becoming inflamed, are sure to take place.

It is therefore extremely probable, that the confinement of this acrid matter beneath the pericranium, must have a considerable effect in promoting the progress of the inflammation; and hence the discharge of it by an incision should be always advised whenever there is any reason to suspect, from the occurrence of pain and a small tumefaction as the consequences of external violence, that matter is collected even in the smallest quantity between this membrane and the skull.

It must be remarked, however, that we do not by any means recommend this practice in the treatment

of tumors recently formed by external injuries. It often happens, that a swelling of a considerable size occurs instantly upon a blow being given to any part of the head : But in general this soon disappears by the use of mild astringent applications, particularly of any of the saturnine solutions ; of crude sal ammoniac dissolved in water ; or of common brandy. It would therefore be extremely improper, in such cases, to lay the parts affected open by an incision : A practice, however, which has often been attempted by those not much versant in this branch of business ; for, as swellings of this kind frequently afford, upon examination with the fingers, a sensation similar to what is experienced from a depression of the skull, so they have in many instances been laid open, in order to discover the real state of the parts beneath : But no practitioner of experience will ever be deceived with appearances of this nature ; nor will he ever proceed to lay the skull bare, unless there are more evident marks of its being injured, or of there being some extravasation beneath the skull itself. But whenever a tumor, attended with pain, appears at a distant period upon the spot on which a blow or a bruise was received, as it seldom or never happens that swellings of this kind are of a harmless nature, or that they can be dissolved by external applications, they ought in every instance to be laid open as soon as they become in any degree perceptible. By doing so, we can never do any harm ; and by evacuating an acrid matter, which in almost every case of this kind we will find collected beneath the pericranium, much real advantage may be derived from it.

An incision made for evacuating matter must necessarily go to the depth at which the matter is seated ; otherwise the purpose for which it is intended will not be answered : And in the case of which we are now treating, as it is almost in every instance collected beneath the pericranium, this membrane must always be freely divided. But in making those scarifications we

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had occasion to advise for the purpose of evacuating blood, as they are supposed to be necessary before any tumor has appeared, and are not intended for the evacuation of matter, there is no necessity for carrying them to such a depth. They ought indeed to pass freely into the cellular membrane, otherwise the arteries of the part will not be sufficiently divided; but as no additional advantage could in this state of the disease be received from dividing the pericranium, and as the bone might be injured by it, it ought by all means to be avoided.

After an incision, made in the manner we have mentioned, the wound should be dressed with any emollient ointment; and by a frequent renewal of warm emollient poultices over the whole, a plentiful suppuration will be induced, which, as we have already remarked, proves commonly very effectual, not only in preventing, but in removing all those bad symptoms which an inflammatory affection of these parts is sure to induce.

Having thus pointed out the means to be employed for the removal of inflammation of the brain by resolution, we shall now make a few observations upon the remedies to be used when the disorder has either proceeded to suppuration, or when, on the removal of a portion of the cranium, the dura mater is found to be sloughy, with a tendency to gangrene; and this will include what we have to say upon the third and fourth indications of cure which we formerly mentioned.

When the inflammatory symptoms have not yielded to the means of cure we have mentioned; but have, on the contrary, increased in violence, and are succeeded by coma, paralysis, irregular convulsive motions, involuntary passage of the fæces and urine, dilatation of the pupils and insensibility to the impression of light, along with a slow and full pulse; and more especially when these symptoms have been preceded by fits of rigor or shivering; we then conclude with much certainty, that the suppurative state of the dis-

order has taken place ; that matter is formed within the skull, and operates by occasioning compression of the brain. Shivering fits take place on the formation of large abscesses wherever they are situated ; but in inflammatory affections of the brain, they prove so certainly characteristic of the disease having terminated in suppuration, that no doubt can remain of this having occurred whenever they are found to accompany the other symptoms we have mentioned.

The existence of matter within the cranium being ascertained, as no other remedy can be depended on for removing it, the trepan should be immediately advised ; and as the safety of the patient is to depend entirely on a free evacuation of the collected matter, it ought to be applied with much freedom. In such circumstances, indeed, it must be the height of timidity alone, that can make a practitioner hesitate in forming as many perforations in the skull as are in any degree necessary for discharging the matter.

When, on perforating the skull, there is little or no matter met with immediately beneath, if the dura mater appears to be more tense than usual, as this will give cause to suspect that the symptoms of suppuration have originated from matter collected between this membrane and the pia mater, or perhaps upon the brain itself ; we ought by no means to rest satisfied with having merely perforated the bone : If in such circumstances we proceed no farther, the matter will still remain confined ; the brain will be as much compressed as before ; and of course no advantage will be derived from the operation.

In this situation, therefore, a practitioner should not hesitate in laying the membranes of the brain open. But, for the method of effecting this, as well as for some farther observations upon this point, we must refer to the second section of this chapter, where the consideration of it was fully entered into.

When, again, it is found, on perforating the skull, that the dura mater has already become sloughy, with
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some tendency to gangrene, the utmost danger is to be dreaded : If mortification has commenced, there will be much reason to imagine that death will soon terminate the scene ; but different instances have been met with of sloughs forming upon the dura mater, and of cures being accomplished after these have separated : All, however, that art should in such cases attempt, is to preserve the sores clean ; to see that any matter which may form shall be as freely discharged as possible ; and to take care that nothing but light easy dressings shall be employed ; and that the internal use of Peruvian bark, conjoined with elixir of vitriol, shall be immediately advised in as great quantities as the stomach will bear. If any tendency to inflammation still prevails, the diet should be low and cooling, with a plentiful allowance of whey or any other diluent drink, and the bowels ought to be kept moderately open : But, on the contrary, when the system is low and the pulse feeble, wine ought to be exhibited as the most effectual cordial. In other respects, the patient ought to be treated by such means as are found to prove most beneficial in similar affections of other parts of the body ; but as these have been already treated of particularly in a former publication, we do not think it necessary to enter farther upon them at present.*

Before leaving this subject, it is proper, perhaps even necessary, to take notice of a practice which has been very prevalent, the indiscriminate application of the trepan in the inflammatory as well as in the purulent or suppurative stage of the affection of which we have now been treating. It has been common, in every case of this kind, in the first place to prescribe large evacuations ; and if these fail in procuring relief, to apply the trepan immediately, whatever may be the stage of the disorder.

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* Vide Treatise on Ulcers, &c.

This practice is chiefly founded upon an idea of the operation of the trepan being an innocent remedy, and of no harm being ever produced by it. In support of this opinion, experiments are related of the operation having been performed in sound animals with a view to determine the question, Whether exposure of the brain to the air is detrimental or not? And as it has happened in several instances, that no evident bad effects have ensued, a general conclusion has been drawn in favour of the operation.

But were we for a moment disposed to admit the truth of this conclusion, yet one great objection to the application of the trepan in an inflamed state of the brain, would arise from this consideration, that no benefit could possibly be derived from it. The sole object we have in view in performing the operation of the trepan, is to remove pressure from the surface of the brain: But in an inflamed state of this organ, as no pressure is supposed to exist, it would be absurd to think of accomplishing this intention.

If practitioners would allow themselves to be directed by the effects of those remedies which they find to prove useful in similar affections of other parts of the body, inflammation of the brain, or of its membranes, would never be treated in this manner: We would not surely expect to reap any benefit, so long as symptoms of inflammation continue, from perforating the chest in inflammatory affections of the pleura; nor would any surgeon advise it till the formation of matter was fully indicated.

Independently, however, of this consideration, I am decidedly of opinion; that the trepan cannot be applied in cases of inflammation of the brain without manifest hazard: The symptoms of inflammation are uniformly increased by it; and in almost every instance in which I have known it employed during this state of the disease, the dura mater has been found, after death, either in a state of mortification, or covered with purulent matter. These effects we may suppose

to be in some measure the consequence of admission of air to the brain ; and they may be partly owing to the violent separation of a portion of the cranium from the inflamed dura mater, to which it adheres firmly in almost every point.

Neither is this the only ground on which I would object to the practice : Contrary to the received opinion, I think that the operation of the trepan is in itself dangerous even when performed in a sound state of the brain where no inflammation takes place. Several years ago I made a variety of trials to determine this point ; and nearly one fourth of the animals that underwent the operation, appeared to me to die in consequence of it alone.

It is not, however, from the effects of this operation on other animals alone that I wish to draw any conclusion ; but when consequences similar to what I have now stated, result from it when performed on the human body when no immediate injury has been done to the head, they will surely be allowed to have some weight in establishing the opinion I have advanced. I have accidentally met with three cases much in point, in none of which there was any appearance of inflammation of the brain previous to the operation ; and yet two of the patients died in a few days after the perforation of the skull, evidently from inflammation induced upon the dura mater. As cases of this nature are rarely met with, and as the result of these tends to establish the truth of the opinion I have endeavoured to inculcate, I shall here give a short account of them.

In cases of inveterate epilepsy, where every other means of relief have failed, it has been proposed, by way of experiment, to see what effects would result from the pressure of the atmosphere being freely applied to the brain by one or more perforations made in the skull with the trepan. Any advantage to be expected from this I must acknowledge to be extremely doubtful ; and the effects of it in such instances

appear to me to be so uncertain and even hazardous, that I should never think of advising it. But it has so happened, that I have known of two instances of its having been done by others : And in a third I had occasion to put it in practice myself, upon a gentleman who had laboured under epilepsy for upwards of twenty years. But in this case, as the fits appeared to be the consequence of an injury received in childhood upon the forehead ; as the external appearance of the part on which the injury was inflicted afforded much reason to suspect that a small portion of the skull was depressed at this place ; as there was some reason, therefore to suppose that the fits depended upon this cause, and as they were at this time become extremely violent, it was the opinion of several practitioners, as well as the earnest desire of the patient, that the trepan should be employed. This was accordingly done ; the portion of the skull which received the blow was taken out ; and matters went on very favourably till the end of the second day from the operation, when symptoms of inflammation occurred ; and notwithstanding all the pains that could be employed, he died in little more than forty eight hours from this period. On opening the head, a great quantity of pus was found, not only upon the dura mater, but upon the pia mater, and even between this membrane and the brain ; and as there was not till within twenty four hours of his death any symptoms of a compressed brain, there is much reason to think that the matter was formed merely in consequence of inflammation induced by the operation ; and therefore that the means employed for the patient's relief had evidently hastened his death.

One of the others on whom this operation was performed, recovered from the immediate effects of it, but with no alteration or abatement of the fits for which it was employed. The other died on the seventh day from the operation : Symptoms of inflammation appeared on the third ; and these were at last succeeded

ceeded by evident marks of compression of the brain : A considerable quantity of matter was found between the dura and pia mater, and even beneath this membrane, not merely on the parts contiguous to the wound, but over the whole surface of the brain down to the basis of it.

We have here two cases, very distinctly marked, of the hurtful effects produced by this operation even in a sound state of the brain, at least where no previous inflammation appeared to exist in it. The symptoms of inflammation which supervened in both instances, were evidently the consequence of the perforations : Suppuration ensued in each of them ; and as both the patients died in the space of a few days from this period, no doubt can be entertained of the cause of their death.

Upon the whole, therefore, the operation of the trepan appears to be inexpedient, and even dangerous, in an inflamed state of the brain : But when suppuration has taken place, and when matter formed within the skull operates as a cause of compression, as this operation affords the only chance of safety, it should be employed with freedom, according to the particular circumstances of every case. We proceed now to the consideration of Fissures or simple Fractures of the Skull.

§ 2. *Of Fissures, or simple Fractures of the Skull.*

The term Fissure is here meant to imply a mere division or simple fracture of the skull not attended with depression, and it may either penetrate the whole thickness of the bone, or be confined to one lamella of it only : A fissure too may be either attended with a division or wound of the corresponding teguments, or these may be left entire.

We have already had occasion to remark, that injuries done to the head, prove hazardous nearly in proportion to the violence which the brain receives from them : So that fissures, in so far as they affect the
skull

skull only, are not to be considered as dangerous ; but as they are frequently combined with affections of the brain from the beginning, and are on other occasions productive of consequences from which this organ is ultimately brought to suffer, they of course require our most serious attention. It often indeed happens, that very extensive fissures heal without the occurrence of any bad symptoms ; but as others of apparently a trivial nature frequently terminate in the most fatal manner, we cannot with propriety in any instance treat them with neglect.

Fissures of the skull may prove dangerous, either from being productive of effusions of blood or serum upon the brain, or by tending to excite inflammation of the dura and pia mater.

When effusions take place, as this must be immediately attended with symptoms of compression, those means must be put in practice which we know to be best suited for the removal of them ; but as these have been already fully treated of in the preceding sections, we do not think it necessary to enter into a particular detail of them at present ; and shall just shortly observe, that for the removal of such effusions, a proper application of the trepan is alone to be depended on ; The fissures should be traced through their whole extent ; and a perforation being made in the most depending part of each of them, if this does not prove altogether successful, the operation should be repeated along the course of the fractures, as long as any symptoms continue of a compressed state of the brain ; care being always taken to include the fissure in every perforation : For as the cause of all the mischief will in general be found contiguous to fractures of this kind, it would seldom answer any good purpose to perforate the skull at any distance from them.

It is therefore scarcely necessary to observe, when, in affections of this nature, it is judged proper to apply the trepan, that care should be taken to trace the course of the different fissures with as much exactness

as possible; for which purpose, as soon as the operation is determined on, if the whole extent of the fracture be not previously discovered, it must now be done by making an incision with a scalpel through the skin and other teguments down to the pericranium; and by carrying it slowly on, and taking care to follow the direction of the fissures, they may thus be brought freely into view.

When fissures are of such magnitude as to produce any obvious separation of the two sides of the fractured bone, the nature of the case is at once rendered evident; but it often happens, that the crack produced by a fissure is so extremely small as to render the opinion of the operator somewhat doubtful with respect to it: A little attention, however, to the different circumstances of the patient's situation, will at all times prevent any hesitation respecting the means to be employed for his relief.

The only appearances with which a fissure is in danger of being confounded, are, those indentations formed on the external surface of some parts of the skull by the blood vessels which run upon it; and by the different sutures which serve to unite the bones of the skull together.

When the part affected is not denuded of the pericranium, we may in general be determined with some certainty of the nature of the case, by the degree of adhesion which occurs at this part between this membrane and the bone. The pericranium, as we have seen, naturally adheres firmly to every part of the skull, and particularly at the sutures; and as one certain effect of a fissure is to destroy this connection entirely, when in cases of this kind the pericranium is found to adhere to the bone beneath, we may conclude without hesitation, that the part remains entire; and, on the contrary, when this membrane is loose and somewhat separated from the bone, there will be much reason to imagine that any rent or crack which appears at this part is produced by a fracture.

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It often happens, however, that we are deprived of this means of detecting fissures, by the pericranium along with the other teguments being entirely separated by the accident for a considerable space from the parts beneath. In such circumstances, various means have been proposed for obtaining some certainty of the nature of the case. By pouring ink over the surface of the denuded bone, the whole of it, we are told, may be wiped off, if the bone be not fractured; but, wherever there is a crack or fissure, that it will be impossible even with the assistance of water to remove it. By making the patient keep a firm hold with his teeth of one end of a hair, or of a piece of catgut, while the other extremity of it is secured at such a distance as to render it tense, if it be now struck, the vibrations thus produced will create, we are told, a very sensible degree of uneasiness in the part affected if it be fractured; but will not otherwise have any influence. And, again, it is said, if the patient be made to chew a bit of bread, or any other hard substance, that some pain will occur from it if the bone be fractured; but otherwisewise, that the part affected will not suffer from it.

None of these tests, however, are to be much depended on; neither of the two last have any effect, unless the fissure be extensive, and the sides of the fractured bone considerably separated from one another, when this means of distinction can never be necessary; and as ink penetrates the sutures of the skull unless when they are very firmly ossified, it can seldom happen that any trial to be made with it will be productive of any advantage.

It commonly happens, in fissures which extend through the whole substance of the skull, and even in such as penetrate only to the diploë, that blood continues to ooze from them for a long time after the accident, and it constantly returns again almost as soon as it is wiped off: This is one of the most characteristic marks of a fissure; and when it occurs, it points out

out with precision the nature of the case. But there is no necessity, we may remark, for so much anxiety on this point as is commonly expressed by practitioners; for, unless when symptoms of an alarming nature are met with, we shall presently endeavour to show that no operation should be advised: And again, when symptoms take place of a compressed brain, if any appearances occur of a fissure in that part of the skull which has recently received a blow; however equivocal these may be, yet as this is most probably the seat of the injury, no doubt should be entertained of the propriety of applying the trepan at this place. If it should afterwards appear that the trepan has even been applied upon a suture, as the surgeon under such uncertainty would proceed with much caution, no detriment could ensue from it; and if it should prove to be a real fracture, it would afford much satisfaction to any operator to find that the perforation had been made where alone it could prove serviceable.

But although we have in this place, as well as in other parts of these observations, recommended the trepan as the only remedy to be depended on for the removal of symptoms of a compressed brain; yet unless where symptoms of this kind take place, even the presence of a fissure ought by no means to indicate this operation: But as this is a point upon which I happen to differ from many of the profession; and as it is of much importance in practice to have it duly attended to; I shall enter more minutely into the consideration of it than might otherwise be necessary.

In the treatment of affections of this nature, it has hitherto been almost a general rule, to consider the application of the trepan as absolutely necessary in every case of fissure, whether any symptoms of compression of the brain have occurred or not. But due attention to the real nature of a fissure, and to the effects we have reason to expect from perforating the skull, will show, that although fissures may be frequently combined with such symptoms as require the assistance
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of the trepan, yet that they are not always or necessarily so; and unless when such symptoms actually exist, that this operation, instead of affording any relief, must frequently do mischief: For it is by no means calculated for, or in any respect adequate to, the prevention of them; and we have already endeavoured to show, that laying the brain bare is never to be considered as harmless; and therefore that it ought never to be attempted but when there is some probability of advantage being derived from it.

When a fissure is attended with a compressed state of the brain, there can be no hesitation, as we have said, in recommending an immediate application of the trepan: But in the case of a fissure not accompanied with any symptom of this nature, and while the patient complains of nothing but perhaps a slight degree of pain in the contused part, an occurrence by no means unfrequent; what advantages are we to expect from perforating the skull? In such circumstances, we are certain that no extravasation takes place; and that no part of the skull is depressed, otherwise symptoms would occur of a compressed state of the brain: For what purpose, therefore, should the trepan be applied? No sufficient reason, I believe, can be given for it.

In the case of simple fissure, not attended with any bad symptoms, the most alarming occurrence that we have to dread is the accession of inflammation; for it frequently happens, that the membranes of the brain become afterwards inflamed, although the patient may have remained perfectly well for several days, nay even for weeks, after the injury which produced the fracture was inflicted. Now, whoever attends to one of the immediate effects of the trepan, namely, the violence produced by it upon the dura mater, together with the admission of air to the parts within the skull, must acknowledge, that this tendency to inflammation, which in accidents of this kind is the circumstance which of all others we have most cause to dread, in-
stead

stead of being lessened by this operation, must in all probability be rendered more considerable; so that as a preventative of bad symptoms this remedy ought never to be employed. It has indeed been keenly held forth by those who favour and support a contrary opinion, that in fissures of the skull, no additional risk can be incurred by the operation in question; for it is said, that air being already admitted to the brain by the fracture itself, the trepan cannot possibly afford a more free access to it; while at the same time, they observe, it is attended with this very important advantage of forming and preserving a free vent for any matter that may happen to form between the skull and the dura mater during the cure.

This argument is somewhat specious, but it will not on examination be found to merit much attention. For when fissures are so extensive as to produce any considerable degree of separation between the sides of the fractured bone, a more sufficient vent is thus procured for any matter that may form than could possibly be obtained by any operation: And again, in fissures of lesser extent, as they do not always terminate in the formation of matter beneath the skull, but, on the contrary, as they frequently do well without the occurrence of any bad symptom whatever, it cannot surely be considered as prudent to advise a hazardous operation, merely for the chance of its becoming necessary. And besides, instances are often met with, in which fissures penetrate no deeper than the external table of the skull: A circumstance which cannot be previously known; and for which even the warmest supporters of the practice in question would never surely recommend a perforation through the whole substance of the bone.

The idea which has hitherto very universally prevailed, respecting the harmless nature of this operation, has probably contributed more than any other circumstance to establish the opinion respecting the propriety of performing it in every case of fissure:

But

But if the opinion we have endeavoured to inculcate upon this point be well founded, any utility which in cases of this kind can ever probably be derived from it, will be more than counterbalanced by the hazard with which we suppose it to be at all times attended.

Whilst no bad symptoms have supervened, a fissure of the skull should be treated, we think, merely as a cause which may give rise to inflammation. The patient should be blooded once and again in proportion to his strength; the bowels should be kept lax; the fore should be treated with mild easy dressings; and as long as there is any cause to suspect that inflammation may occur, violent exertion of every kind should be avoided: For although, in such circumstances, we would not, for the reasons mentioned above, advise the common practice to be continued, of perforating the skull in every case of fissure, we are perfectly clear in this, that fissures ought always to be treated with the utmost attention, and should have the most effectual means employed for obviating those effects with which they are always attended when inflammation occurs as the consequence of them.

By the means we have pointed out, a cure will be frequently obtained, without putting the patient to the hazard of suffering by the operation of the trepan; but when from the violence of the injury, or from any other cause, they are found to fail, and that any inflammation which occurred has terminated in suppuration, as in such circumstances nothing but a free discharge being given to the matter can render the patient safe, this operation will now with much propriety be employed: But for the reasons already advanced, I must again say, till this stage of the disease takes place, the perforation of the skull ought never to be recommended. The arguments adduced in support of this opinion in different parts of this and of the preceding sections, appear of themselves to be satisfactory; but in a point of such importance, no person ought to speak decisively, merely from theoretical reasoning.

When

When a probable opinion, however, is found to be supported by the result of experience, we are more readily induced to give our assent to it than we can ever do to a mere practical fact; and as all the observation I have been able to make respecting the point under consideration, tends to support the practice I have inculcated, it is without hesitation that I venture to propose it.

SECTION VI.

Conclusion.

THE importance of the subject which we have just been considering, together with the intricacy in which it is involved, have led to a length of discussion which I did not at first expect: If, however, in treating of injuries of the head from external violence, I have in any degree contributed to remove the perplexity which has hitherto obscured the subject, arising, as well from the complicated nature of the injuries themselves as from the manner in which authors have generally handled them; the time I have spent, and the pains I have taken, will not be thought misapplied.

The length to which this chapter has extended, points out the propriety of our endeavouring to bring the more material parts of the subject into one point of view: On this account, the following recapitulation is subjoined by way of conclusion.

1. It appears, that in a state of health the cavity formed by the bones of the skull is completely filled with the brain and its membranes.

2. That a direct communication takes place between the external covering of the skull and the parts

contained within it, by means of blood vessels passing between the dura mater and the pericranium, especially at the different sutures.

3. From this mechanism, we may perceive how the smallest diminution of the cavity of the skull, however it is produced, must always occasion compression of the brain: And from it also we are able to account for the ready communication of inflammation from the external teguments of the skull to the dura mater.

4. The various symptoms which occur from injuries done to the head, may be referred to three general effects; compression, concussion, and inflammation of the brain.

5. In a compressed state of the brain, the safety of the patient depends solely upon the removal of the cause by which the compression is produced. When a portion of the bone has been beat in, and is at the same time so loose as to admit of its being taken away by the fingers of the operator, by means of a pair of pliers, or perhaps of a levator, these only should be employed: But when the portion of the bone that may be beat in is firmly fixed, or when the compression arises from effusion of blood, of serum, or from the formation of pus, the proper application of the trepan can alone afford relief; and we ought not to hesitate in employing it.

In such circumstances, the patient is in a very hazardous situation; and perforating the skull with the trepan as frequently as may be necessary, may prove, as it often has done, a very effectual remedy.

6. We are by no means to imagine, as many have done, that a surgeon has accomplished all that is incumbent on him, as soon as the operation of the trepan is finished. Indeed, little advantage will in general be derived from it, if other circumstances relating to the situation of the patient are neglected. As the cause producing the compression, whatever it may be, must injure the membranes of the brain considerably, care should be taken, as far as possible, to obviate the effects

effects of it. No doffils, or syndons as they are termed, should be crammed into the perforations made by the trepan, and every irritating application should be avoided. The whole surface of the fore should be lightly covered with soft lint spread with any emollient ointment; and this, with a compress of soft old linen, should be retained by a common night cap, as the easiest and best bandage that can be applied to the head. The patient should lose blood in proportion to his strength; his bowels should be kept lax; his skin should be preserved soft and perspirable; a low diet should be recommended; and he should be kept free from noise and every kind of disturbance.

7. When symptoms which originate from external violence done to the head, depend on concussion or commotion of the brain; as this cause seems to operate chiefly by inducing debility of the whole system, the common practice of discharging much blood, and of giving strong purgatives, ought to be avoided.

Instead of this, a moderate use of wine, as well as of other cordials, should be recommended, together with a nourishing diet; whilst blisters and other stimulants should be applied to the head itself. In long continued affections proceeding from this cause, such as loss of memory and imbecility, electricity may be safely employed. I have known some instances where it appeared to prove highly serviceable.

8. In the treatment of injuries done to the head, it should always be kept in view, that inflammation of the membranes of the brain very seldom takes place immediately, but is apt to supervene at some distant period from the injury being received: In consequence of which, accidents which do not at first appear to be of much importance, frequently terminate fatally.

In cases of this kind, we should adhere to such means of cure as are known to prove most effectual in inflammatory affections of other parts. General and local blood letting should be chiefly depended on, and

ought always to be carried as far as the strength of the patient admits. The bowels should not only be kept lax, but strong purgatives should be advised: Mild sudorifics prove sometimes serviceable; and when the patient is restless, and especially when violent pain occurs, opiates in sufficient doses are frequently found to prove useful.

When an inflammatory state of these parts has been induced by a contused wound of the external teguments, warm emollient poultices are the best application that can be made to the sore. By inducing a discharge of matter from the neighbourhood of the inflamed parts, they prove often extremely serviceable. Again, when the skin and other soft parts have not been divided by the contusion, they should be laid open upon the first appearance of a tumor, without expecting or waiting for a complete suppuration.

In recommending this treatment, I have departed from the common mode of practice, which directs the immediate application of the trepan if blood letting and other evacuations do not give speedy relief; and I have done so for two reasons.

In the real inflammatory state of the membranes of the brain, compression of that organ does not take place: It is not indicated by the symptoms which take place; nor is it met with on dissection in such patients as die in this stage of the disease: Perforating the skull therefore in this situation can do no good. And, farther, the operation of the trepan in itself is not, as is generally imagined, innocent and harmless. By admitting a free access of air to the membranes of the brain, as well as from other causes, it has a sensible effect in exciting and promoting inflammation of these parts. Applied therefore in this case, the trepan may aggravate, but cannot relieve, the complaint for which it is used.

9. When, notwithstanding our endeavours to remove inflammation of the membranes of the brain by resolution, this affection proceeds to the purulent state

state, the formation of pus either upon the surface of the dura mater or within this membrane, acting as a cause of compression, must in every respect be treated as an effusion induced in any other manner. In this situation, the operation of the trepan is indispensably necessary; for by no other means can the matter be evacuated, or the safety of the patient insured.

In performing this operation, instead of removing a considerable portion of the skin and other teguments, as has commonly been done, a simple incision upon the part on which the instrument is to be applied is all that is necessary; and no more of the pericranium should be removed than is required for the same purpose.

10. During the progress of the cure after the application of the trepan, fungous excrescences are apt to shoot out from the different perforations in the bone. There is seldom, however, any reason for our attempting to remove them, as is commonly done, by compression, caustic, or ligature; for in general they disappear soon after the ossifying process is completed in the several openings. But when this does not happen, and when they still continue to prove troublesome after the rest of the cure is accomplished, they may with safety be taken away either with caustic or the scalpel.

In several points of importance treated of in the preceding sections, I happen to differ from several authors of reputation, particularly from Mr. Pott, whose opinion I am always inclined to treat with deference: But however diffident I am in first dissenting from an established doctrine, if my own experience is found to justify this dissent, the more respectable the authority by which the contrary opinion is supported, the more I think it necessary to investigate the merits of it.

But in proposing modes of practice^d different from what are sanctioned by long custom, I have never been conscious of being actuated by a spirit of innovation, or by a desire of appearing singular: And

whenever I have ventured to dissent from men of known abilities, I have always endeavoured with fairness and candour, to state the reasons of my doing so, and the grounds upon which my opinions are formed: At least this has been my intention; and I hope it will appear to others that I have done so.

CHAPTER

CHAPTER XXVII.

Of the Diseases of the Eyes.



SECTION I.

Anatomical Description of the EYE.

THE object of this chapter is the surgical treatment of the diseases of the eye and parts immediately connected with it: Hence it will comprehend the consideration of those affections to which the lachrymal passages are liable. But before proceeding farther, it will be proper to premise an anatomical description of the parts in which these diseases are seated.

Minuteness on this subject would lead to a greater length than the extent of this work will admit, and it is not by any means necessary: We shall therefore give only such a general description of them as the nature of the diseases, and the operations of which we are to treat, seem to require.

The eyes, with part of their appendages, are placed in two bony cavities, termed the Orbits, formed by a conjunction of the inferior part of the frontal bone with several other bones of the head and face; namely, with the ossa maxillaria, ossa malarum, ossa unguis, os ethmoides, os sphenoides, and ossa palati. All the upper part of the orbits is formed by the orbital pro-

esses of the frontal bone ; and the same processes form a considerable vacancy in each orbit towards the external canthus of the eye, in which the glandula lachrymalis is lodged. The inferior part of the orbits is formed by the ossa maxillaria and ossa malarum, which also form part of the sides or angles of each orbit ; the former stretching towards the internal canthus, and the latter towards the external angle of the eye. The bottom or back part of each orbit is formed by the ethmoid, sphenoid, and a small portion of the palate bones ; and a small part of the internal corner or angle of each orbit is filled up by the os unguis.

As this last mentioned bone, the os unguis, is frequently the subject of a very nice operation, it is particularly necessary for surgeons to be well acquainted with its structure and situation. It is extremely thin and brittle, so that a perforation may be made in it with very little force ; with less indeed than is commonly imagined ; for as it is not thicker than fine paper, the point of a sharp instrument is easily made to pass through it. The internal surface of the os unguis, which in part covers the cells of the ethmoid bone, is somewhat rough ; but its external surface is smooth, and consists of two depressions or concavities divided by a ridge. This ridge forms the boundary of the orbit at the internal canthus of the eye : So that one of the depressions which we have mentioned of the os unguis, is found to form the very point or angle of the orbit ; while the other concavity, which lies between this ridge and the nasal process of the maxillary bone, serves to lodge in its upper part, where it is largest, the lachrymal sac, and below it protects the duct leading from this sac into the nose, where it terminates immediately below the superiour edge of the lower os spongiosum. The nasal duct of the lachrymal sac admits a probe of the size of a crow's quill ; and it continues of this diameter till within a little of its termination in the membrane of the nose ; where, by running in an oblique direction between the layers
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of this membrane, in a manner similar to the termination of the ureters in the bladder, it is in general found contracted to a very narrow point.

The principal part of each orbit is filled by what is termed the Ball or Globe of the eye; a body which we find to be composed of several membranes or coats, inclosing fluids or liquors of different consistences, improperly termed the Humours of the eye.

Anatomists have considered the coats of the eye as numerous, but there are only three which can be distinctly traced; namely, the Sclerotic, the Choroid, and the Retina. The former has indeed been supposed to consist of different coats, to all of which names have been appropriated, viz. the tunica albuginea, the cornea opaca, cornea lucida, &c. and even the choroid has been imagined to be formed of different tunics: But although a tedious maceration may separate some of these parts into different lamellæ, the knife of the anatomist is not able to do so; and as distinctions of this kind can never tend to any useful purpose, they ought to be universally rejected.

The fat and different muscles belonging to the eye being separated from it, the sclerotica is the first coat which presents itself; and it is found to surround the whole globe of the eye, which is not the case with any of the other coats. In the anterior convex part of the eye, which in a healthy state is always transparent, this membrane is in general termed the Cornea. The posterior part of it being extremely firm and white, is also perfectly opaque: It is this part of it which has commonly been termed the Sclerotic Coat, or as we have already observed, the opaque Cornea. But although the transparent cornea can be easily separated into different laminæ, which cannot be so readily done with the other; a circumstance which has led some anatomists to consider them as distinct coats; yet as the one is evidently a continuation of the other, and as they are both supplied with, and nourished by the same blood vessels, there seems to be no good reason

son, as we have just remarked, for retaining this distinction.

All the opaque part of the sclerotica we find to be lined with the second coat of the eye, the choroides, a dark, or dusky red coloured membrane, which every where adheres to it with firmness, particularly at a small distance behind the commencement of the transparent cornea, where a circular whitish ring is formed by this junction of the choroides with the sclerotica, commonly termed the *Ligamentum Ciliare*. From this junction of the choroides with the sclerotica, a perforated kind of curtain or septum is produced, which from the variety of its colours is termed the *Iris*. The perforation in the centre of this membrane is termed the *Pupil*, and serves to admit the rays of light to the bottom of the eye.

Towards the middle of the iris, a number of radiated lines are observed, which run from the circumference to the centre: These are denominated the ciliary processes, and on their action the contraction and dilatation of the pupil appears to depend; for it seems to be doubtful whether any circular fibres exist in the iris or not.

Ruyfch, as well as other anatomists, have imagined, that the tunica choroides consists of two distinct coats, and the iris has been in general considered as a continuation of one of these; but later discoveries tend to show, that the choroides in the human eye consists of one simple indivisible tunic, and that it is extremely different in every respect from the iris.

The third and most internal coat of the eye is the *Retina*, which seems to be an expansion of the optic nerve. It does not line the whole cavity of the eye, but appears to terminate over the anterior edge of the sac or capsule of the vitreous humour, which we shall afterwards have occasion to describe.

Vision we suppose to be produced by the rays of light being applied in a certain manner upon the retina; it is therefore obvious, that a sound state of the
optic

optic nerve by which this membrane is produced, is absolutely necessary for the purposes of vision. And we conclude with much probability, that the nerve is found, when the usual contraction and dilatation of the pupil takes place on light being applied to, or removed from the eye: For in a healthy state of this organ, such a connection occurs between the optic nerve and the iris, that the latter always contracts or dilates, just in proportion to the quantity of light thrown upon the former.

These are all the proper coats or coverings of the eye; but there are two membranous expansions which likewise cover a considerable portion of the back part of the globe, and which by many have been enumerated as part of its tunics; namely, the albuginea, which we have already mentioned, and the tunica conjunctiva: The former, however, consists entirely of the tendinous attachments of the muscles of the eye; and the latter is a continuation or reflection of the membrane which lines the internal surface of the eyelids.

The cavity formed by these different coats or membranes, is filled with three kinds of substances or humours as they are commonly termed: Namely, the vitreous; the chrystalline; and the aqueous. All the posterior part of the eye is filled with the vitreous humour, which is perfectly transparent, and of a gelatinous consistence: This humour is completely surrounded by a very delicate membrane, which likewise appears to pass through the substance of this gelatinous mass, and to confine it in a kind of cellular texture or net work. In the anterior surface of the vitreous humour, we find a depression exactly opposite to the pupil, for the purpose of receiving the chrystalline humour, a substance of a much firmer texture than itself, and of a rounded or lenticular shape. This body, or the Lens as it is commonly termed, is retained in its situation by a very fine membrane or capsule, which appears to be formed by the capsule of the vitreous humour,

humour, separating or dividing at this part into two distinct laminæ. It has indeed been supposed, that the chrystalline lens has a cyst or capsule peculiar to itself; but I have never been able to distinguish it, nor has any sufficient evidence ever been given of it.

The whole anterior part of the eye, from the termination of the vitreous and chrystalline humours forward to the internal surface of the transparent cornea, is filled with the aqueous humour, a thin transparent fluid. By the iris, which we have already described, this part of the eye is divided into two unequal departments: The smallest of these, which is scarcely a tenth of an inch in width, and lies between the iris and the capsule of the vitreous humour, is termed the Posterior Chamber; and the other, which is considerably larger, and occupies the whole space from the iris to the cornea, is called the Anterior Chamber of the eye. Although these two divisions of the eye, however, are in some parts perfectly distinct and separate from each other, yet, in a healthy state of this organ, it is evident they must always communicate at the pupil, the opening we have described in the centre of the iris.

The muscles of the eye are six in number; namely, the levator oculi, the depressor, adductor and abductor, the obliquus superior and inferior. By these all the motions of the eye are performed. The five first arise from near the bottom of the orbit, at no great distance from one another; and the last originate from the orbitar process of the maxillary bone near to its junction with the os unguis. They are all inserted into the tunica sclerotica, below the adnata or tunica conjunctiva.

The constant motion of the eye requiring it to be kept soft and moist, we find it plentifully supplied for this purpose by a fine transparent fluid, the tears. This secretion is now known to depend in a great measure upon a large glandular body, the glandula lachrymalis, seated immediately above the eye, in that depression we formerly mentioned in the os frontis,
near

near to the external angle of the orbit. We likewise find in the internal or great angle of the eye, a small red coloured body, termed the *Caruncula Lachrymalis*, which till of late was supposed to be the principal origin of the tears. This, however, is not the case; and there is even reason to doubt whether this substance be of a glandular nature or not.

But although we suppose the tears to be chiefly secreted by the *glandula lachrymalis*, there is much reason to imagine that the quantity of this fluid is increased by exudations from the whole surface of the eye, as well as from the membrane of the eyelids. But this being in some measure foreign to our subject, we cannot at present enter farther upon the consideration of it.

The eye, and its appendages, which we have just described, are supplied by several arterial branches, either directly from the internal carotid, or from the maxillary arteries. None of these, however, are of any considerable size; at least, before they reach the eye, they are in general found to be divided into branches of no great magnitude: A circumstance of some importance for practitioners to attend to: For, on the supposition of these arteries being larger than they really are, surgeons have commonly been deterred from operating with that freedom on the eye which they otherwise might do, particularly in the total removal or extraction of the eye ball; an operation we shall afterwards have occasion to consider. The veins of the eye terminate partly in the external, and partly in the internal, jugular veins.

Vision, as we have already observed, depends in a great measure on the optic nerve which passes in from the brain at the bottom of the orbit; but the eye does not depend entirely upon this nerve: It receives branches from several others, particularly from the fourth, fifth, and sixth pairs.

The globe of the eye, and other parts contained in the orbit, are covered by two very moveable membranes,

branes, called *Palpebræ*, or *Eyelids*, formed chiefly of the skin and a smooth fine membrane we have already mentioned; the *tunica conjunctiva*, with an intermediate thin cartilaginous body termed *Tarsus*, on which the *cilia* or eye lashes are placed. Both the upper and under eyelids are supplied with this thin cartilage; at the extreme border of which, towards the roots of the *cilia*, a number of small follicles are placed, named after their discoverer, the follicles or glands of *Meibomius*; from whence is poured out a viscid sebaceous matter, commonly termed the gum of the eyes.

The motion of the eyelids is performed entirely by two muscles, the *orbicularis palpebrarum*, and the *levator palpebræ superioris*. The former is common to both the eyelids: It originates by a tendon at the inner angle of the eye, and by fleshy fibres from the orbital process of the maxillary bone, and is inserted by a small round tendon into the nasal process of the same bone. A few of the tendinous fibres of this muscle too are spread upon, and seem to be inserted into, the anterior surface of the lachrymal sac. The use of this muscle is to draw the eyelids together, and to compress the eye ball.

The *levator palpebræ superioris* originates from the bottom of the orbit, and is inserted into the membranous and cartilaginous parts of the upper eyelid: The sole purpose of it seems to be to raise this covering of the eye.

We have already described the lachrymal sac and duct, by which the tears are transmitted to the nose: We have now to attend to the manner in which they are conveyed into the sac. After the tears have been employed in lubricating the eyes, they would at all times be falling over the cheeks, if they were not carried off in some other manner: A very beautiful mechanism, however, is employed by nature for this purpose.

Near to the internal angle of each eye, two small protuberances are observed, one on the border or edge
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of the upper eyelid, and the other exactly opposite to it on the under eyelid. In the centre of each of these there is a small hole or opening, termed the *Punctum Lachrymale*, which we find to be the mouth of a small conduit leading to the lachrymal sac, and by which the tears are conveyed into it. These canals are of such a size as to admit a probe somewhat larger than a hog's bristle. They are each of them about four tenths of an inch in length; and after running in an oblique direction along the edge of the eye lids, they commonly join into one common trunk immediately before they enter the lachrymal sac, somewhat more than the tenth of an inch below the upper extremity of it.

The protuberances on which these canals originate, are evidently irritable, as may readily be seen on their being touched with a probe or with any acrid application. This renders it probable that they are endowed with a power of absorbing the tears; and this fluid we find is at all times plentifully applied to the mouths of them, by a kind of membranous production of the *tunica conjunctiva*, of a semilunar form, lying in the internal angle of the eye. This membrane is by anatomists termed the *Valvula Semilunaris*. In order, however, to render the anatomy of the parts we have last described as intelligible as possible, a circumstance of much importance in the treatment of the diseases to which they are liable, we have thought it right to give a delineation of them in Plate XXXI. fig. 1.

Being now prepared to enter upon the consideration of the diseases of these parts, we shall proceed accordingly to this part of our subject.

Inflammation of the eye frequently occurs, and is productive of other disorders to which this organ is liable: We shall therefore enter first upon the consideration of this affection, and shall afterwards proceed to treat of the following diseases and operations in the order they are here mentioned, viz. Wounds of the eyelids and eyeballs—Tumors of the eyelids, such as
abscesses

abscesses, melicerous and steatomatous collections, warts, &c.—Inversion of the cilia or eyelashes—Eversion of the eyelids—Concretion of the eyelids—Fleshy excrescences on the cornea—Abscesses in the globe of the eye—Dropfical swellings of the eyeball—Blood effused in one or both of the chambers of the eye—Ulcers on the cornea—Specks or films on the transparent part of the eye—Protrusion of the globe of the eye from the socket—Of cancerous affections of the eye, and extirpation of the eye ball—Of artificial eyes—Of cataracts, and the treatment of them by depression and extraction—Obliteration of the pupil, by concretion of its sides and adhesion of the iris to the capsule of the chrystalline and vitreous humours.—And, lastly, of the fistula lachrymalis.

SECTION II.

Of Ophthalmia, or Inflammation of the Eyes.

THE eyes and their appendages, like every organised part of the body, are liable to inflammation; and the symptoms produced by this affection vary according to the particular seat of the disease. Thus the symptoms attending an inflammatory affection of the retina and other deep seated parts, are different from those which occur from inflammation of the external coverings of the eye; and these again are very different from those produced by an inflamed state of the eyelids.

The symptoms which most frequently take place in inflammatory affections of the eye, are, a preternatural redness of the adnata, owing to a turgescence of its blood vessels; pain and heat over the whole surface of the eye, attended with a sensation of motes or of some extraneous body between the palpebræ and the
eye

eye ball : And in most instances there is a plentiful effusion of tears. All these symptoms are commonly increased by motion of the eye or of its coverings, and likewise by exposure to light. We judge too of the depth of the inflammation by the degree of pain induced by light thrown upon the eye. When the pain produced by light is considerable, we have much reason to imagine that the parts at the bottom of the eye, and especially the retina, are chiefly affected ; and vice versa, when the pain is not much increased by this kind of exposure, we conclude with much probability that the inflammation is confined perhaps entirely to the external coverings of the eye. In superficial affections of this kind, too, the symptoms are in general perfectly local ; but whenever the inflammation is deep seated, it is attended with severe shooting pains through the head, and fever to a greater or lesser degree commonly takes place.

During the whole course of the disease there is for the most part a very plentiful flow of tears, which frequently become so hot and acrid as to excoriate the neighbouring parts ; but it often happens after the disease has been of some duration, that, together with the tears, a considerable quantity of a yellow purulent like matter is discharged : And, when the inflammation has either spread to the eyelids, or has been seated there from the beginning, as soon as the tarfi become affected, a discharge takes place of a viscid glutinous kind of matter ; which adds greatly to the patient's distress, as it tends to increase the inflammation, by cementing the eyelids so firmly together as to render it extremely difficult to separate them.

This is the appearance usually exhibited by inflammation of the eyes in the first stages of the disorder ; but when the disease continues violent notwithstanding the use of any remedies that may be employed, like inflammatory affections of other parts it proceeds to terminate either in suppuration, or in obstruction or induration of some part of the membranes of the

eye. Inflammation of the eyes has been known, too, to terminate in mortification ; but this is a rare occurrence : And we even know that it does not readily proceed to suppuration, for reasons which we have elsewhere entered more fully into the consideration of.*

Inflammatory affections of the eyes are induced by a variety of causes : Whatever tends to produce inflammation in other parts, will be attended with similar effects when exerted upon the eye ; but the peculiar mechanism of this organ renders it liable to be acted upon by causes which may with impunity be applied to other parts of the body. Thus, much exposure to smoke tends often to induce inflammation of the eyes : And this likewise happens from the application of much light ; particularly from much exposure to the rays of the sun ; to the influence of a large fire ; or to the effects of snow : And the introduction of lime, sand, or any other extraneous body, between the eyelids and the eye, is very universally attended with this effect.

The consequences, however, of these causes are not in general very permanent ; for in recent cases of this nature, a removal of the cause is in most instances attended with the cure of the disorder. It is those inflammatory affections which originate from diseases of the constitution which prove most obstinate, and which are therefore most to be dreaded, particularly such as occur from scrophula, and from lues venerea ; for it is found by experience, that scarcely any symptom in either of these diseases proves ever so tedious as those inflammations of the eyes with which they are frequently attended. Whilst a venereal or scrophulous affection subsists, it is in vain to expect a cure of those inflammations of the eyes which appear to be produced by them. In every case therefore of this nature, such remedies ought to be employed, as are known to prove most powerful for the removal of the disease of
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* Treatise on Inflammation and its Consequences.

PLATE XXXIX.

FIG. 1.

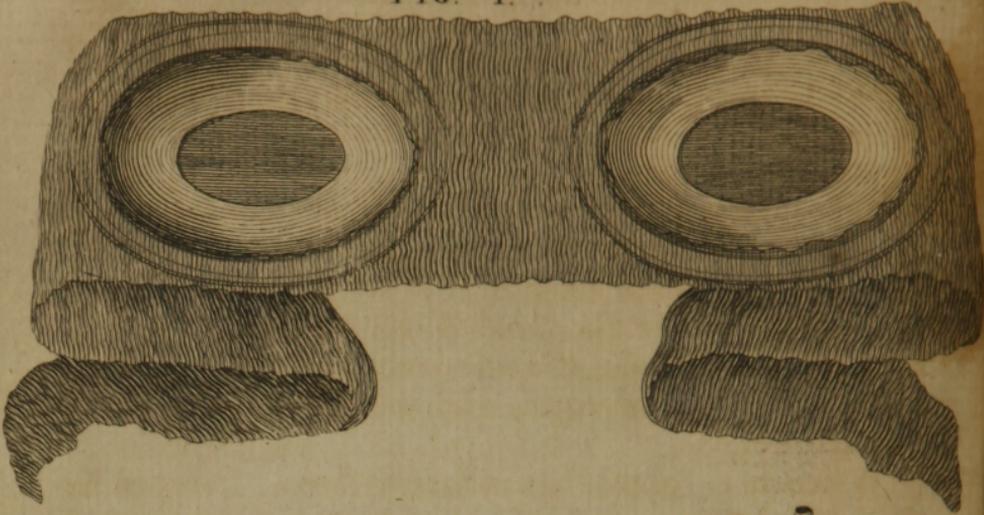


FIG. 2.



FIG. 4.



FIG. 3.

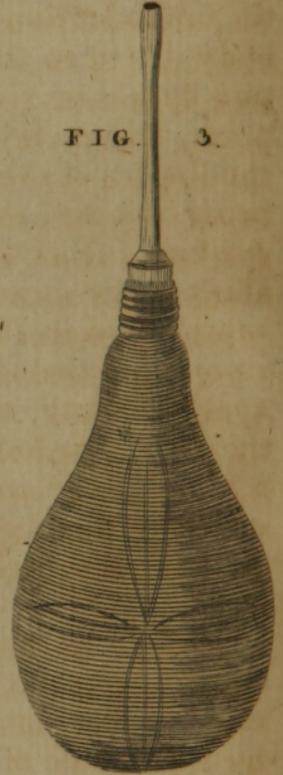


FIG. 5.



FIG. 6.



the constitution, at the same time that we attend to the local treatment of the disorder of the eyes. It is the management of this local affection which we are at present to consider.

In the treatment of inflamed eyes, the indications to be kept in view are, to remove any extraneous substances by which irritation may be produced on the eyes or on the eyelids; to diminish pain and irritability already induced; to remove the turgescence of the blood vessels of the eyes; and to prevent a return of the disorder.

When it is found that inflammation is induced by the introduction of sand, or any other extraneous body, between the eyelids and eyes, the utmost attention should be given to the removal of them. By due pains, the eyelids may be so far separated merely by the fingers of the operator, as to admit of a clear view being obtained over a very considerable portion of the eye ball. But this will be done more effectually if an assistant, by means of a flat curved hook, such as is represented in Plate XXIX. fig. 6. elevates the superior, while the surgeon himself depresses the inferior eyelid. Any extraneous body discovered by this means, if it is loose, may be taken out with the end of a blunt probe covered with a bit of soft linen or silk; or if any sharp pointed substance is observed fixed on the eye, it may be removed with a pair of small forceps.

It often happens, however, even when we are almost certain from the feeling of the patient as well as from other circumstances, that the inflammation is kept up by some cause of this nature, that nothing can be discovered even on the most minute inspection. In such circumstances some advantage is often derived from injecting, at proper intervals, quantities of tepid water, or of milk and water, between the eyelids and eyes, by which sand and dust may often be washed out when they cannot be removed in any other manner: The easiest and most effectual method of throwing in these

liquids, is by means of a small bag of the elastic gum, fitted with a short pipe of ivory, the point of which should be insinuated between the eyelids. By means of this, a surgeon can easily perform all that is necessary without any assistance, which with a syringe he cannot so readily do. One of these bags properly mounted is represented in Plate XXIX. fig. 3.

In this manner, and by frequent dipping and bathing the eyes in warm water, they may in general be entirely cleared of all extraneous bodies: But when the inflammation has subsisted for some time, it will often continue after the cause which produced it at first has been removed; in which event, other remedies must be employed. When the pain and inflammation are considerable, and have induced a fulness and quickness of pulse, along with other symptoms of fever, it is sometimes necessary to take away a considerable quantity of blood by one or more general evacuations. The bowels should be kept open with brisk purgatives; a low diet should be continued for a length of time in proportion to the violence of the disease, and to the strength of the patient; the body should be kept cool; light should be excluded from the eyes, and they should be kept constantly covered either with soft linen soaked in a watery solution of lead, or with cataplasms applied cold, composed of this solution and crumb of bread. By these means it will often happen that inflammatory affections of a very violent nature will be effectually removed; but cases frequently occur which resist even a long continued use of them.

In such instances, it has been found, that discharging blood from the neighbourhood of the parts affected, or even from the blood vessels of the eye itself, has often proved useful when every other means have failed. Indeed every general blood letting should in affections of this nature be practised on vessels as contiguous to the eyes as possible; particularly on the jugular veins or temporal arteries; which last, as we have shown

shown in a preceding part of this work, may at all times be opened with perfect safety. But when it is determined to discharge blood, either from the parts contiguous to the eyes, or from the vessels of the eyes themselves, the means we employ for this purpose are, cupping and scarifying the temples, leeches applied as near as possible to the eyes, and scarifying the blood vessels of the eye balls or of the eyelids. The operation of cupping and scarifying, we have already described, as also the best method of applying leeches.*

By one or other of these means, a great proportion of inflammatory affections of this nature may be removed; but in cases of a more obstinate kind, much advantage may be derived from scarifying the vessels of the eyes, when no relief whatever is obtained from the discharge of blood in any other manner. As scarifying the vessels of the eye, however, has always been considered as a very nice and delicate operation, it has not been so generally practised as it ought to be; but any surgeon with a steady hand may at all times perform it with perfect safety, and without any kind of risk of injuring the eye itself.

Various methods have been proposed for dividing the vessels of an inflamed eye. It has been attempted with a brush composed of the beards of barley, whose sharp spiculæ being drawn across the part to be scarified, a number of its vessels are thus penetrated and divided. This was first put in practice by a famous English Oculist, Mr. Woolhouse, about the beginning of this century, and was supposed to prove more effectual than the means which till then had been in use for this purpose from the days of Hippocrates and Celsus; which were, rubbing the parts to be scarified, either with a piece of rough pumice stone, or with the spiculæ of different species of thistles, till the blood vessels were sufficiently lacerated for discharging as
much

* Vide Volume I. Chapter III.

much blood as was necessary. It has likewise been proposed to raise or elevate the vessels to be divided, with the point of a needle; and then by means of a pair of scissors, or with a scalpel, to cut them across.

All these modes, however, of scarifying the eye are evidently founded on timidity; they give a great deal of unnecessary pain, and they do not prove so effectual as scarifications made with a sharp cutting instrument. Practitioners have commonly been afraid of attempting this operation with an instrument of this kind; but any person accustomed to chyrurgical practice will soon find that it may be done with perfect ease and safety. In the hands of a steady surgeon the shoulder of the common lancet answers very well for this purpose. But with a view to prevent any risk of the eyelids being injured by one edge of the instrument while the other is employed in scarifying the eye itself, I have delineated a small knife in Plate XXXI. fig. 3. which I have long used for this purpose. It is nearly of the shape of a lancet; but being blunt on the back, the objection I have mentioned to that instrument is thus effectually obviated.

In this operation the only assistants that are necessary is one to stand behind the patient to support the head, and another to secure the hands with a view to prevent any interruption to the operator. This being done, the surgeon, with the fore and middle finger of one hand must separate the eyelids, so as to expose as much of the eye ball as possible; whilst, with the instrument we have mentioned in the other, he is to divide as many of the inflamed vessels as appears to be proper. This is most effectually done by making small scarifications, and repeating them frequently in different parts of the eyeball, or on the internal surface of the eyelids when they are much affected. In general we wish to avoid the transparent cornea in this operation, and to confine the scarifications to the albuginea or cornea opaca; but when the vessels of this part of the

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PLATE XXX.



FIG. 1.



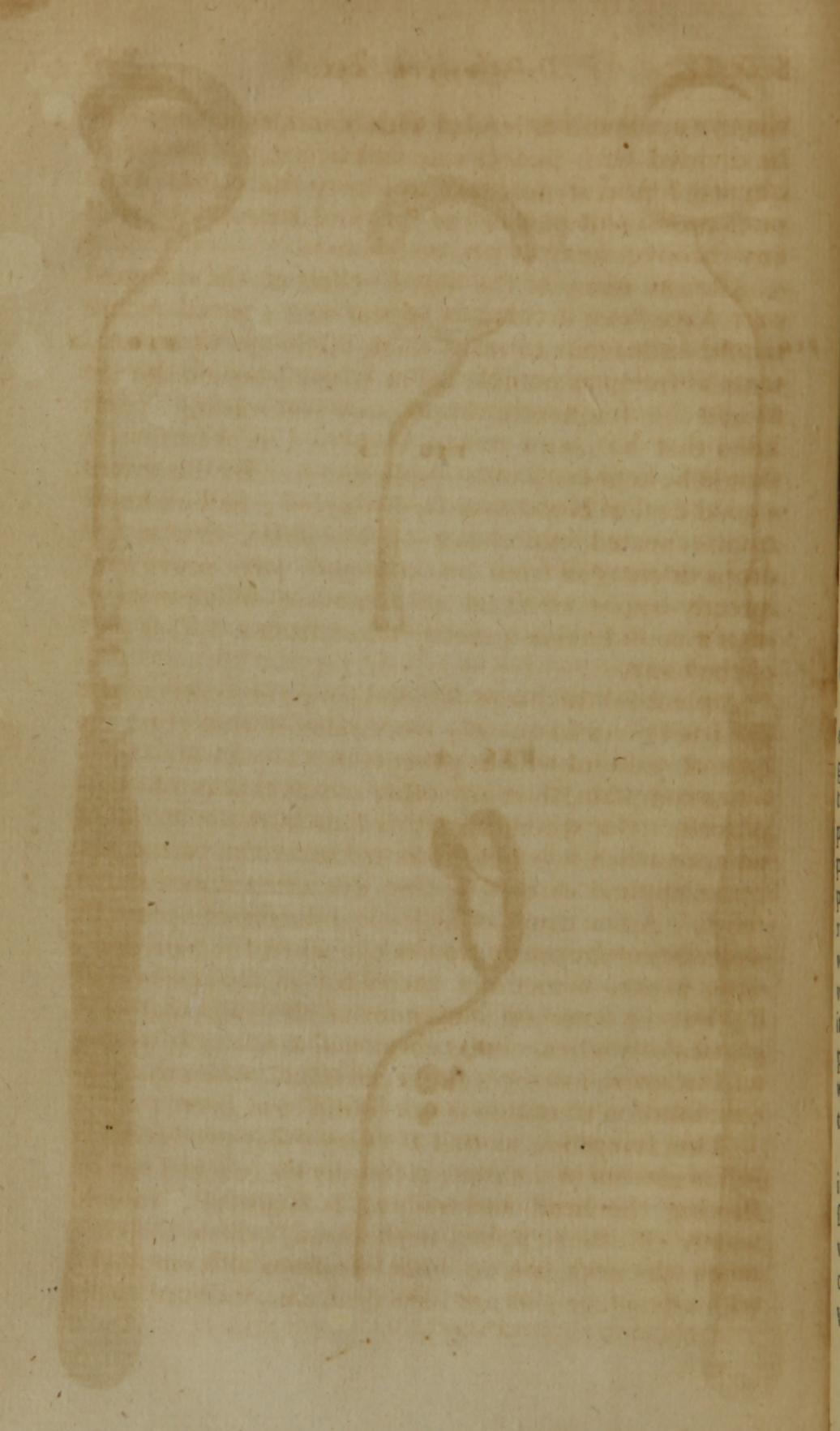
FIG. 3.



FIG. 2.

FIG. 4.





the eye are much distended with blood, even they may be divided with perfect ease and safety. I have frequently found it necessary to scarify the vessels of the most prominent part of the eye, and I never observed any inconvenience to proceed from it.

After as many of the blood vessels of the inflamed part have been divided as appear to be necessary, we should endeavour to make them discharge their contents as freely as possible : For which purpose the eye should be frequently dipped in warm water, or soft linen that has been newly immersed in warm water should be kept constantly applied to it. By this means a good deal of blood may be evacuated ; and we know from repeated experience of its effects, that a few drops discharged from an inflamed part, prove frequently more effectual in removing inflammation, than a considerable quantity taken from a distant part of the body.

A plentiful discharge of blood from the vessels of the eye itself gives frequently more relief in that great degree of pain of which patients in this disease sometimes complain, than any other means that can be employed. But when this either fails in the removal of pain, or when it is not submitted to by the patient, opiates applied directly to the eye often afford much relief. A few drops of a strong solution of opium in water being dropped into the eye when the pain is severe, proves sometimes successful in the removal of it ; but the common laudanum of the dispensatories, particularly when wine is employed as the menstruum, will in many instances prove effectual when the watery solution of opium is not found to answer.

This symptom, as well as every other produced by inflammation of the eyes, is frequently relieved too by shaving the head and washing it frequently in cold water. Blisters applied to the head, behind the ears, or on the neck, are on some occasions also employed with advantage ; as are likewise drains, induced either

by ordinary pea issues, or by a cord in the back part of the neck.

In the distressful state to which those are reduced who labour under severe affections of this nature, every circumstance merits the attention of practitioners from which any relief can be derived. In some stages of the disorder, much uneasiness is experienced from a thick viscid secretion, which glues the eyelids so closely together, especially in the mornings, as always requires much trouble, and frequently some pain, to separate them. This takes place in a greater or lesser degree in almost every variety of ophthalmia, but particularly when the tarfi or extreme borders of the eyelids are much inflamed. In this variety of the disease, indeed, it often happens, that the inflammation soon terminates in a great number of small ulcerations, which very commonly with the assistance of a magnifier, and sometimes with the naked eye alone, may be distinctly observed round the whole circumference of the cartilaginous border of the eyelids. From these the viscid matter we have mentioned, which appears in some measure to be produced by the sebaceous glands of these parts, is poured out in great quantities; and unless some means be employed for the cure of the ulcers, scarcely any remedy will have much effect on the inflammation of the eyes.

It often happens, that a little of any emollient ointment being inserted between the eyelids every night before going to rest, will prove highly serviceable in preventing this glutinous kind of matter from fixing them so firmly together; but the relief obtained in this manner is in general only temporary. Some addition must be made to the emollient for the purpose of healing the ulcers from whence the matter is discharged, otherwise no permanent advantage is to be expected from it; and when the disorder is entirely local, and not connected with scrophula or some other affection of the constitution, the cure of these ulcers will very commonly be followed by a perfect cure of
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the inflammation by which they were at first produced. With this view, a calx of zinc, or lapis calaminaris finely levigated, and added to an equal quantity of an emollient ointment composed of wax and oil, will often be found to prove useful; but no application proves in general so effectual as ointments of the mercurial kind; and the best of these appears to be the unguentum citrinum of the Edinburgh Dispensatory, mixed with an equal quantity of pure hog's lard; or the blue mercurial ointment of different dispensatories, prepared with quicksilver triturated with an emollient ointment. One ounce of quicksilver, effectually triturated with four ounces of axunge, makes for this purpose a very useful application. Every night and morning the ulceration on the eyelids should be covered with a little of this by means of a pencil, at the same time that a small portion of the ointment should be insinuated between the upper and under eyelids; and a weak saturnine or vitriolic solution should be employed once or twice daily for bathing the parts.

It is almost unnecessary to remark, that in every disease of this kind it is proper to avoid the admission of light to the eyes, not merely during the continuation of the inflammation, but as long as it creates any degree of pain: And even when one eye only is affected, care should be taken to keep them both covered; for we know from daily experience, that the exposure even of a sound eye to the effects of light, while the other is in a state of inflammation, almost constantly proves hurtful to both.

The eyes, however, ought not to be kept closely tied down, as is too frequently done. In every case of inflammation this does much mischief, by keeping them too warm. They should be very lightly covered with a loose bandage either of silk or of soft linen; and when the patient is able to walk a little abroad, before his eyes can bear a free admission of light, the bandage represented in Plate XXIX. fig. 1. frequently proves useful: By means of it the quantity of light

to be admitted to the eyes can be easily regulated, whilst at the same time the eyes themselves are neither compressed nor kept warmer than is necessary.

By continuing a cautious plan of treatment, such as we have mentioned, for a longer or shorter period, according to the circumstances of the case, and to the strength and age of the patient, a great proportion of inflammatory affections of the eye will at last be removed, unless where the complaint proceeds from some general affection of the constitution, such as scrophula or lues venerea; in which case, no remedy will prove altogether effectual for the disease of the eyes till the disorder of the system is removed.

With a view to prevent a return of an inflamed state of the eyes, various remedies have been recommended, particularly washes and other applications of an astringent nature: It rarely happens, however, that any of these have much effect; and if they are ever made too strong with vitriol, or any other irritating substance, they are very apt to do mischief. Whilst the inflammation of the eyes continues, applications of this nature, particularly those of the saturnine kind, both by themselves and when conjoined with a small proportion of white vitriol, frequently prove useful; but they do not appear to have any effect in preventing a return of inflammation. For this purpose, nothing I have ever employed proves so certainly useful as cold bathing, not only of the whole body, but of the head, and especially of the eyes themselves. By keeping the head shaved, and immersing it daily in cold water, much may be done in preventing those frequent returns of inflammatory affections of the eyes, to which many people are liable. For the purpose of applying local bathing to the eyes, different means have been proposed; but the most simple and most effectual of all of them is by means of a cup represented in Plate XXIX. fig. 2. By filling this cup, which should be of an oval form and somewhat larger than the eye, with water or any other liquid, and press-
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ing the eye in upon it, if in this situation the eyelids are opened and moved about, the whole surface of the eye may be thus effectually bathed. As a preventative too of this disorder, a liberal use of Jesuits bark has often been of service; and we know from experience, whenever inflammation of the eyes returns periodically, that this is almost the only remedy to be depended on. We need scarcely observe, too, that whenever any cause is discovered by which the disease appears to be excited, to avoid this is absolutely necessary; and unless this circumstance be attended to, that nothing will ever prove effectual in preventing it.

SECTION III.

Of Wounds of the Eyelids and of the Eyeball.

AS the management of wounds will make the subject of another chapter, it may be considered as rather out of place to enter upon any part of it at present; but the anatomical description we have given of the eye, renders it sufficiently proper in this place to proceed to treat of every affection to which this organ is liable.

In wounds of the eyelids, the parts may be divided either in a longitudinal, or in a transverse direction, with respect to the course of their muscular fibres. If the skin only be divided, or if a wound, penetrating the whole substance of the eyelid, be inflicted in such a manner as merely to separate the fibres of the orbicularis muscle from one another, all that is necessary to be done in the treatment of it, is to draw the skin and other parts that are divided as exactly together as possible, and to retain them in this situation by small slips of adhesive plaster. As in such circumstances no retraction can occur of the divided parts, they are easily

fily retained together in the manner we have mentioned; and care should be taken that they be kept in this situation till they are firmly united.

But when the orbicularis muscle is divided in a transverse direction, and especially when a corresponding part of the tarsus or cartilaginous border of the eyelid is likewise divided, more attention is necessary in retaining them: If they are allowed to separate much from one another, such a laxity of the eyelid is apt to occur as prevents it from performing its usual motions with facility: And again, if the divided parts are drawn too tightly together, the eyeball itself is apt to suffer by the parts which ought to move easily upon it being rendered too tight and firm for this purpose.

In transverse wounds of this nature, in order to retain the parts in their situation, it is necessary to employ a future, or perhaps two, if the wound runs nearly across the eyelid. The common interrupted future is usually employed for this purpose; but as the twisted future answers better, it ought to be preferred. As we have described the method of performing these futures in the first volume of this work, we have at present only to remark, that in the practice of either of them upon the eyelids, a good deal of nicety and delicacy is required, otherwise much detriment may ensue, not only to the parts immediately operated upon, but to the eyeball itself. When the twisted future is employed, the pins to be made use of should be short and very thin, so as to run as little risk as possible of injuring the contiguous parts. In the introduction of them, care should be taken to make them pass not only through the skin, but into the fibres of the orbicularis muscle, otherwise little advantage will be gained by the operation: But there is no necessity for carrying them entirely through the inner membrane of the eyelid. This would irritate and inflame the eye; and as it is not in any respect necessary, it ought to be avoided. If the skin be retained properly in its situation

ation with a few of the fibres of the muscle underneath, a better cure will be obtained than if the needles were made to pass through the whole substance of the eyelid: for in this manner the action of the muscle is preserved, whilst no risk is incurred of the eyelid being too much contracted; a circumstance very apt to occur when the whole thickness of the eyelid is penetrated by one or more futures.

It is almost unnecessary to observe, that in order to insure success from any of these operations, the motion of both the eyes should be as effectually prevented as possible, otherwise no union of the divided parts will be obtained. Irritation will be produced on the eye itself; inflammation will occur; and this will render it necessary to remove the futures before they have effected the purpose for which they were employed.

Immediately after the futures are finished, the eyelids should be closed and covered with a piece of soft linen spread with Goulard's cerate, in order to preserve the parts in as soft and easy a state as possible; and a compress of soft lint being laid over it, and another over the sound eye, the whole should be retained by a napkin tied over the head, in such a manner as to press equally and gently upon both eyes. Inflammation should be guarded against; or if present, it must be removed by the means recommended in the last section: And in the course of three days from the futures being introduced, they should all be removed; for in this period, if the parts have been kept in contact, their union will be completely effected.

We have hitherto been supposing, that the parts are only simply divided; and when replaced, that the eye is found to be as completely covered as before: But it sometimes happens here, as in wounds of other parts of the body, that the parts are not only divided but destroyed; in which case, when such a considerable portion of the eyelids is totally removed, as to prevent the remaining parts from being brought into contact without impeding the motion of the eye, it will
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be more prudent to leave them at some distance from one another; and by treating them with light easy dressings, to trust to nature for supplying the deficiency by a new production of cellular substance.

The mechanism of the eyelids is extremely well adapted for the purpose of protecting the parts beneath from too free an admission of light, air, dust, &c. but no possible structure could prevent their suffering from injuries of a different nature: And accordingly we find, that the eyeball is liable, like other parts of the body, to wounds, contusions, &c.

As the bones at the bottom of the orbit are in some parts extremely thin, wounds of the eye which penetrate deep prove frequently dangerous from the near contiguity of the brain: But wounds of a more superficial nature which penetrate only the anterior part of the eye, although they may destroy the beauty and utility of the organ, are not in other respects to be considered as hazardous. Wounds of this part, however, of whatever nature they may be, at all times require our most serious attention; not only with a view to the preservation of sight, but in order to prevent or obviate the effects of inflammation; a symptom with which they are very commonly attended.

Wounds of the transparent cornea, when directly opposite to the pupil, are most frequently productive either of a total or of a partial loss of vision; for the cicatrix which ensues from a wound of this part very commonly remains opaque during the life of the patient.: But although in this respect wounds of the anterior part of the eye are always to be dreaded, yet they are not usually attended with so much inflammation as wounds of a similar extent of the sclerotica or opaque cornea.

If the effects of wounds of the eye are found to be different according to their situation, they are much more so with respect to their extent; and in this too the peculiar structure of the eye renders them very different from wounds in almost every other part of
the

the body. In other parts of the body, we know that in general a small punctured wound is more to be dreaded than a cut of much greater extent : but in the eye, the risk with which wounds are attended is most frequently in proportion to their extent ; a circumstance which long experience has now rendered certain, and which should have a considerable effect with surgeons in determining the preference to be given to the different operations performed upon this organ. It is not the pain produced by wounds which we here allude to, and which frequently occurs to a greater degree from mere punctures than from very extensive cuts ; but it is the risk which large wounds induce of discharging the different humours or contents of the eye, by which vision, if it be not entirely destroyed, must at least be greatly injured ; and by which in many instances the eye is so much diminished as to sink almost to the very bottom of the orbit : We shall afterwards, however, when treating of Cataracts, have occasion to enter more fully upon the consideration of this subject.

The circumstance of most importance in the treatment of wounds in the eyeball, and to which all our attention ought to be directed, is the prevention or removal of inflammation. If the coats of the eye are so extensively divided as to admit of any considerable part, or of all the humours being evacuated, it is not in the power of art to prevent it ; for if a large opening is formed in any part of the eye, the natural and usual action of the muscles with which it is furnished, will for certain discharge or press out a great proportion of its contents : But in every wound of the eye, practitioners have much in their power, not only in the prevention of inflammation, but in the removal of this symptom when it has once taken place. As we have entered fully, however, into the consideration of this subject in the last section, we must now refer to what was then said upon it.

In

In wounds of the eyeball, the structure of the parts renders it impossible to diminish the extent of the openings produced by them, by the practice which we recommended in wounds of the eyelids; namely, the placing of the divided parts in contact with one another, and retaining them till they are united either by sutures or by adhesive plasters. For, as nothing of this kind is here admissible, all that art can in such cases attempt, is, together with a strict antiphlogistic course, to keep the eye lightly covered with some emollient application of the saturnine kind, such as Goulard's cerate, and to bathe it now and then with a watery solution of lead. And when pain occurs in any considerable degree, as in wounds of the eye it frequently does, opium should be given in doses proportioned to the violence of it.

When a wound is very extensive, so as to effect a complete evacuation of all the contents of the eye, a permanent blindness, with a considerable deformity induced by the sinking of the eyeball, will be almost the certain consequence: But in wounds of lesser extent, a due attention to the circumstances we have mentioned, will frequently effect a total removal of symptoms which at first appeared in the highest degree formidable.

S E C T I O N I V .

Of Tumors of the Eyelids.

THE eyelids are frequently infested with small tumors, which by impeding their motion, and rubbing upon the globe of the eye, become in many instances so very troublesome as to require the assistance of surgery for their removal.

The contents of these swellings are various, and therefore the tumors themselves are found to be of
different

different degrees of firmness. Towards the internal angle of the eye, and most frequently on the under eyelid near to the lachrymal punctum, many people are liable to frequent returns of a small encysted tumor of the inflammatory kind, in this country commonly termed the *Stye*.* It begins with a sensation of fulness, stiffness, and uneasiness in the internal canthus of the eye. At first the skin is scarcely if at all discoloured; but if the tumor proceeds to suppuration, which it always does, if means are not employed to prevent it, it becomes first of a pale red, and afterwards of a yellow complexion towards the upper part of it, where it commonly bursts and discharges a small quantity of thick purulent matter. This species of swelling, as we have said, originates evidently from inflammation; and, from the account we have given of it, ought clearly to be considered as a common bile or abscess. The only circumstances in which it differs from biles in other parts of the body, are, the colour of the skin not being of such a deep red during the inflammatory stage of it, and its advancing more slowly to suppuration. This, however, is evidently owing to the peculiarity of its situation; for the matter in these tumors being seated between the tarsus and the internal membrane of the eyelid, the firmness of the cartilage prevents the skin which covers it externally from being much discoloured; at the same time that the pressure produced by it may probably have some influence in preventing, or rather in retarding, the progress of that effusion which we know to be necessary for the formation of pus.

These are the tumors we meet with most frequently upon the eyelids; there are others however, which often occur, and from whence a good deal of distress is occasionally experienced. By different authors a great variety of these has been described, but no real utility

* This is a variety of the *Hordeolum* of Mr. Sauvages and other nosologists.

utility is derived from this. And as no beneficial purpose can be obtained from enumerating any distinction that does not point out some variety of practice, it is this consideration only by which we are to be directed in mentioning the varieties of the disease.

The inflammatory tumors already described are most commonly situated towards the internal canthus of the eye; all the others to which the eyelids are liable are met with indiscriminately in every part of them. They are of three kinds, all of them differing from each other in their degree of firmness, and requiring a different method of treatment.

The first we shall mention is commonly of a roundish form; is somewhat soft or compressible; it seems to move or roll when pressed upon; the skin retains its natural appearance; and from the contents of it when laid open being universally of a white fatty nature, we properly enough term it a Steatoma. The soft white matter, of which tumors of this kind are composed, is always surrounded with a firm membranous cyst.

From different parts both of the upper and under eyelid, we frequently observe small pendulous tumors or excrescences to hang by very narrow necks; whilst on other occasions they are connected to the skin by means of thin though broad bases. Some of these excrescences being of a soft fleshy consistence, are termed Sarcomatous tumors; whilst others being hard, and on some occasions even approaching to the firmness of horn, are denominated *Verrucæ*, or Warts.

In the treatment of those inflammatory tumors or small piles which occur so frequently towards the internal angle of the eye, some doubt has occurred respecting the propriety of endeavouring to bring them to suppuration; and by many it is even said, that we ought in perhaps every instance, by means of vitriolic and other astringent applications, to attempt to cure or remove them by resolution or discussion. The most material reason, however, that can be given for this,

this, is, the trouble which attends the contrary practice of bringing them to suppuration: But when we consider the advantages which result from it, and the hazard of injuring the eyelids by frequently attempting to repel what nature wishes to discharge, we will not hesitate in the choice of our method of cure. By bringing these tumors to suppuration, we do indeed incur some additional trouble; but this is by no means considerable: And as soon as matter is fully formed, if it does not burst and discharge itself, opening the tumor by the point of a lancet procures complete relief, and the sore commonly heals quickly of itself without any farther trouble.

In every case, therefore, of this nature, as soon as it is evident that the disease is clearly formed, we ought, by warm emollient poultices frequently renewed, to endeavour to bring the tumor to suppurate, then to discharge the matter in the manner already mentioned, if it does not previously burst of itself. I know from experience that this practice is perfectly safe; that the pain attending it is very inconsiderable; that it removes every risk of tumors of a harder and more inveterate nature forming in the site of these inflammatory affections; and which I have observed in different instances to be the consequence of a contrary management. After biles of this kind have suppurated and discharged their contents, bathing the parts with a weak saturnine solution or with some other astringent is highly proper: It tends to remove any uneasiness which may remain, and to restore the parts to their usual tone.

In those encysted tumors, again, of the steatomatous kind, as well as in these excrescences we have mentioned of a fleshy or warty nature, as we can have no dependence on removing them by suppuration, as soon as they begin to impede the motion either of the eye or of the eyelids, they should be immediately removed by excision. As long as affections of this nature continue of a small size, they are for the most part inof-

fenfive, and are therefore generally overlooked; but whenever they acquire any considerable magnitude, they ought by all means to be taken off.

In all warty excrescences of a small size, and in similar affections of a soft fleshy nature, we are commonly directed to remove them by the application of strong caustic; or if their bases are very small, to attempt to do it by ligature. This, however, is a practice which ought not to be recommended; and no apology indeed can be offered for it but timidity either on the part of the patient or of the operator: From the nature of the remedy it must necessarily prove tedious. Painful and troublesome inflammatory affections have been induced both by the use of ligatures and of caustic: And the distress produced by them is in every respect more considerable than what commonly occurs when the scalpel is employed. We ought therefore, in the removal of these tumors, to depend solely upon excision; an operation which in matters of this kind is neither difficult nor dangerous.

The patient being seated opposite to a window, and his head being secured by an assistant, if the tumor be not large enough to be laid hold of with the fingers, a ligature ought either to be passed round it, or pushed through the centre of it by means of a needle, in order to enable the operator to raise it by pulling it gently from the parts beneath: And this being done, if the basis of the swelling is narrow, it may be separated by one stroke of the scalpel; but if it is attached in any considerable extent to the neighbouring parts, it is better by slow dissection to ensure its total removal, than by proceeding quickly to run any risk of allowing part of it to remain, or to require any farther trouble afterwards in removing it. On the operation being finished, the only dressing which in general is found necessary, is a small piece of soft lint to be retained by a slip of adhesive plaster; and the sore very commonly heals easily without any farther trouble.

When,

When, again, we have to remove a tumor of the steatomatous or encysted kind, instead of dissecting off the swelling covered with the skin which surrounds it, by which a troublesome unseemly cicatrix is always produced, it answers the purpose much more effectually merely to divide the skin and cellular substance covering the swelling, by a simple incision with a common small scalpel. This should be done from one side of the tumor across the most prominent part of it to the other; and a strong waxed thread being passed through the centre of the cyst, this should be given to an assistant for the purpose of separating or raising it from the parts beneath: The surgeon himself, too, by cautious dissection, should endeavour to separate the skin and cellular substance from the whole circumference of the cyst; and this being done, the tumor will be easily removed by the ligature attached to it.

If the tumor has been so situated as to render it necessary in removing it to make an incision through the internal membrane of the eyelid, no dressing can with propriety be applied to the sore, as the most inoffensive remedy of this kind we could employ would tend to irritate and inflame the globe of the eye. All that we can do therefore in such circumstances, is to lay the lips of the sore as nearly together as possible; and to take care to remove as frequently as is necessary any superfluous matter that may happen to form in it. But when, in the removal of tumors of this kind, it is found necessary to divide the external coverings of the eyelids, in order to render the cicatrix as neat as possible, the lips of the wound should be drawn together by the fingers, and retained in this situation by slips of adhesive plaster till their union is accomplished.

In the extirpation of these tumors, when the cyst is tolerably firm, and their contents found to be of the steatomatous kind, the cyst ought to be preserved entire, as in this state it is more easily and more effectually removed by doing so than in any other manner: But whenever the cyst is thin, and especially when the

contents of it are found to be fluid by a suppuration having taken place in any part of it, which is not unfrequently the case, it is commonly very difficult, and in some instances impossible, to separate the teguments from the cyst beneath without laying the cyst open. In this case, after dividing the skin and cellular substance in the manner we have directed, by making an incision across the most prominent part of the tumor, it is better to open the cyst at once by a large puncture with the point of the scalpel in order to discharge the matter contained in it, than to make an attempt, as is commonly done, to preserve it entire; which in such circumstances always renders the operation much more tedious than it otherwise would be.

SECTION V.

*Of Inversion of the Cilia, or Eyelashes.**

THE eyelashes are in some instances so much inverted, or turned inwards upon the eye, as to create much pain and inflammation by rubbing or fretting the coats of it: In which case we are under the necessity of attempting by some means or other to remove them.

The inversion of the cilia we find to depend upon different causes: In some cases it proceeds entirely from a derangement of the hairs themselves, which leaving their usual direction turn in towards the eyeball: But it is more frequently produced by a cause of a more obstinate and more distressing nature, an inversion of the tarsus or cartilaginous border of the eyelid, which is most commonly induced either by some unequal spasmodic affection of the orbicularis muscle in the under eyelid; for this disorder is not frequently met with in the upper palpebra; or it occurs as the
effects

* The Trichiasis and Entropium of authors.

effects of some cicatrix formed upon the skin of this part, as the consequence of wounds, or of abscesses forming upon it. In some instances, too, it is evidently produced by tumors pressing the eyelashes in upon the eye; and a relaxation of the external teguments of the eyelid has likewise been supposed to induce it. As the cause of the disease is various, so it is evident that the means of cure must likewise be so.

When it is found to originate solely from a derangement of the cilia themselves, without any inversion of the eyelids, we are directed by authors, in the first place, to pull all the inverted hairs out with a pair of small pliers; and with a view to prevent their growing again, we are desired to burn the roots of each of them, either with lunar caustic, or with the point of a red hot needle or wire. Nay, some have gone so far, as to propose that the whole cartilaginous edge of the eyelid in which the hairs are placed, should be entirely destroyed with caustic. The pain and inflammation of the eye induced by an inversion of the cilia, is in some instances indeed so extremely distressing, and it is so impossible by any other means to procure a remedy than by preventing them from rubbing upon the eye, that none who have had opportunities of observing the obstinacy of such affections will be surpris'd at the attention with which they have been treated by almost every author who has wrote upon this subject: But it fortunately happens, that none of the remedies we have mentioned, which are both extremely painful and terrifying, are in any respect necessary; for the same intention may in almost every instance be accomplished by means of a more simple nature.

When the eye lashes have remained for any considerable time in a deranged state, and have therefore acquired their full strength and elasticity, it is altogether impossible to bring them again into a proper direction. In such circumstances, therefore, they ought to be pulled all out by the roots; for to cut them over, as is sometimes done, tends rather to in-

crease the cause of the disorder by making them stronger and sharper than they were before. This being cautiously done with a pair of small forceps or pliers, relief is thus commonly obtained immediately : But unless some means are adopted to prevent the new hairs which shoot out from taking a similar direction, they will very speedily advance so far as to induce a return of the disorder. Nothing, however, can be done to prevent this inconvenience till the new hairs have acquired some length ; but as soon as they are about half their usual length, and whilst they are yet more soft and pliable than they afterwards become, by turning them down upon the eyelid with the end of a blunt probe, and retaining them in this situation for several days, or perhaps for two or three weeks, either by covering them with narrow slips of adhesive plaster, or with strong mucilage or glue by means of a small pencil, a complete cure may thus be commonly obtained. Much attention is necessary indeed in order to insure success ; more it must be acknowledged, than is commonly paid to disorders of this kind : But due perseverance in the means we have mentioned will in almost every instance accomplish our purpose : And as it is an easy method of obtaining relief in a very painful disorder, nothing should be omitted that can tend to render the practice of it frequent and more certain.

When, again, the disorder appears to originate from any of the other causes we enumerated, the particular nature of it must be ascertained with exactness before any remedy can be employed. If it is found to proceed from any unequal spasmodic exertion of the orbicularis muscle of the eyelid, no danger can ensue from making a slight incision on the internal surface of the under palpebra, of such a depth as to divide those fibres of the muscle which appear to be preternaturally contracted, and by which the inversion of the cilia is produced. The only inconvenience that could occur from this, would be some degree of stiffness

ness or immobility in the under eyelid, which could not be of much importance even in the worst degree of it that can probably happen : And as no other remedy could in this variety of the disease be supposed to prove effectual, no hesitation should occur in advising it. If then those fibres of the muscle which appear to be preternaturally contracted are freely divided, a cure of the disease will be immediately obtained, and the incision will readily heal without being covered with any kind of dressing. In this situation, indeed, no dressing can with propriety be applied to the sore ; but experience shows that it is not necessary, for a cut in this part commonly heals easily.

When the cilia are found to be pushed in upon the eye, either by a tumor or by a cicatrix of some old sore situated in such a manner as to produce this effect, no cure can be expected from any other means than from the removal of the cause itself. In such circumstances, therefore, any tumor which occurs should be extirpated in the manner we have already mentioned : And again, when it is necessary to remove an old cicatrix, as there is never any necessity for going deeper than the skin and cellular substance, it may be taken away with perfect safety, merely by making an incision with a scalpel so as to surround the whole of it, and afterwards in a slow cautious manner to dissect it off.— When the pressure produced by the cicatrix upon the cartilage of the eyelid has been the sole cause of its being turned inwards, the removal of the cicatrix will in general be attended with an immediate cure of the disease ; and in this case the sore may be healed in the usual manner by soft easy dressings. But when it is found that the direction of the cilia is not immediately altered upon the cicatrix being removed, the lips of the sore should be drawn together, so as to bring the edges of the divided skin into immediate contact : and in this state they should be secured either by slips of adhesive plaster ; or when this is not found to be practicable, the twisted suture with short flat pins, or even the interrupted suture, may be employed, in order to
effect

effect their union : By which means the point of the eyelashes may be turned altogether outwards, so as to accomplish the intention of the operation in the most complete manner.

It has also been supposed, as we have already remarked, that this disease may be produced by the external skin situated upon or beneath the eyelid, being too much relaxed. This, however, is an occurrence which I never met with ; and as we cannot suppose that these parts are retained in their situation by any exertion of the skin alone, it is not probable that any relaxation to which it is liable can have any influence in producing a wrong direction of the cilia ; but if the contrary should ever appear to be the case, the nature of the remedy to be employed is obvious : If the disease is of short duration, and the relaxation and loss of tone in the skin not considerable, bathing the parts frequently with a strong solution of alum in an infusion of oak bark, the strongest astringent perhaps which with safety can be applied to the human body, such a degree of firmness may be restored to the affected skin, as to accomplish a removal of the disease ; but when this happens to fail, no doubt should be entertained of advising the removal of all the relaxed skin by the scalpel : And this being done, the divided edges of it should be drawn together, and retained by sutures in the manner we have directed above, where it is necessary to remove a portion of the teguments along with any cicatrix that may be found to have produced the disease.

An inversion of the eyelashes is constantly attended as we have said, with a considerable degree of inflammation of the eyeball : This symptom, however, commonly subsides on the hairs being removed ; but when it does not, those means must be employed which we have recommended in a former section for the removal of inflammation of the eyes by whatever cause it may have been induced.

We have already observed, that the disease we have just been treating of, occurs most frequently in the under
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der eyelid. In some instances, however, it has been met with in the upper palpebræ; and in such cases it is scarcely necessary to remark, that the disease being exactly similar both in its causes and effects, the means employed for removing it ought also to be similar. In the upper eyelid we sometimes meet with a swelling or tumefaction over the whole of it, by which the usual and natural exertion of its muscles is either much impeded or perhaps entirely interrupted, and by which too the eyelashes may now and then be so far inverted as to produce the disease in question. In such cases, as the swelling of the eyelid is commonly of the drop-sical kind, it will be more readily removed by two or three small punctures with the point of a lancet than by any other means: But when this does not prove sufficient, if it appears to be perfectly local, and not connected with an anasarcaous swelling over the rest of the body, rather than allow vision to be much interrupted by a continuance of the swelling, it has been proposed to cut out a segment of the most prominent part of the skin, to discharge any water that may be contained in it, and to reunite the divided edges of the fore by futures. Nay, much time and ingenuity have been employed in the invention of machines for effecting this operation neatly, and without much loss of blood; an occurrence which in former times was always much dreaded. This should indeed be guarded against as far as is necessary: But in the operation we are now considering, it can never require any particular attention, as there are no blood vessels in those parts of a sufficient size to render the division of them in any respect dangerous.

The machines we allude to were of such a nature as effected the intention of the operator solely by pressure. All the skin intended to be removed being included between the flat sides of two thin brass plates, a degree of pressure sufficient to destroy the circulation of the contained parts was now applied, and continued by means of a screw till the whole dropped off.

But

But although this practice has been much recommended both by German and French oculists, yet as it originated solely from the danger that is apprehended from a division of the blood vessels of the eyelid, but which there is no cause to dread, and as the operation may be much more neatly and speedily accomplished with the scalpel, we have therefore no hesitation in recommending this last in preference to every other method that has been proposed. In performing it, as much of the skin should be removed as appears to be superfluous: If the edges of the fore, on being brought together, can be retained by adhesive plasters, the retention may be attempted by this means; but when the plaster does not easily answer, either the interrupted or twisted suture may be employed in the manner we have already pointed out.

SECTION VI.

Of the Gaping or turning Outwards of the Eyelids.

WHEN the internal surface of either of the eyelids is turned outwards so as to fold over any part of the cilia, or of the contiguous skin, the disease we are now to consider is produced: By Nosologists this disorder is in general termed *Ectropium*; and when the upper eyelid only is affected, it has been termed *Lagophthalmus*, from a resemblance which this affection is supposed to bear to the eye of a hare.

Any degree of this affection occasions always much deformity; so that even in this respect it merits the attention of practitioners: But in more advanced stages of the disease, it is not to be considered merely as a deformity or inconvenience; for in this situation it is frequently productive of much distress, not only from

from the pain induced by a considerable portion of the internal membrane of the eyelid being turned outwards, but by a great part of the eye which naturally ought to be covered being left perfectly bare. It is therefore evident that the removal of affections of this nature must always be an object of importance to those who labour under them: And this points out the propriety of more attention being paid to them than practitioners in general think necessary.

The internal membrane of the eyelids may be turned outwards by a variety of causes; an enlargement of any part of the ball of the eye, and tumors of whatever nature they may be when seated within the orbit are sometimes productive of it: It is sometimes induced by dropfical effusions between the external skin and this membrane. Violent inflammatory affections of the internal covering of the eyelids, by the increase of bulk which they give to it, frequently turn it outwards. Relaxation, induced either by a preceding inflamed state of this part, by a previous dropfical swelling, or merely as a consequence of old age which is to be considered as perhaps the most frequent cause of it, is in general productive of the most obstinate variety of the disorder: And lastly, we find this disease often induced by the cicatrix of a wound or abscess, especially of such as are the consequences of the confluent small pox, when situated in such a manner as to corrugate or contract the skin of either of the eyelids. In the treatment of the disorder, it is evident that a due attention is necessary to the particular cause by which it is produced.

When the disease is induced by an enlargement of any part of the eyeball, nothing but a removal of this will have any effect in carrying it off; but as the treatment of this affection of the eye will be the subject of one of the ensuing sections, we must for the present postpone what we have to say upon this subject; and when tumors of any other nature are discovered to be the cause of it, they must be removed in the manner

we have mentioned. When dropfical fwellings are found to be the caufe of the gaping of the eyelids, if thefe are connected with a general anafarca, the difeafe of the conftitution being carried off by general remedies, this particular fymptom will moft frequently yield ; but when it appears to be perfectly local, as in fome inftances is the cafe, we are not to depend on the ufe of any internal medicine for removing it : In this cafe, the moft effectual remedy we can employ is an evacuation of the effufed fluid either by punctures or fcarifications, not made through the external coverings of the eyelids, but directly into that part of the internal membrane which is protruded or pushed out by the water collected within it. Small punctures fhould be firft advised with the point of a lancet ; and if thefe do not prove effectual, fcarifications may be made either with the fhoulder of a lancet, or with the knife delineated in Plate XXXI. fig. 3. all along the courfe of the fwelling ; and being carried entirely through the membrane to be divided, they will not only evacuate all the effufed water, but the inflammation which they excite will have a confiderable effect in preventing it from collecting again : After the water is completely evacuated, and any inflammation that may have been induced is fubfided, in order to ftrengthen the parts which have been relaxed by the fwelling, they fhould be frequently washed or bathed with fome gently aftringent collyrium.

When the diforder is induced by inflammation, which it frequently is, the treatment muft be entirely directed to the removal of this fymptom ; and, for the moft part, when the difeafe has not been long neglected, or when it does not prove particularly obftinate, a cure of the inflammation will effect a complete removal of the protruded membrane : But when an inflamed ftate of this membrane has fubfifted for any confiderable time, the protrufion often continues fixed and permanent long after the inflammation which gave rife to it is removed : Whenever the difeafe therefore

is found to depend upon this cause, our utmost endeavours should be exerted to get it effectually and speedily carried off. We have already, however, in Section II. of this Chapter, entered into a full consideration of this subject: We must now refer therefore to what was then said upon it; and shall only farther observe, that along with what we had formerly occasion to recommend for the removal of inflammation of these parts, deep scarifications into the inflamed membrane itself ought here to be particularly depended on. The vessels of this membrane are in this state of the disease commonly so turgid as to give it a considerable degree of preternatural thickness: Unless this increase of bulk be removed, no cure can be expected; and nothing with which we are acquainted tends so much to accomplish this as unloading the inflamed vessels of their contents, which scarifications, if properly and freely made, effect in the most certain manner.

When, again, the disorder appears to be the effect merely of relaxation, if this occurs, as it often does, in an advanced stage of life as a consequence of weakness induced by old age; it would be highly improper to advise any chirurgical operation for its removal. In such circumstances we ought to depend entirely on a palliative course: The patient should be desired to bathe his eyes daily in cold water, or in water mixed with a small proportion of brandy; or, he may use an astringent collyrium of white vitriol, and of saccharum saturni dissolved in water. By these means the disease will be often prevented from advancing farther, and in some instances may even be completely cured. But whether this should be the case or not, when it is evidently induced by old age, as no remedy could probably prevent a return of it, nothing more active or more severe in its operation than what we have mentioned should ever be advised. The same applications too are to be made when the disease arises from relaxation,

relaxation, whether this be the consequence of inflammation or of dropfical swellings.

The last cause we had occasion to mention as being productive of this disorder, is, the cicatrices of sores, of abscesses, and of the confluent small pox, when situated in such a manner as to contract the skin of either of the eyelids; by which a very troublesome variety of the disease is often induced. A cicatrix may be so situated, as we have seen in the last section, as to produce an *inversion* of the cilia. Different instances of this have been met with; but it more frequently happens, that an affection of a different nature, the disease we are now considering, is induced by it.

In the treatment of this species of the disorder, as it is evidently induced by a preternatural contraction of the skin connected with the eyelid, nothing can possibly accomplish a cure but a division of such parts of the skin as are thus morbidly drawn together. For this purpose, the operator, by an attentive examination of the parts affected, should render himself perfectly certain of the full extent of the disease; and having done so, an incision should be made directly across that part of the skin which appears to be contracted, and should be carried freely into the cellular substance by which the skin is connected to the muscles and other parts beneath. When the contraction is produced by the skin being particularly drawn together at one point only, if a free division of it is effected at this part, the contraction will be immediately removed: But it very commonly happens, that the skin, instead of being contracted merely at one point, is fixed to the parts beneath over the whole course of the cicatrix; in which event, a single incision, in the manner we have mentioned, and with which operators in general rest satisfied, will have little or no effect in removing the disease.

In this case, after making an incision through the teguments from one extremity of the cicatrix to another, the edge of the divided skin should be raised with
a pair

a pair of small dissecting forceps, and the whole of it should be separated with the scalpel from the parts to which it is found to adhere. If this is effectually done, that part of the eyelid which was turned outwards by the contraction, will either return of itself to its usual natural situation, or it may be very easily replaced by the operator; and this being done, the rest of the cure must consist in such an application of a proper bandage, or of slips of adhesive plaster, as will retain the skin in the state in which it ought to remain, till by the formation of new granulations at the bottom of the sore, any farther contraction may be prevented in future. To give particular directions respecting bandages for this purpose is very unnecessary, as it could not probably prove in any degree useful. This must always be directed by the ingenuity of every operator. In general, however, we may remark, that when slips of adhesive plaster can be made to answer the purpose of bandages, they should always be preferred in every affection about the eyes, where bandages can never be applied of such a degree of tightness as is necessary for retaining any dressings that may be employed, without producing a degree of pressure upon the parts beneath, which almost constantly proves hurtful.

SECTION VII.

Of Concretion of the Eyelids.

WE know that any two parts of an animal body being kept in contact for a certain length of time while in a state of inflammation, will readily unite and adhere very firmly together: A fact which accounts for many phenomena daily observed by practitioners; and among others for those adhesions of the

eyelids which now and then succeed to an inflamed state of these parts. Inflammation of the eyelids, when of long duration, is frequently found to produce partial adhesions of them, not only to each other, but to different parts of the eyeball itself : This, however, a patient will in general rather submit to, than undergo the pain and terror of an operation for removing it ; but when the adhesions are so considerable as to impede the motion of the eyelids, and thus to obstruct vision, it then becomes necessary to employ such means of relief as we know will most probably prove effectual. It sometimes happens, too, that a cohesion is found to take place between the eyelids at birth : In which case, it is likewise requisite to endeavour to remove this obstruction to vision, which would otherwise subsist for life.

When the adhesion is slight, and has not been of long duration, it may in general be easily removed by the end of a blunt probe insinuated behind it, so as to tear it asunder by means of it ; but when the eyelids adhere either firmly to each other, or to the eyeball, a cure can be effected by a slow cautious dissection only. In performing this operation, the patient's head should be firmly supported by an assistant, who should likewise endeavour to support or elevate the upper eyelid, whilst the surgeon, with a pair of small forceps in one hand, must endeavour to raise or separate the under palpebra, and at the same time must proceed to divide with a scalpel in the other, every fibre that appears to have any effect in forming the adhesion. In every part of the operation much steadiness and accuracy is necessary ; but this is particularly the case when any part of the palpebræ adhere to the eyeball.

When the cause of adhesion is thus completely removed, as dressings usually employed to sores cannot with propriety be used to these parts, all that we ought to attempt, is to cover the eye with a piece of soft lint spread with Goulard's cerate or any other cooling emollient ointment ; and after the first dressing, a small
portion

portion of the same ointment, perhaps the size of a pea or so, may be daily insinuated between the eyelids : By this means the sore is kept soft and easy, at the same time that the usual motion of the eyelids prevents every risk of the parts newly divided adhering together again. In this, however, as well as in every operation upon the eye, the structure of which is so delicate as to render it very susceptible of inflammation, much attention is necessary to prevent this symptom, and to remove it when it has actually taken place.

SECTION VIII.

Of Fleshy Excrescences in the Cornea.

WE frequently find that eyes which have been liable to repeated attacks of inflammation, are apt to have a membranous kind of substance form in some particular point upon the opaque cornea, which in some instances continues of a small size, so as never to be productive of any inconvenience, but which in others extends so as to form a ring round the whole tunica conjunctiva, and which is sometimes known to spread to such an extent as to cover not only all the opaque cornea, but even the transparent part of the eye.

This disorder begins most frequently in the internal canthus of the eye ; and on its first beginning to spread, as it has been supposed to assume the form of a fowl's wing, it has been named Pterygium ; whilst by others it is termed Onyx, from its resemblance to the nail of a finger. But although its commencement is in general observed at first at the internal angle of the eye, this is by no means universally the case ; for in various instances it begins towards the external an-

gle, and in others directly above the middle of the under palpebra on the most prominent part of the tunica albuginea.

In some instances of severe inflammatory affections of the eye, we observe a tough yellow coloured membranous kind of substance to form and spread over the whole eyeball : which, on examination, however, appears to be perfectly inorganic, and is evidently of a nature similar to those crusts or exsudations so frequently met with in parts recently inflamed : But the disorder we are now considering consists of an organic membranous substance, which is equally irritable with other parts of the body, and which, when wounded, discharges blood freely. It is indeed so evidently vascular as to render it probable that it consists almost entirely of a congeries of small blood vessels, which being once forced out from any point of the ball of the eye, either as a consequence of external violence or of inflammation from any other cause, we can easily suppose that every fresh attack of inflammation will cause them to pullulate or shoot out in a degree somewhat proportioned to the violence of the cause.

In some instances, this production does not begin to appear till the violence of an ophthalmia is either nearly or perhaps entirely over : In which case, it is not attended with much pain, unless when some irritating body is applied to it ; but in others it takes place as a symptom of inflammation, when the pain attending it is in general severe. During the inflammatory state of the disorder, this membrane is in general of a deep red colour ; but when it occurs without any previous inflammation, which it does in a few instances, its colour is commonly a pale yellow. It rarely appears, however, from any other cause but inflammation.

As long as this excrescence continues of a moderate size, and does not impede the motion of the eyelids, nor obstruct vision, all we ought to do is, by means of astringent applications, to endeavour to prevent its farther increase. In a former section, we have said

all that appears to be necessary on the subject of inflammation. We shall now therefore suppose that the inflammatory symptoms are, by the means we have formerly pointed out, either entirely removed or much mitigated, and that our attention is now to be directed solely to the removal of this preternatural membranous production. In this state of the disease, astringent applications, as we have said, ought to be alone depended on as long as the size of the excrescence does not render it troublesome. A weak solution of corrosive sublimate in water, viz. one grain of the mercury to four ounces of water, has sometimes proved useful; but in general, nothing answers with more certainty than white vitriol or alum, dissolved in water, care being taken to render the solution always of such a strength as the eye can easily bear. A scruple of white vitriol, or half a drachm of alum, to four ounces of water, will in general prove sufficiently strong: but in every case of this nature, the strength of the application must be particularly adapted to the feelings of the patient; for with some a wash of this kind may be employed of double the strength that can be admitted by others.

By the eye being bathed three or four times daily with one or other of these remedies, or perhaps with a weak solution of verdigris, an application now not so generally employed as it ought to be, if the disease has not been long neglected, it will very commonly happen, either that the excrescence will be considerably diminished in bulk, or at least prevented from becoming larger.

A proper use of powders, moderately escharotic, has frequently, too, proved useful in removing affections of this nature; but remedies of this kind require much caution in the application. Calcined alum in fine powder, a small proportion of white vitriol, or of verdigris, mixed with a sufficient quantity of white powdered sugar, or any other powder of a mild nature, may all be used for this purpose. A very small quan-

tity of any of these may be sprinkled over the surface of the diseased part once or twice daily, and continued as long as any advantage appears to be derived from them ; or the use of the powders may be alternated with the application of the wash in the manner we have mentioned.

A due perseverance in the use of these remedies will very commonly, as we have said, prevent affections of this nature from becoming formidable ; but when it proves otherwise, and when the excrescence proceeds so far as to cover any part of the transparent cornea, as this might soon be attended with a total loss of sight, other means should be employed for removing it.

As our object, in such circumstances, is to remove the excrescence entirely, when astringent or escharotic applications are found to fail in effecting this, the scalpel alone is to be depended on. Authors who have wrote upon this subject, describe an operation for the purpose of removing membranes of this kind by dissection. When the excrescence is loose through a considerable part of its extent, and attached to the eye by a small pedicle only, it may be removed with safety and expedition by one stroke of a scalpel ; and in such cases this method should be preferred to every other. But whenever the excrescence adheres to the eye over its whole surface, the removal of it by dissection is difficult and hazardous ; and as the intention of the operation may be accomplished by more gentle means, these ought to be adopted.

This disorder begins universally, as we have already observed, upon some part or other of the tunica conjunctiva, and approaches in a gradual manner towards the centre of the eye : We have likewise seen that the excrescence which forms this disease consists almost entirely of an extension or elongation of a number of small blood vessels : Hence we may conclude, that nothing will tend more effectually to remove it than the destruction or division of these vessels by which the

the membrane is produced and supported: And accordingly I have in various instances been able to accomplish complete cures of such affections by this means alone. And as the operation for this purpose, with those accustomed to perform it, is neither difficult nor dangerous, it ought always to be attempted as soon as the disease is found to resist the means usually employed for its removal.

The method of performing it is this: The patient being placed upon a pillow on the floor, the surgeon, sitting behind him on a chair, should cause him to incline his head moderately backwards upon his knees, with his face raised in such a manner that a sufficient degree of light may fall directly upon his eyes. This being done, and the patient's hands being properly secured to prevent interruption, the under eyelid should be drawn down as far as possible by an assistant, whilst the upper palpebra is supported in such a manner by the surgeon with his left hand, as to expose to view the full extent of the disease on the eyeball. The knife, figure 3. Plate XXXI. being now put into his right hand, is to be employed in making scarifications through the full thickness of the excrescence, near to, and entirely round its external circumference, so as to cut off all communication between the roots and extremities of those vessels of which it is formed. This may either be done by one continued stroke of the scalpel, or it may be performed by repeated smaller scarifications; and in order to render the operation more certain of succeeding, by a free division being made of every blood vessel connected with the excrescence, after the discharge of blood induced by the first incisions is somewhat abated, one, two, or more circular scarifications may be made within one another, in such a manner as that the last may be contiguous to the centre of the excrescence.

In making these scarifications, it is necessary to guard as much as possible against any injury being done to the eyeball; for which reason it is better to

form the incisions by repeated strokes, than to go to the full depth of the excrescence at once ; but it may be done with much more ease in the manner we have mentioned, and with equal safety to the eye, than by lifting the excrescence with a needle and ligature before dividing it ; for we may just as readily injure the coats of the eye with the needle as with a scalpel : This method of elevating the parts to be divided by means of a ligature, is much recommended by some practitioners ; but I know from experience, that the operation may be performed with more ease in the manner now pointed out.

After as many incisions have been made as appear to be necessary, the parts may be allowed to bleed freely, and may be afterwards bathed twice or thrice daily with a weak solution of *saccharum saturni*. The incisions too may be repeated in a similar manner, if, in the course of a few days, the excrescence does not begin to shrink and diminish in size ; and the same operation may be renewed with perfect safety from time to time, as long as any part of the disease is found to remain.

When, again, any portion of the excrescence is observed to become more loose in its connection with the eye, either in consequence of the number of incisions made in it, or of the suppuration which commonly ensues from this operation, it ought by all means to be removed with the scalpel ; but when this does not take place, and when every part of it continues still to adhere firmly to the eye, no attempt should be made to remove it.

When a cure can be effected by any means hitherto known, the plan we have mentioned will more readily prove successful than any other ; and as it is not attended with any hazard to the eye, it ought therefore to be very universally preferred. But it is necessary to remark, that although this operation very commonly proves effectual, yet instances now and then occur in which no advantage is derived from it, and in which
any

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FIG. 2.



FIG. 1.

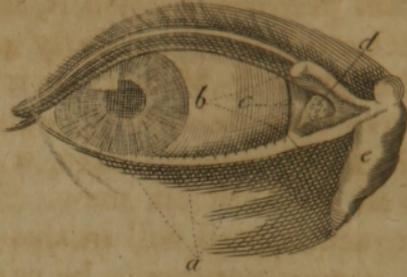
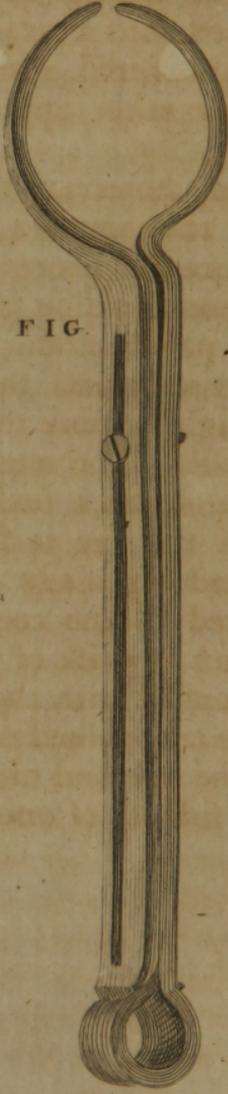


FIG. 3.



FIG.

4.



any scarifications made into the excrescence, or any other operation performed upon it, instead of proving in any respect useful, are regularly attended with an increase of the disease. When this is the case, the operation we have been describing ought not to be persisted in. In such circumstances, a palliative course ought alone to be kept in view. No remedy with which we are acquainted will in this state remove the disorder, but it may commonly be prevented from acquiring any additional increase; and the symptoms induced by it may be kept moderate, by the eye being frequently bathed with a weak saturnine solution, and by keeping it covered with pledgits of Goulard's cerate, or any other application of a similar nature.

When it is found, however, that the disease does not yield to any of the remedies we have mentioned, and if the excrescence still proceeds to acquire an additional bulk, as soon as vision is destroyed by it, and especially when the pain attending it is severe, as there will be much reason to suspect that it may degenerate into a cancer, it ought at once to be removed by extirpating the eyeball. The remedy is no doubt severe: but in circumstances such as we are describing, as the use of the eye is supposed to be irrecoverably lost; and especially as the patient's life might be endangered by the contiguous sound parts being allowed to run any risk of being infected by remaining long in contact with those that are diseased; no doubt should be entertained of the propriety of removing them. The method of performing this operation will be the subject of one of the following sections.

SECTION

SECTION IX.

Of Abscesses in the Globe of the Eye.

INFLAMMATION of the eyes is by experience known to terminate most frequently by resolution; that is, the pain and tension abate, and the redness and fulness of the vessels are dissipated, without any marks being left of their having ever existed. Instances however, occur of suppuration ensuing from an inflamed state of the eyes; in some cases, from those means being neglected at first which tends most certainly to remove inflammation; and in others, from a scrophulous habit or some other vitiated state of the constitution, which effectually counteracts the operation of every remedy employed for the patient's relief.

When the internal surface of the membranes of the eye has been long in a state of inflammation, it is apt to yield a purulent kind of matter, which being poured into one or other of the chambers of the eye, is soon diffused over all the aqueous humour; by which the ball of the eye is not only much enlarged, but vision is either in a great measure or perhaps entirely destroyed; the appearance of the eye is much changed; and neither the iris, pupil, or chrystalline, can be distinguished. This at least is in general the case; but in a few instances, the iris is pushed forward, and is observed to lie in close contact with the internal surface of the transparent cornea; and the coats of the eye being weaker here than in other parts of it, a protrusion commonly takes place, which, if not previously opened, at last bursts of itself, and discharges either some part or perhaps the whole contents of the eye; and at this opening, the iris, in a thickened diseased state, is very generally pushed out. It is this disease
which,

which, from its supposed resemblance to a grape, is denominated Staphyloma; different varieties of which are described by authors under different names: But as these are all of a similar nature, and require the same method of treatment, any difference of form from whence these denominations have been taken, is not of such importance as to deserve notice; and as the distinctions proposed to be established serve only to confuse and perplex the younger part of the profession, we do not mean to enumerate them.

Under the general term of Staphyloma, a word we shall retain merely from its having been long employed, may be comprehended all collections, such as we have described, which take place within the cavity of the eye. In most instances, as we have already observed, the transparent cornea is protruded from its being the weakest part of the eye; but, in others, partial swellings or protrusions occur in the sclerotica, or opake part of the eye.

During the formation of this disease, the patient suffers not only a loss of sight, but severe pains in the eye, which shoot backwards into the head, attended with a constant restlessness, heat, and other symptoms of fever; and these very commonly continue, either till the eye bursts of itself, or till the contents of it are discharged by an opening being made into it.

It happens, at least in most instances, that patients suffer much pain in this disease; but cases have now and then occurred, in which no other inconvenience has been experienced from it, than deformity and loss of sight: But in these, any matter formed in the swelling is commonly in small quantity, and the principal part of the tumor is found to be of a watery nature, possibly from an increased secretion of the aqueous humour of the eye: But whether the contents of such swellings have a greater or smaller proportion of pus mixed with them, their external appearances are nearly similar, and the method of treatment is likewise similar.

Besides

Besides the collections we have described, in which the matter is lodged within the coats of the eye, this organ, we find, is liable to abscesses of a different nature, in which the matter is seated in the substance of one or other of its tunics. In the small pox it frequently happens that a pustule is seated in some part of the eye, when the variolous matter being formed between two of its coats, affords all the appearances of a small abscess; but collections of pus occur here from external injuries, and from inflammation by whatever cause it may be induced, although by no means so frequently, as we have already remarked, as they do in other parts of the body.

This disease has in general been termed Hypopyon. It ought not, however, to be distinguished by any particular appellation: For it is precisely an abscess in the coats of the eye, and exhibits exactly the same appearances here, and requires to be treated in the same manner, as collections of matter in any other part of the body.

It is in this disease, as in the staphyloma, which we have just described; the matter may be situated in various parts of the eye. In some instances it is met with in the sclerotica; but it most frequently happens, that abscesses of this kind are seated in the transparent cornea, when they very commonly destroy vision entirely. The hypopyon is distinguished from the staphyloma by the matter being collected in a particular bag or cyst; at least it is always confined to one part of the eye, which is observed to be elevated into the form of an ordinary abscess, whilst the rest of the eye retains its usual form: But in the other, although the matter does always at last force out some protuberance at one part or another of the eye; most frequently, as we have said, in the transparent cornea; yet an enlargement may be always observed over the whole substance of this organ. In both, the motion of the eyelids is much impeded: But in the
staphyloma,

staphyloma, this is always more considerable and more distressing than in the other, a sense of tightness being felt over the whole globe of the eye; whereas in the hypopyon, this uneasiness occurs at a particular point only. In the latter, too, the pain is seldom so severe as when the matter is collected within the ball of the eye. Any uneasiness produced by it, affects the surface of the eye only, and does not spread back towards the head as it commonly does in the staphyloma.

In the treatment of the staphyloma, as it rarely happens that the use of the eye can be preserved, our great object in general is, to endeavour to abate the violence of the pain, which is often very severe, and to remove that deformity which an enlargement of the eye is always sure to produce. With a view to abate the pain, blood letting, blisters, cooling applications to the eye, and opiates, are to be chiefly depended on in the commencement of the disorder. In this stage of the disease, indeed, it is to be considered entirely as an inflammatory affection, and to be accordingly treated in the manner we have pointed out in Section II. of this Chapter.

But if these and the other means employed for abating inflammations, do not prove effectual; if supuration takes place; and if the pain still continues severe, as this very commonly occurs from the coats of the eye being over-distended; nothing will so certainly afford relief, as evacuating the matter by making an incision into the ball of the eye. This will commonly indeed produce a discharge of all the humours of the eye, particularly of the aqueous humour; but in circumstances such as we are describing, this is not to be regarded, as vision is totally destroyed in consequence of the disease. We are therefore to use the most effectual means for removing pain, and for obviating the deformity induced by the tumefaction of the eye, without any regard to the humours contained in it. For this purpose an incision should be made into the
eye

eye sufficiently large for discharging all the thinner part of its contents. The proper place for this incision is the most depending part of the transparent cornea, or perhaps the most prominent part of the small tumor, which commonly occurs in this disease in some part or other of the eye, from a protrusion of some of its coats induced by the collected matter within. The patient's head being secured by an assistant, and the operator standing before him, the eyelids may be sufficiently separated by the fingers of one hand, while the point of the knife, fig. 3. Plate XXXI. being introduced with the other into the part to be opened, it may be easily carried forward in a horizontal direction, till an opening is effected of a size sufficient for our intended purpose.

Authors who have wrote upon this subject, instead of a simple incision into the swelling, direct all the prominent part of the eye to be cut off either with a scalpel or a pair of scissors: Whilst others, from an apprehension of hemorrhagies being produced by such an extensive wound as this would occasion, have advised the tumor to be removed by ligature; by which they imagine that the eye may be sufficiently diminished, at the same time that the deformity produced by the swelling will be effectually removed. There is no necessity, however, for our adopting either of these methods; which are both of them more painful, and neither of them in any respect more useful, than the mode we have advised, of evacuating the contents of such tumors by a simple incision. The disease, as we have already observed, is in reality an abscess, or a collection of matter within the coats of the eyes; and it ought to be treated exactly in a similar manner with abscesses in other parts of the body; not by removing any part of the tumor, but merely by laying it open in the manner we have mentioned. There is indeed a variety of the staphyloma sometimes met with, in which, either from a long continuance of the disease, or from some cause with which we are not acquainted, the

the different humours of the eye are totally absorbed, or as it were annihilated, and where all the external appearances of the disease which we have described are very distinctly observed; but in which the tumor is formed by a thickening of the different coats of the eye, and particularly of the iris. In such occurrences, the operation we have mentioned could not prove serviceable; and the only means of relief to be depended on, is the removal by a scapel of all the prominent part of the eye. It rarely happens, however, except in the very advanced stages of staphyloma, that this variety is met with.

After the contents of the eye have been evacuated, the parts should be slightly covered with a soft compress, moistened with a weak solution of saccharum saturni; the patient should be kept upon a low cooling diet, and every part of an antiphlogistic regimen should be followed, either till the wound in the eye is completely cured, or till there appears to be no risk of an accession of inflammation.

With respect to the treatment of the hypopyon, namely, that species of the disease in which matter is collected, either in the substance of one of the coats, or between two of the coats of the eye, it ought to be nearly similar to what we have advised for the staphyloma. In general, the pain in this disorder is not very severe; so that it may always be kept moderate by small doses of opiates; and as soon as the matter is freely and clearly formed, it ought to be evacuated by an incision made in the manner we have mentioned, in the most depending part of the abscess.

The general practice on this point ought by no means to be imitated. We commonly observe, that practitioners decline to operate in affections of this nature, till they are in some measure forced to it, either by the deformity being considerable, or by the abscess becoming so large as greatly to impede the motion of the eyelids. But delays should be always avoided when it is once evident that suppuration has
taken

taken place ; for as the matter of an abscess of this kind will just as readily burst inwardly, so as to mix with the humours of the eye, as outwardly by an external opening ; and as this very constantly terminates in a total annihilation of any degree of vision which may hitherto have remained ; it ought to be as much as possible guarded against, by the matter being evacuated in the manner we have directed, as soon as it is certain that suppuration has taken place. The after treatment of the parts ought to be the same here as what we have directed for the staphyloma.

It happens in both these diseases, after evacuating the matter, that fungous excrescences rise where the opening has been made ; but they may commonly be prevented from proceeding to any height by applying daily a little burnt alum or fine powder, or touching them from time to time with lunar caustic.

S E C T I O N X.

Of Dropical Swellings of the Eyeball.

IN the preceding section, we have seen that the globe of the eye is sometimes enlarged by pus being effused within its cavity ; and in a few instances that an enlargement of it is produced by a small quantity of pus being mixed with an increased secretion of the aqueous humour. In cases of this nature, vision is commonly destroyed by opacity produced in the aqueous humour in consequence of a mixture of purulent matter. The eye, however, is liable to be enlarged by a different cause, which does not communicate any opacity to it, namely, by a preternatural quantity of the aqueous humour collecting in it without any mixture of pus or of any other matter. In this affection, the patient at first complains of a sense of fulness in the

the eye, which continues to occasion a good deal of distress long before any increase is observable in the size of the eye ; at last the motion of the eyelids begins to be impeded ; and although the power of vision still remains in some degree, yet it gradually becomes more imperfect, till in the latter stages of the disorder the patient can only distinguish light from darkness : and in this period of the disease, too, some part of the eye, most frequently the transparent cornea, generally begins to protrude, so as to form a small tumor, such as we have described in the staphyloma. If the contents of the eye are not now discharged by an operation, the swelling in this state commonly proceeds to increase so quickly as to burst of itself ; which in general affords immediate relief from any pain which the patient may have suffered ; but which in this disease is never very severe, excepting in the very last stages of it, when, from distention alone, a good deal of distress is often experienced.

When the disease has been of long duration, it is very universally mistaken for and confounded with staphyloma ; and in the latter stages of it, indeed, we must acknowledge, that it is with much difficulty they can be distinguished. In this period of the disease, its external appearances are exactly similar to those which attend the staphyloma : But in the pure drop-fical swelling, the patient is always sensible to the effects of light ; and if the pupil can be distinguished, a clear light will commonly be observed to produce some contraction in it. Now in the other, excepting in its very first stages, the patient is never sensible to light, nor can any kind of contraction be discovered in the pupil. When the two diseases, however, are far advanced, it is seldom of much importance whether we have it in our power to distinguish them or not, as the use of the eye is in general so much destroyed as not to be recoverable : But in the commencement of this affection, we may very commonly with some certain-

ty distinguish it from the other ; and when we are able to do so, it ought always to be attended to.

From the account we have given of the staphyloma, it appears evidently to be the consequence of inflammation. It begins with all the symptoms of it, and terminates, as we have said, in the formation of matter. By this circumstance alone it is very distinctly marked ; and by attending to it, we can seldom, in the early period of the disease, have much difficulty in distinguishing it from a mere hydropic swelling of the eye ; in which no symptoms of inflammation take place, and in which the only marks of disease which occur at first are a sensation of fulness in the eye, and which, by degrees terminates in an enlargement of the eyeball, and in a confused state of vision.

When this disorder is allowed to proceed far before being attended to, as its appearances as well as the effects produced by it upon the eye, are nearly similar, as we have just observed, to those which occur from the staphyloma, the treatment we have proposed for that disorder will likewise be applicable here. The eyesight being destroyed, all that we have in our power to do, is to remove the pain and deformity produced by the enlargement of the eyeball ; which may be effectually done by an incision made in the most prominent part of the tumor, in the manner we have mentioned in the preceding section. But in the earlier stages of this affection, an object of greater importance presents itself, I mean the possibility of saving the use of the eye ; which, from the result of some cases I have met with, there is reason, I think, to imagine might in many instances be done.

When water or any other fluid collects in the eye in such quantities as to distend it much beyond its natural size, vision is thus frequently destroyed merely by distension, when no other morbid affection is perceptible. In such circumstances, when the nature of the disease is evident, and as soon as the eye begins to lose its usual powers, instead of allowing the swelling

to increase, as is commonly done, till it arrives at a very great bulk, and till the power of vision is lost; would it not be better to try the effect of evacuating the fluid by which the swelling is produced? No danger could result from this, for the operation may be done with perfect safety; and it would at least prevent the eye from suffering by over-distension, and might thus afford leisure for a cure being effected either by the application of proper remedies, or by some change being induced in the part by nature herself; an object which ought to be kept more in view, in every hydropic swelling, than we find to be commonly the case.

The easiest and most effectual method of performing this operation, is by making a small opening in the under and most depending part of the transparent cornea. By insinuating the point of the knife, fig. 1. Plate XXXIII. into this part of the cornea, and making an incision of three tenths of an inch or thereby in length, all the aqueous humour may thus be easily evacuated; and as the wound seldom heals immediately, the water or serum would accordingly be allowed to drain off almost as quickly as it is secreted. But in the event of the disease returning after the wound in the cornea is healed, as a repetition of the operation in this part might be productive of a cicatrix of such a size as would tend to obstruct vision, I should think it more advisable to make an opening into the posterior chamber of the eye, directly behind the iris, either with the point of the knife above mentioned, or, what will be found to answer better for this purpose, with a very small trocar. This instrument, if not thicker than a crow's quill, and if made of a flat or lancet point form, will penetrate the coats of the eye with almost as much ease as a common couching needle; and an opening made with it will evacuate the aqueous humour of the eye with more certainty, than an opening of an equal size made in any other manner.

The patient's head being properly supported by an assistant, the eyelids may be sufficiently separated by the operator himself with the fingers of one hand, whilst with the other the trocar is pushed into the most depending part of the eye, by entering the point of it at the distance of a tenth part of an inch behind the iris, and carrying it to such a depth as to admit of the extremity of the canula being completely covered by the coats of the eye, when the stilette should be withdrawn; and as much of the aqueous humour being allowed to run off as is judged proper, the canula may be now taken out, and the opening will require no farther attention. With a view, however, to strengthen the eye, and, if possible, to prevent a return of the disorder, the parts may be frequently bathed in washes of a moderately astringent nature; viz. in cold water with a certain proportion of brandy, in a solution of alum, or in decoctions of oak bark. In this manner a complete removal of the disease may in some instances be obtained; and as it will always afford at least some chance of preserving the eye, we have therefore no hesitation of recommending it in preference to the usual practice of allowing the eye to become so large before it is opened, as to produce in almost every case an entire loss of sight.

When the disorder has proceeded so far as to destroy vision entirely, it has been proposed to evacuate the contents of the eye, by passing a small seton or cord through it: But in an organ of such delicate mechanism, whose parts are all extremely irritable, there is reason to imagine, that more pain and inflammation would in general ensue from this than from a free incision made with a knife or with a lancet; and as all the intention of the operation may be answered by this means, it should therefore, I think, be preferred.

SECTION XI.

Of Blood effused in the Cavity of the Eyeball.

A FREE passage of the rays of light to the bottom of the eye, which is absolutely necessary for the purpose of vision, requires a clear and perfectly transparent state of the different humours of the eye. We find accordingly, that vision is always much impaired, and in many instances totally destroyed, by any of the humours becoming opaque; and as nothing more certainly induces an opacity of the aqueous humour than blood being effused in it, whenever this is observed to take place, its removal must always be an object of importance; for in no other manner can perfect vision be restored.

Blood may be effused into one or other of the chambers of the eye by various causes. In some instances it has happened as a consequence of putrid diseases, either from a dissolved state of the blood taking place in these, or more probably from a lax state of the solids; by which the red globules of the blood are admitted into vessels and parts which do not naturally receive them, and by which the different secretions are in these diseases frequently tinged with blood. Blood is sometimes poured into the eye, too, as the effect of an inflamed state of this organ; but it occurs more frequently from the rupture of a blood vessel, from external injuries, than from any other cause. Blows upon the eye are frequently attended with this effect; and wounds, when they penetrate into the posterior chamber, are almost universally productive of it. In some instances, too, wounds which penetrate into the anterior chamber only are succeeded by effusions of blood; but this is by no means frequent,

quent, from the vessels of this part of the eye being in general so extremely small as to be incapable of admitting red blood.

In whatever manner blood may be effused into the eye, if it mixes with the aqueous humour so as to render it opaque, and if it be not soon absorbed, which happens in some instances, it ought to be discharged by an operation. In a few cases, we observe, that a small quantity of blood falling into the eye is not productive of any inconvenience, by its sinking immediately below the axis of vision, and remaining in this situation without mixing with the aqueous humour. In this case, no attempt should be made for removing it: For as long as it continues at the bottom of the eye, no harm can be done by it; and we have it always in our power to remove it, if, at any future period, it should happen to dissolve in such a manner in the aqueous humour as to render it opaque. The method of performing this operation is exactly similar to what we recommended in the last section, for the removal of dropical collections in the eye.

A small opening should be made in the most depending part of the transparent cornea, by entering the knife at the distance of the sixteenth part of an inch, or thereby, from the junction of the iris to the coats of the eye; and having carried the point of it forward in a horizontal direction to the distance of three tenths of an inch, it ought at this part to be pushed through the cornea; and by proceeding slowly and steadily, all that part of this membrane should be divided which lies below the two openings made by the instrument at its entrance into and in its passage from the cavity of the eye; care being taken to make the incision at an equal distance from the iris through its whole length.

In this manner an opening will be made, at which the aqueous humour, with any blood that is mixed with it, will be immediately discharged: And in order to promote the evacuation of it, the patient should be desired to turn his face downwards, and the sides of
the

the divided cornea may be somewhat separated from one another by the end of a blunt probe, or with the scoop, fig. 4. Plate XXXIII. On the aqueous humour being thus all evacuated, the eye will appear to be much diminished by the anterior part of it collapsing. This, however, is a matter of little importance; for the wound in the cornea commonly heals soon, and the aqueous humour is in general quickly renewed. The only application required after this operation, is a compress of soft lint moistened in a weak solution of saccharum saturni.

S E C T I O N X I I .

Of Ulcers on the Globe of the Eye.

IN a former publication we have entered into a full consideration of the theory and management of ulcers, and shall now refer in general to what we have there endeavoured to establish upon this subject: But ulcers on the eye merit particular attention; for we have here not only the cure of the sores to keep in view, but means must be employed to prevent or remove those marks or spots which they almost universally produce, and which very commonly terminate either in a total or partial loss of sight. In other parts of the body, the cicatrix induced by an ulcer is seldom productive of any inconvenience; but in the eye, the cicatrix of even the smallest sore that occurs in it, is on some occasions attended with very disagreeable consequences. It is evident, however, that the effects of ulcers must in this respect be very different, according to the part of the eye on which they are seated. Thus, we observe, that sores of considerable magnitude frequently occur upon the sclerotica without any obstruction to vision being induced by them;

whilst ulcers in the transparent part of the eye very commonly destroy vision entirely. Our prognosis therefore, with respect to the consequences of these affections, must in general depend in a great measure on their situation; for sores, which in one part of the eye might not be of much importance, will in others render the organ perfectly useless.

The danger attending ulcers on the eye, depends in some measure, too, upon their form, which we find to be equally various here as in other parts of the body; but the structure of the eye renders the form of any sore that occurs in it of more importance than it can possibly be in any other situation. In some instances, ulcers upon the eye are very superficial, being no deeper than the tunica adnata; whilst in others they are small, narrow, and penetrate to a considerable depth. Those which spread upon the surface of the eye may destroy vision by the cicatrix which they produce; but the deep seated ulcers are not only attended with this effect, but very commonly terminate in an evacuation of the aqueous humour, either from their penetrating immediately through all the coats of the eye, or from their leaving such a weakness in some particular part of them, as admits of the aqueous, and perhaps of the other humours, forcing a passage for themselves.

In other cases, again, instead of a loss of substance being produced by ulcers, the parts become soft and fungous, and excrescences or granulations shoot out, as we frequently find to be the case in ulcers of other parts of the body.

Ulcers of the eye may occur from a variety of causes; namely, from wounds, contusions, burns, &c. And they may be induced by any general affection of the constitution; such as leus venerea, or scrophula. But in most instances they may be traced as the consequence of inflammation terminating in suppuration; for abscesses in the eye are often met with; and every abscess terminates in an ulcer, excepting in a very few instances; in which they either continue during life,

or

or in which the matter, instead of being discharged by an opening, is absorbed into the system.

Ulcers of the eye are frequently induced by inflammation; and it commonly happens, that inflammation is the most troublesome symptom with which they are attended: Indeed the pain which occurs from an inflamed state of an ulcer on the eye, proves in some instances so very distressing, as to induce restlessness, heat, quickness of pulse, and every other symptom of a smart fever: So that in the treatment of sores of this nature, this symptom of inflammation requires our most serious attention.

In the management therefore of these affections, when they are found to be in an inflamed state, blood letting, both general and local, should be employed; together with blisters, laxatives, and cooling applications to the eye, in the manner we have mentioned more particularly in the section on Ophthalmia: For till the violence of this symptom is much abated, we cannot with propriety employ any remedy directly for the cure of the ulcers. In other cases of ophthalmia, along with general evacuations, I have urged, in a particular manner, the propriety of taking blood directly from the part affected, by scarifying the turgid blood vessels. In ulcers of the eye, too, where we frequently find a considerable number of inflamed vessels passing directly from the sores along the centre of the eye, it often proves useful to cut them completely across; not only for the removal of inflammation, but for the cure of the sores themselves. Indeed, from observing the effects which result from this practice, I think it probable, that the discharge afforded by ulcers of the eye is commonly supplied by these turgid vessels which run into them; for it often happens, that the sores are cured by this remedy alone, when every other means have failed. The operation, however, requires to be very neatly and steadily performed; but when deep and extensive scarifications are made in the neighbourhood of an ulcer, they are apt to de-
generate

generate into tedious sores of a similar nature. This, however, is not the fault of the remedy, but of the method of putting it in practice; for it is an effect I have never observed to result from it, when the turgid vessels only have been divided; which may be easily done in the manner we have mentioned in one of the preceding sections.

It has been objected to this practice, that we may render the healing of ulcers more tedious by it than would otherwise happen, by dividing the lymphatics which proceed from the sores along with the turgid blood vessels; for these, by absorbing the matter secreted or discharged into ulcers, have been by some imagined to have a considerable influence on their cure: And therefore, it is said, that we ought never to run any risk of dividing them, which must always be done in scarifying the larger vessels of the eye, which they very commonly accompany. The idea is ingenious; but so far as I have yet seen, it is not supported by experience. Scarifications, when improperly performed, may in some instances, as we have said, do mischief; but in many cases of ulcers of the eye, I have known them prove very useful. Besides, we might, from reasoning alone, conclude, that scarification, when properly performed, ought not to do harm; and that the doubts which have been entertained with respect to it, cannot be well founded: For although some proportion of the matter afforded by ulcers is no doubt carried off by absorption, yet daily experience shows, that we are never to depend upon this for effecting a cure; and, on the contrary, that sores are more frequently cured by those applications which seem to act by destroying the power of the absorbents, as well as of the other vessels with which the ulcers are supplied, than by any other means; namely, by drying astringent remedies, and by external pressure applied with such firmness as must frequently annihilate the smaller vessels of sores, by keeping them for a considerable time closely compressed together.

After

After the inflammatory state of an ulcer on the eye has been removed in the manner we have mentioned, our views ought to be exactly the same as in the treatment of sores in other parts of the body; and the means employed for effecting them, must, for the most part, be likewise similar. When the disease is connected with any general affection of the system, proper remedies must be advised for correcting this before any permanent cure can be expected. We find sores on the eye, in some instances, combined with lues venerea; when a well directed mercurial course is to be chiefly depended on: But they are much more frequently combined with, and indeed originate from, scrophula; a disease which affects the eye more frequently than any other part of the body; and hitherto we have not been so fortunate as to discover any certain remedy for its removal. Cold bathing, however, with the use of steel mineral waters, bark, and other tonics, and living in a dry atmosphere, have frequently proved serviceable in this disorder; and for the symptom of which we are now speaking, namely, ulcers on the eyes, issues, when duly persisted in, are to be more depended on than any remedy with which we are acquainted.

In the local treatment of sores upon the eye, the remedies to be employed must depend entirely on the appearances which take place. Before any attempt is made to induce the formation of a cicatrix, any fungous excrescences which occur must be destroyed; and if the matter discharged is thin, and the bottom of the ulcer foul, these circumstances must be corrected. With this view, detergent ointments and washes, as they are called, should be applied; and for the removal of excrescences, the scalpel and caustic applications are alone to be depended on.

A general prejudice prevails against the use of stimulating applications to the eye; and in many of the diseases to which this organ is liable, they certainly cannot be employed with propriety; but in others, especially

especially in ulcers, they may not only be applied with perfect safety, but with much advantage. In many instances a cure cannot be otherwise accomplished; and a great deal of mischief is daily done by the contrary practice of a long continued use of emollients. In cases of ophthalmia, accompanied with much pain and tension, a proper use of emollients, particularly of warm fomentations and cataplasms, will in some instances prove extremely useful; but in ulcers of the eye, after any inflammation with which they may have been attended is removed, instead of being productive of any advantage, I have constantly observed them do harm. They not only seem to promote that tendency to relaxation and sponginess which usually occurs in these sores, but in different instances they have appeared to be the sole cause of those excrescences very frequently met with in ulcers of the eye, and which always prove extremely troublesome. When I first engaged in practice, I entered into a free use of remedies of this class, in ulcers as well as in other affections of the eyes; but from repeated instances of their proving hurtful, I am now convinced that they ought to be employed with much caution.

In ulcers that are hollow, with foul edges, and that discharge thin and perhaps fetid matter, a liniment of wax and oil, with a small proportion of red precipitate, commonly answers the purpose of cleansing them; or the same intention may be obtained from a remedy of the same nature, prepared with white vitriol, or with a small proportion of verdigris; care being taken to have the liniment of such a thin consistence, that by means of a small brush or pencil a little of it may be easily applied at any time over the whole surface of the sores. By adding a small proportion, too, of camphor to applications of this nature, their effects in cleansing ulcers of the eye are frequently improved; and the same remedy proves sometimes serviceable in a dissolved state, when employed as a wash to these sores. The most effectual wash, however, for this purpose, is
either

either a weak solution of verdigris in water or of white vitriol ; and I have on some occasions employed, with much advantage, a weak solution of corrosive sublimate in water. One grain of corrosive mercury in four ounces of water, makes a solution of a sufficient strength for this purpose.

Practitioners not accustomed to the application of irritating substances to the eye, may be surpris'd to find red precipitate, verdigris, and even corrosive sublimate, recommended ; but daily experience shows, that in many diseases of this organ they may be employed with much freedom and advantage.

When by a due continuation of these means, or of remedies of a similar nature, an ulcer on the eye is properly cleansed and a good suppuration induced, by the assistance of a magnifier, granulations will be observed to form ; any deficiency of parts which may have been induced by the sore will soon be filled up ; and, if no interruption occurs to the cure, a cicatrix will soon be obtained.

It often happens, however, in this state of the disorder, that a cure is with difficulty accomplished. The surface of the sore remains soft, and becomes somewhat elevated above the rest of the eye, by which a cicatrix is prevented from forming upon it : In this situation, drying astringent applications prove most effectual. The parts affected should be covered once or twice daily with lapis calaminaris finely levigated ; with prepared chalk, or with crab's eyes : and they may be bathed morning and evening with a strong solution of alum ; with brandy properly diluted ; or with a strong infusion of galls or of oak bark : by these means when the constitution is otherwise healthy, a cure will in general be obtained.

When, again, a sore upon the eye, instead of being hollow and attended with a destruction of some of the parts in which it is seated, is found to be covered with a fungous production, this excrescence must be removed before any permanent cure can be expected ; and

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the same means must be employed for this purpose here, that prove most effectual for the removal of excrescences in other parts of the body.

In some instances, productions of this nature arrive at a considerable magnitude, and, after separating the eyelids, fall down upon the upper part of the cheek. Of this, there are different cases recorded by authors; some of which were on dissection found indeed to be connected with the more interior parts of the eye, when extirpation of the eye itself would no doubt be rendered necessary; but it sometimes happens, that tumors of this kind are found to adhere to the surface of the cornea only, when they may commonly be removed without any material injury being done to the eye. We are, in general, directed in cases of this nature, to attempt the removal of these excrescences by ligature; but as this frequently proves painful, tedious, and uncertain, the scalpel or lunar caustic ought for the most part to be preferred.

For the removal of a large excrescence, excision by the scalpel should alone be trusted to; and when done with caution, no danger can occur from it. The patient being firmly seated opposite to a clear light, and the surgeon sitting before him, his head should be supported by an assistant behind, who at the same time should separate the eyelids, by elevating the one and drawing down the other; which may be easily done by the fingers of each hand properly placed upon them. This being accomplished, a needle armed with a firm waxed ligature should be passed through the centre of the excrescence, for the purpose of fixing it and raising it as much as possible from the surface of the eye; and with one hand the operator should lay hold of this ligature, while with a scalpel in the other he slowly and steadily dissects off the excrescence. The only dressing that can be applied here, is a piece of soft lint soaked in a solution of *saccharum saturni*, or in any cooling liquid, laid over the eyelid; and if the sore produced by the operation does not heal easily,

easily, some of these astringent applications must be employed that we have just had occasion to mention.

But in the treatment of excrescences of the eye which are not pendulous or much elevated, there is no necessity for the use of the scalpel, as they may almost always be removed with much certainty by a proper application of caustic. By touching the surface of the part intended to be destroyed with a piece of lunar caustic, either daily or once in the two days, any protuberance which occurs will soon be removed; and the sore being in this manner reduced to the level of the rest of the eye, a cure may be obtained by the means we have already mentioned.

It is necessary, however, to remark, that in the application of caustic to the eye, much steadiness and nicety is necessary; but with due attention it may be done with perfect safety, and often with much advantage. In order to prevent the rest of the eye or the eyelids from suffering by coming into contact with the caustic, the eye should be previously fixed with a speculum; and after the excrescence is rubbed over with caustic, before removing the speculum, it should be entirely washed off with a small brush or pencil soaked in warm water, or in warm milk, which proves commonly more effectual than any other liquid for destroying the activity of caustic applications. In this manner, all the advantages may be obtained from the use of lunar caustic, which we daily experience from it in the removal of excrescences in other parts of the body; and when applied with caution, it may be done without any kind of risk.

We have already remarked, that when the constitution is sound, ulcers of the eye will commonly heal by the means we have mentioned; but it happens in some instances, that they still continue obstinate, and even daily become more virulent, notwithstanding the use of these and all the other remedies that may be employed: In which event, whenever the disease has advanced so far as to destroy vision, and when it is still
proceeding

proceeding to increase, as nothing but extirpation of the morbid parts will afford any chance of preventing it from spreading to the contiguous sound parts, this ought certainly to be advised. The method of extirpating a diseased eye will be the subject of a different section.

S E C T I O N XIII.

Of Specks or Films upon the Eye.

WE frequently observe that vision is obstructed by opake spots or films forming upon the eye: A disease commonly termed Leucoma, Albugo, or Nubecula.

Spots of this kind are met with upon the sclerotica or white part of the eye; but in this situation, as the inconvenience which ensues from them is seldom of much importance, they do not often become the object of surgery. In the transparent part of the eye, however, they always require our most serious attention; for in this situation, even the least degree of opacity will be frequently productive of an entire loss of vision: And although we cannot in every instance accomplish a total removal of them, yet we can often do so, and, by proper management, we have it frequently in our power to preserve eyes which otherwise would in all probability be lost.

We have already entered into the consideration of various affections which may tend to obstruct vision, by inducing an opake state of the transparent cornea and humours of the eye. Thus every high degree of inflammation; the staphyloma, hypopyon, and ulcers on the transparent part of the eye; are all attended with this effect: But as each of these forms a distinct disease, requiring a method of treatment peculiar to itself,

itself, we have judged it proper to allot a separate section for each of them. What we now mean to consider, are those white opake spots frequently met with on the cornea, and which occur most commonly as the consequence of inflammation.

Affections of this kind are for the most part, indeed, so evidently induced by inflammation, that we doubt if they ever occur from any other cause; for all those specks which succeed to accidental wounds of the cornea, or to such operations as are performed upon it, as likewise those which occur in the small pox and measles, are always preceded by an inflamed state of the eye: We therefore conclude, that they depend, perhaps entirely, on inflammation, by whatever cause this may at first be excited.

When we attend to the nature of these opake spots upon the eye, it appears sufficiently obvious, that they are produced in most instances by that effusion, with which inflammation, when in a high degree, is always attended. In some cases, when it terminates in complete suppuration, a small abscess is produced; which either on bursting, or on being opened in the manner we have directed in a preceding section, very commonly leaves an opake spot, attended with some degree of prominency or elevation of the parts in which it is seated: But in others, when the effusion, instead of being near to the surface of the cornea, is perhaps diffused among the different lamellæ of which this part of the eye is composed; or when the degree of inflammation which takes place is not sufficient for carrying it on to suppuration, the opacity induced by it does not, as in the case of an abscess, form a small protuberance; but appears rather to constitute a part of the substance of the cornea itself. In the one, the different lamellæ of the cornea are much separated from each other; and on the matter contained between them being evacuated, the speck which remains appears in the form of an adventitious body, adhering to, but not intimately connected with, that part of the

eye on which it is seated : Whereas in the other, that is, when a small effusion only has taken place, and when no tendency to suppuration occurs, although a very considerable degree of opacity may be produced by it, yet the nicest examination will not discover the cornea to be at this part either elevated or increased in thickness. In this case the disease appears to form a part of the eye itself, and cannot be separated from it but with the destruction of the organ ; whereas in the other, the appearances which it exhibits are such as would lead one to consider it entirely as a preternatural formation ; and in many instances it may be removed without much injury being done to the eye.

These spots upon the eye are met with in various forms and in different degrees of magnitude ; but the distress induced by them is always in proportion to their extent, to their degree of opacity, or to their situation with respect to the pupil ; for as they prove hurtful merely by preventing the rays of light from passing to the bottom of the eye, it is evident that it is by one or other of these circumstances that this must be determined. When a spot upon the eye, therefore, is either so extremely small, so slightly opaque, or so far removed from the pupil, that vision is not much hurt by it, we ought not to consider it as an object of Surgery ; for till the use of the eye is impaired by it, as it is never attended with pain unless when the parts are inflamed, no other consideration can render it proper to meddle with it : For every practitioner knows that this organ is so very delicate, as often to suffer more by the means employed for removing diseases, than it previously did by the diseases themselves. But whenever vision is materially impaired, we are then authorised to endeavour to remove the cause by those means which experience has shown to prove most proper for this purpose.

We have shown that inflammation is to be considered as the principal, and perhaps as the only, cause of this disorder : Besides other motives, therefore, this
ought,

ought, in every case of inflamed eyes, to convince practitioners, of the propriety of losing no time in the application of proper remedies for removing it; for whenever the disease has proceeded so far, as to induce any degree of effusion, we can have no certainty of being able to prevent either a partial, or perhaps a total loss of sight. The means best adapted for the removal of inflammation having been already pointed out, we do not now think it necessary to repeat them; and shall proceed to mention those remedies which are to be chiefly depended on in the treatment of specks already formed.

In the management of specks upon the eye, it is a matter of much importance to attend to the particular nature of each of them; for the two varieties we have mentioned of this disorder, are so very opposite to each other, that such remedies as are found to prove very useful in the one, are scarcely, if at all, admissible in the other: And hence it happens, that the same applications being indiscriminately employed in every case, a great deal of injury is done which ought not to have happened; and remedies fall into discredit, which, when properly applied, prove commonly of much advantage.

Thus it is found by experience, that escharotic applications of a moderate strength may with safety be applied to the eye; and as specks upon the cornea are in many instances removed by them, it has long been the common practice to apply them with equal freedom in every case. By attentive observation, however, to this branch of practice, I am perfectly convinced, that it is in one variety of the disease only that remedies of this class ever prove useful; namely, in that which is attended with an evident prominency or elevation of the diseased part. In such instances, when the cornea beneath happens to be found, the removal of this elevated opaque spot will leave it perfectly transparent, and fit for the purposes of vision: And in such cases, escharotics of a mild nature may with

much propriety be employed : But in the other species of the disease, where the effused matter seems to spread through the whole substance of that part of the cornea in which it is seated, without raising or elevating any part of it, no advantage can be expected either from escharotics, or from any other external application. In this case, the diseased part of the cornea, as we have formerly mentioned, does not seem to be thicker than the other parts of it ; and it is impossible to destroy the effused matter without destroying the cornea itself. In such circumstances, the employment of escharotics can never be proper ; and we have no hesitation in saying, that in this state of the disease, they can never be used but with a much greater chance of doing harm than good.

It sometimes happens, however, even in this variety of the disease, that the patient either recovers a partial or perhaps a complete use of his eye, by the opacity in the cornea being gradually carried off, probably by an absorption taking place of the effused matter. As this has in some instances been effected by a natural exertion of the system, practitioners ought, in the treatment of the disease, to endeavour to assist this operation of nature, by employing such remedies as are known to prove most effectual in promoting absorption : And with this view, there is nothing perhaps to be so much depended on as a gentle but long continued course of mercury. In similar affections of other parts of the body, mercury often proves useful ; and it is the only internal medicine which, so far as I have yet seen, ought to be employed in this disease. Issues have in some instances, too, appeared to be useful ; and as a cord in the neck in general discharges plentifully, it commonly answers the purpose most effectually.

With the same view, too, a brisk purgative being given from time to time during the mercurial course, may sometimes prove serviceable ; but it must be acknowledged, that the effect of our practice in this disease

ease is extremely uncertain : For although, in a few cases, some advantage has apparently been derived from the remedies we have mentioned, yet this has not happened so frequently as to admit of our placing much dependence upon them.

With respect to external applications ; for the reasons we have already given, there can never be any room for much expectation from them ; they may do harm, but they can never accomplish a removal of the disease. When indeed the eye is inflamed, and especially when the opaque spot appears to have turgid vessels running into it, the use of a saturnine solution, or any other astringent wash, may be very proper ; and in such cases, it may likewise be proper to employ general blood letting, at the same time that we empty the vessels of the eye by dividing those that are turgid. But for a more particular account of the remedies to be employed in ophthalmia, we must refer to the section upon that subject, viz. Section II. of this Chapter.

Although in this variety of the disease our efforts are seldom of much evident utility, in the other a due attention to the different circumstances of the case proves often highly serviceable. As in this case we suppose the disease to be produced by a thin lamella of the cornea being elevated from the rest of this covering beneath, by an effusion of some kind of matter, and as this separated portion is in general perfectly opaque, the only chance we have of effecting a cure is to remove it entirely. Even this will not always leave the eye perfectly clear and transparent ; for it sometimes happens, either from the effused matter having been of a sharp corrosive nature, or from its having been long confined, that a roughness, attended with some degree of opacity, is left upon the remaining part of the cornea. This, however, is not universally the case ; and, at any rate, although a complete cure may not in every case be obtained by the removal of the elevated part of the cornea, yet in almost every instance

some advantage will be derived from it, by a greater quantity of light being thus allowed to pass to the retina.

With respect to the method of removing spots of this kind, they may be taken away either by the knife or with escharotics; but in general the former is preferable. The eye being properly fixed with a speculum, Plate XXX. fig. 1. the surgeon should seat himself in a convenient height between the patient and the clear light of a window; when, with repeated small strokes of the knife, Plate XXXI. fig. 3. he should endeavour to cut away and remove all that portion of the cornea which is in any degree separated from the rest; for no part of it that is separated will ever adhere again, and the cure will not be complete if any portion of it is allowed to remain.

As the eye is extremely tender and delicate, the operation we have mentioned appears to be very formidable to those who have not been accustomed to perform it; but it may be done with safety by any person possessed of sufficient caution and steadiness. The speculum we have mentioned fixes the eye completely; and on the head being properly secured by an assistant, any operation of this nature may be done upon it with safety. The knife I have mentioned will in most cases be found to answer; but in a few instances a knife with two edges I have thought has answered better. A representation of such a one may be seen in Plate XXXIII. fig. 1.

Patients, however, will not always submit to this operation: In which case we are under the necessity of employing escharotics; and by these being continued for a sufficient length of time, we have it often in our power to remove blemishes of great firmness and of considerable extent: and although very strong applications of this kind, are not admissible, and have frequently done mischief by creating pain and inflammation, yet we think it right to remark, that there is no necessity for so much caution on this point as is in
general

general inculcated ; for daily experience evinces, that a good deal of freedom may be used with remedies of this class. It has been alleged, that, besides raising pain and a temporary state of inflammation, escharotics must prove hurtful by corroding and inducing ulceration on the sound part of the eye, just as readily as they will destroy the spot intended to be removed. This reasoning is specious, but it is not supported by experience ; for every practitioner must have observed, and it is particularly well known to itinerants, who commonly use little delicacy in matters of this kind, that specks upon the cornea are frequently removed by escharotics alone, without any kind of harm being done to the rest of the eye ; and the fact, I think, may be accounted for. So far as I have been able to observe, those specks in which escharotics are employed with most advantage, consist of a substance in which there is little or perhaps no animal life ; at least they are perfectly white, are destitute of the circulation of red blood, and are so far insensible that little or no pain is experienced from their being cut or even bruised with much freedom. Now we know, that in other instances, escharotic or corrosive applications of a moderate strength will destroy a part of a dead animal, which during the life of the animal would have produced no effect upon it. This is particularly remarkable in a process which sometimes occurs in the stomach after death ; a curious fact, first taken notice of by that very ingenious practitioner Mr. John Hunter of London. The stomach has frequently been found on dissection to have holes corroded in it, even where no pain or other symptom of disease of this organ had previously existed ; from whence we may fairly conclude, that the liquor gastricus, or that fluid which nature has provided for the purposes of digestion ; although during the life of the animal it may act only as a moderate stimulus to the viscera, yet after death, the stomach being now deprived of the power of resisting the corrosive property of this liquor,

comes at last to be destroyed by it. In the same manner we may suppose, that a dead lifeless spot may be removed by corrosive applications, the strength of which is not sufficient to affect the rest of the eye.

We may thus account for the cause of this phenomenon; but whether our reasoning shall appear to be well founded or not, the fact, as we have said, is certain, that corrosive applications may be made to the eye sufficiently strong for removing many of those spots to which it is liable, without doing any injury to the rest of the organ.

For a considerable time I was afraid to apply remedies of an escharotic nature with any kind of freedom to the eye; farther experience, however, has convinced me, that they may be used with more safety than is commonly imagined.

Remedies of this kind may be used in different forms: but they are most conveniently employed in the form of a powder, an ointment, or a wash. When powders are used, they ought to be very finely levigated; otherwise, by their spiculæ, they are apt to irritate and inflame the eye: and, for the same reason, when they are joined to ointments, they ought likewise to be very finely prepared. Such articles of this kind as are soluble in water, are perhaps preferable to any; for in the form of solution they can never prove hurtful if their strength be duly attended to, as in this manner none of their sharp spiculæ can possibly be applied to the eye.

In the form of a powder various articles have been employed; but the most effectual perhaps of any of them is red precipitate or verdigris finely levigated, and mixed with three or four parts of fine sugar. Calcin'd alum, too, and white vitriol, likewise mixed with a proportion of sugar, or with egg shells in fine powder, have frequently proved useful.

Ointments for the same purpose are prepared by adding to fine hogs lard or any emollient ointment of the same consistence, such a proportion of any of the
powders

powders we have mentioned as the patient is liable to bear; and washes are made by dissolving a due proportion of the substance to be employed, in water. For this purpose, verdigris or white vitriol are found to prove very serviceable; and on some occasions I have known good effects to result from a weak solution of corrosive sublimate.

It is impossible, in cases of spots upon the eye, to confine any application to the diseased part; all we can do is to insert the powder, ointment, or wash, as much as possible within the eyelid; by the motion of which it is very quickly conveyed over the whole surface of the eye. In order however to have every possible advantage from remedies of this class, their use should be long persisted in, and two or even more of them should be employed at the same time. Thus, a small quantity of any of the powders or ointments we have mentioned, may be inserted within the eye evening and morning, and a weak solution of corrosive sublimate, of verdigris, or of white vitriol, may be employed twice or thrice daily for washing the eye.

It cannot be alleged, that these or any other remedies will in every instance prove effectual; but I can with confidence say, that a prudent and long continued use of them will frequently remove spots upon the eyes, which otherwise would probably terminate in an entire loss of vision.

S E C T I O N X I V .

Of Protrusions of the Globe of the Eye from the Socket.

EVERY practitioner must have met with instances of the eye being pushed more or less from its natural situation in the socket, and various causes are recorded of it by authors.

The

The eye may be protruded from its socket by different causes.

1. A partial protrusion of the eyeball takes place in several of the diseases we have considered in the preceding sections; particularly in the hypopyon, in the staphyloma, and in dropfical swellings of the eye.

2. The eye may be displaced or pushed from its socket by the effects of external violence. And,

3. It may be raised or elevated by tumors forming behind or beneath it.

Even the slightest degree of distortion or displacement of the eye affords a very disagreeable appearance; and to those not accustomed to meet with it, gives much cause to suspect that vision will be completely destroyed by it. Every affection of this nature has therefore been in general considered as incurable: little or nothing has accordingly been attempted for removing them; so that patients labouring under them have for the most part been allowed to finish a miserable existence without any measures being employed for their relief. But although we cannot in every affection of this nature preserve the power of vision, yet in most instances we may do so; and wherever there is any probability of this being practicable, it ought always to be attempted.

As the means of cure to be employed must depend upon the cause by which the disease is induced, it is very material for practitioners to attend to this circumstance. When the ball of the eye is morbidly enlarged from any of the causes we have mentioned, namely, from water, pus, or any other fluid being collected in any part of it, if a portion of it is by this cause pushed out from the socket, all that art can do, is to diminish the size of the swelling in the manner we have already directed, either by puncture, incision, or perhaps by removing a portion of it. In most cases of this kind, vision will be irrecoverably lost; but by the means we have mentioned, the deformity produced by the disease may be commonly removed.

When,

When, again, the eyeball is pushed from its socket by external violence, as the optic nerve will be suddenly stretched, we would à priori conclude, that vision must necessarily be destroyed by it. This will probably be most frequently the case; but it does not always happen: for instances have occurred of the eye being pushed suddenly and entirely out of the socket, and on its being replaced, of vision being as perfect as it was before.

Several years ago I met with an instance of this, in which the eye was almost entirely turned out of the socket by a sharp pointed wedge of iron pushed in beneath it. The iron passed through a portion of the socket, and remained very firmly fixed for the space of a quarter of an hour; during which period the patient suffered exquisite pain; he was quite blind in the affected eye; and the eyeball being pushed so far out as to give reason to suspect a rupture of the optic nerve, it was doubted whether it would answer any purpose to replace it or not. As no disadvantage, however, could occur from a trial being made of it, I resolved to attempt it; and with much pleasure and astonishment I found, on removing the wedge of iron, which being driven to the head was done with difficulty, that the power of vision instantly returned even before the eye was replaced. The eye was now put easily into the socket; and the effects of inflammation being guarded against, the patient enjoyed very perfect vision.

A case of a similar nature to this is recorded by a very ingenious practitioner, Mr. White of Manchester: In which the eye was still more completely displaced than in the one I have mentioned, and in which the power of vision was scarcely affected.*

The success in both these instances should prevent us from despairing in any case of this nature where the eyeball remains entire, and where it is not altogether separated from the contiguous parts, and they afford sufficient

* Vide Cases in Surgery, &c. By Charles White, F. R. S. &c.

sufficient evidence of no material inconvenience being experienced even from a sudden extension of the optic nerve. No case, therefore, of this kind, should be considered as incurable, till it has actually proved to be so by the power of vision being found to be entirely lost after every endeavour for preventing it has failed. After every kind of extraneous matter is removed, the eye should be cautiously replaced; and with a view to prevent or render moderate the inflammation, which otherwise there would be reason to expect to run high, blood letting, both general and local, should be advised, together with a very strict antiphlogistic regimen. At the same time, too, light should be excluded from the eye, and it should be kept covered with any of the cooling saturnine applications.

When the eyeball is protruded by a tumor situated beneath or behind it, the cure must depend entirely on a removal of the tumor. When an abscess or a collection of any kind of fluid is attended with this effect, a cure will sometimes be obtained merely by laying the cyst which contains the matter sufficiently open: But when the tumor is of a firmer nature, nothing will prove effectual but the removal of it by extirpation.

It is necessary in this place to remark, that practitioners are in general too timid in operating upon tumors of this kind, owing to their near contiguity to the eye; insomuch, that, when a tumor is situated entirely within the orbit, a patient is commonly directed rather to allow it to remain, than to submit to an operation. As long as no material inconvenience is experienced from such tumors; when they are not likely to degenerate into a worse nature; and when they appear to remain stationary without receiving any additional increase; it would surely be improper to advise a patient to undergo the pain and terror of an operation: But whenever they begin to acquire an additional bulk; when there is any reason to suspect that they may ever become cancerous; and especially when

when they begin to impede the motion of the eye, and to push it out of the socket ; no farther delay should be admitted. In such circumstances, the removal of the tumor is absolutely necessary for the welfare of the patient ; and as this must daily be rendered more difficult, it ought to be immediately attempted.

Even where tumors of this kind have acquired a considerable bulk, there is much less difficulty in removing them than is commonly imagined. By proceeding cautiously, they may often be taken out, even where they pass to a considerable depth in the socket, without hurting the eye : But where the eye has already suffered, by being pushed from its natural situation, as nothing but extirpation of the tumor can remove the disease, it ought always to be done, even although there should be some risk of the eye being hurt by it : For, besides the injury which such tumors do to the eye and other soft parts, when they increase to any considerable bulk, by pressing upon the contiguous bones they very commonly bring these likewise into a state of disease. In some instances, the bones become carious, and produce tedious ulcers ; but most frequently they swell, become soft, and on being laid open, instead of the usual appearances of bone, they are found to consist of a clear gelatinous matter. In this state of the disease no advantage can be expected from extirpation, and it therefore should not be attempted ; but this distressful situation may very commonly be prevented, by the operation being employed more early.

It sometimes happens, that the eye is pushed from its socket by an enlargement of the glandula lachrymalis. This forms a kind of tumor, of more difficult management than any other to which these parts are liable : We ought not, however, even in this case to despair of effecting a cure ; for instances have occurred of this gland in an enlarged state being entirely removed, without any injury being done to the eyeball :
and

and there will seldom be much difficulty in replacing the eye, on the cause being removed by which it was pushed out.

S E C T I O N X V .

Of Cancerous Affections of the Eye, and Extirpation of the Eyeball.

THE eye, like every part of the body, is liable to diseases, which, from a virulence in their nature, cannot be cured, and which therefore renders the removal of the diseased part necessary, in order to prevent the affection from spreading to the contiguous sound parts.

A great proportion of the diseases of the eye may be cured by proper management: but when this is either neglected altogether, or is not duly persisted in, it sometimes happens, especially in cases of violent ophthalmia, and in some instances of staphyloma, that the disease degenerates into a real cancer: the eyeball becomes enlarged, and protrudes beyond the boundaries of the socket; it acquires a firm and even a hard consistence; the power of vision is destroyed; and the tumor has commonly a red or fleshy appearance. In some instances, a yellow glutinous matter, but most frequently a thin acrid ichor, is discharged from the surface of it. For a considerable time the patient complains only of heat, or a sensation of burning in the swelling; but at last he becomes distressed with severe pains shooting through the substance of it, and across the brain to the opposite side of the head.

In this situation, blood letting, opiates, and the external use of emollient applications, are commonly advised, with a view to render the pain moderate; but
 although

although we may in some instances be able to accomplish this by large doses of opiates, yet no remedy will prevent the disease from spreading: and as it is always a matter of importance to remove cancerous tumors as early as possible, we should never hesitate in recommending the operation as soon as the disease appears evidently to be formed.

In a former publication, we entered fully into the consideration of Cancer.* We there made it appear, that extirpation of the diseased part, is the only remedy to be depended upon; that it often succeeds when employed early in the disease; that it must necessarily very frequently fail when it is long delayed; and that practitioners have till of late years been often blameable, by an ill founded aversion to this operation, in preventing patients from submitting to it. For a more particular discussion of this point, we must refer to the section we have mentioned; but it is here necessary to remark, that this general aversion to operate in cases of cancer has been carried still farther when the disease is seated in the eye, that when it occurs in any other external situation.

It is in general objected to the extirpation of cancer, that the disease is so very apt to return, that the advantage to be derived from it is seldom equal to the pain, trouble, and confinement which occur from it. This, we have elsewhere shown, is by no means the case: But when the disease is seated in the eye, another objection has been raised to it; namely, the hazardous nature of the operation; for as it is impossible, from the depth of the orbit, to secure any arteries by ligature which may be divided at the bottom of it, it has been supposed that much danger must occur from this circumstance alone: And accordingly, although we find the method of extirpating the eye described in books, excepting by a very few practitioners the operation has been very seldom performed.

There

* Vide Treatise on Ulcers, &c. Section VIII.

There is no cause, however, for this timidity: for although a good deal of blood is sent to the eye by different branches of both the internal and external carotid arteries; yet at the place where these are divided in extirpating the eye, they are commonly so much ramified, that no hazard, so far as I know, has ever occurred from the operation: And I have not only done it myself, but have in different instances seen it performed by others. It is not the extirpation of a portion of the eye, namely, that part of it which protrudes beyond the orbit, which I now speak of, but the total removal of the whole eye when the eyeball is altogether diseased. A partial extirpation of it is often indeed recommended, chiefly for the reason I have mentioned, the danger which is supposed may occur from a deep division of the ocular artery: but whenever the eye is in a cancerous state, as all the diseased parts must be removed in order to render the patient in any degree safe; as we have endeavoured to show that the eye may be altogether cut out without any kind of hazard; and as no advantage can be derived from allowing a portion of it to remain; we should never hesitate in removing the whole. The method of performing the operation is this.

The patient should either be firmly seated in a proper light, with the head supported by an assistant, or, what answers better in every tedious operation, he ought to be laid on a table with his head upon a pillow; the most convenient posture not only for himself but for the operator. When the eyelids are diseased, it is necessary to remove them along with the eye itself; but when they are sound, they should be allowed to remain as a protection to the orbit. By means of two flat hooks, one of which is represented in Plate XXIX. fig. 6. the palpebræ may be much separated by assistants; and this being done, the surgeon is to proceed to the operation.

When the eyeball has acquired such a size as to cause it to protrude beyond the orbit, the operator will

will in general be able to lay hold of it with his fingers; but when this cannot be done, a broad flat ligature should be introduced through the centre of it, in order to secure it during the operation. While this is done with one hand, the surgeon, with a common scalpel in the other, must endeavour to separate by slow dissection the whole ball of the eye from the different parts to which it is connected. All the diseased parts should be removed: but care should be taken not to injure the bones; for as in some parts of the orbit they are extremely thin, a good deal of mischief might ensue from their being much hurt.

On the eye being taken out, the attention of the operator is necessarily directed to the hemorrhagy: But although in some instances this may take place to a considerable degree, yet this is very seldom the case; for in general any discharge of blood which occurs here scarcely requires the aid of compression to put a stop to it. But whenever it happens that the hemorrhagy continues longer than is judged proper, it may be very easily commanded by pressure alone; or, a piece of dry sponge being applied to the mouths of the bleeding vessels, pressure may be applied along with it, by stuffing the rest of the orbit with soft lint, and applying a napkin over the whole, so as to make it press with some firmness upon the sponge beneath.

When sponge, however, is employed, some attention is necessary in the application of it: for whenever sponge is applied to the mouth of a bleeding artery, it adheres with such firmness, as renders a good deal of force, as well as some management, necessary to remove it. Before inserting the sponge, therefore, a piece of strong waxed pack thread should be tied to it; by which it may be pulled out when there is no farther risk of hemorrhagy.

As soon as a free suppuration takes place, the bandage and lint will be easily removed; and the only dressing that can be necessary will be a pledgit of any

emollient ointment, to be continued as long as any discharge of matter is observed from the orbit.

In performing this operation, we have directed the common scalpel to be employed; and we have no hesitation in saying, that it is preferable to any instrument that has yet been proposed. Different forms of scalpels may be seen in books of surgery which have been invented for this operation, particularly one with a considerable degree of curvature. As this has been in some instances employed, I have thought proper to give a delineation of it in Plate XXVIII. But it does not answer the purpose so well as the straight scalpel; and in using it, we are more apt to injure the bones of the orbit.

The operation we have described, namely, the extirpation of an eye, is attended with much pain to the patient; and appears to be of a cruel and dangerous nature to byestanders; so that few surgeons have resolution to perform it. It ought in no instance to be advised where there is any possibility of effecting a cure by means of a more gentle nature; but when this cannot be done, and when a patient will for certain die in misery if the eye be not removed, it ought surely to be recommended as a means that may afford at least some chance of safety: For although it will not always prove successful, yet we know from experience, that in some instances lives have been saved by it, which otherwise would in all probability have been lost. We ought always, however, to remember, in every case of cancer, that extirpation proves, *cæteris paribus*, most successful when practised early: So that this ought always to be advised as soon as it is evident that the disease is clearly formed.

SECTION XVI.

Of Artificial Eyes.

AS the loss of an eye is always attended with much deformity, our being in some measure able to obviate this, is not unfrequently a desirable object; and by the ingenuity of modern tradesmen, it is very easily accomplished.

A thin concave plate of glass, silver, or of gold, being fitted to the orbit, must be coloured so as to match the other eye as exactly as possible; and if care be taken to render it perfectly smooth, it may be introduced beneath the palpebræ, and used without pain being excited. Of all these substances, however, glass is the most proper; for it not only can be made to resemble the natural eye more exactly than the others, but it is much more cleanly. It has been objected to the use of glass for this purpose, that it is apt to be broke by blows and other accidents: Of many, however, who I have known use artificial eyes of this kind, I do not remember an instance of any who have complained of it.

An artificial eye may be fitted to any orbit, where the eye has either been sunk by the evacuation of part of its contents, or where a portion of the eyeball has been removed: But it seldom happens that any advantage is derived from this invention where the globe of the eye has been entirely taken away; for when it is supported beneath, the artificial eye sinks too much into the orbit, and can never be made to fit it properly. It is chiefly, therefore, in cases of hydrophthalia and of staphyloma in which it has been found necessary to evacuate a portion of the contents of the eye, or perhaps to remove some part of it, that artificial eyes prove most useful.

SECTION XVII.

Of CATARACTS.§ 1. *General Remarks on Cataracts.*

VARIOUS definitions have been given of the term Cataract; some of which are sufficiently applicable, but others have rather tended to convey an improper idea of the nature of the disease.

Blindness, induced by an opaque body immediately behind the iris, forms the disease we name Cataract; and as we find from dissection that this opacity is in every instance seated in the chrystalline lens, or in its investing membrane, a cataract may with propriety be defined, to be a deprivation of sight induced by an opaque state of the lens or of its capsule.

The real seat of cataract being a late discovery, we need not be surpris'd at finding very perplexed and contradictory accounts of it in all our ancient chyrurgical authors. By some it was considered as an affection of the internal surface of the cornea; others imagined that it was seated in the vitreous humour; whilst by a great proportion of practitioners it was supposed to be produced by a new formation of a membranous substance within the cavity of the eye. By some this new production was supposed to be attached to the coats of the eye: But others alleged that it usually continued loose, and floated in the aqueous humour. Some writers of eminence, too, appear to have confounded the gutta serena with this disease, the former being often mentioned and described under the name of the Black Cataract.

The fact, however, is now ascertained, that the cataract, in a pure unmixed form, depends entirely on an
affection

affection of the lens or of its capsule ; and its appearance indeed is so distinctly marked, that no practitioner of experience can ever be mistaken with regard to it : But for the advantage of those who may not be accustomed to this branch of business, we shall, in the first place, give a short history of the rise and progress of the disease ; and shall afterwards endeavour to point out such circumstances as distinguish it more particularly from some other affections to which the eye is liable.

Instances have occurred, in which cataracts have been suddenly formed ; a total loss of sight, with a very considerable degree of opacity in the lens, taking place at once without any previous affection. This, however, is rare ; and it commonly happens, that the disease approaches in a very gradual manner, from a slight degree of dimness, with which it commences, to an entire loss of the power of vision.

The first symptom which generally occurs in cataract is what the patient usually terms a weakness of sight, and which commonly takes place long before any alteration is perceived in the state of the lens. By degrees this weakness, or rather dimness of the eye, becomes more considerable ; and the patient, being from his feelings led to suppose that it is in some measure produced by dust or motes floating in the air, or by some opaque matter upon the external surface of the cornea, he is often employed in rubbing his eyes ; and is surprised to find that his sight never becomes clearer from his doing so.

If in this state of the disease the eye be examined, the lens will be observed to have acquired a dusky hue ; and instead of being perfectly clear and diaphanous, which it naturally is, it will be found to be slightly opaque. By degrees the dimness of sight becomes more troublesome, till at last it terminates either in total blindness, or perhaps the patient may be able to distinguish light from darkness ; but in the advanced stages of the disease, he can seldom distinguish

colours, excepting those of the brighter kinds, nor can he find his way in roads where he is not perfectly acquainted.

In proportion to the degree of blindness which takes place, the lens is observed to become more and more opake, till at last it is found to be either entirely white, or of a light gray or pearl colour. In a few instances this whiteness is confined to a small portion of the lens, and forms a small opake spot in some particular part of it. In general, however, the whole body of the lens is equally affected.

During the whole course of the disease, the pupil contracts or dilates according to the degree of light in which it is placed; at least this will be always observed when the eye is not otherwise diseased. Cataracts, however, are often combined with a gutta serena; in which case the pupil will not be affected by any degree of light that can be applied to it: But this does not proceed from the state of the lens, but from the diseased state of the optic nerve.

Cataracts are not commonly attended with pain; but in some instances it is otherwise, and every exposure to light creates a good deal of uneasiness. But this we suppose to depend upon some degree of inflammation at the bottom of the eye, with which the cataract may be connected; for it is never to be considered as a necessary symptom of the disease.

We have already observed, that the cataract has been confounded with other diseases. This however, can only happen from inattention; for there is scarcely any affection of the eye to which it bears much resemblance. But in books, we find it has been mistaken for the gutta serena, for the hypopyon and staphylo-ma; and it has been confounded with white opake spots upon the cornea.

It is easily distinguished, however, from all of these. From the first of them, by the pupil contracting when exposed to much light, and by an opake body being observed behind the iris: whereas in the gutta serena, the

the pupil remains in a state of dilatation whatever degree of light may be applied to it, and no opacity is observed at the bottom of the eye. It was formerly indeed imagined, that the gutta serena was a variety of cataract not so frequent as that in which the lens is of a white or gray colour; but the disease was supposed to be of the same nature, and was accordingly distinguished by the name of the Black Cataract. But we have already remarked, that there is no foundation for this distinction.

The cataract is readily distinguished from the other diseases we have mentioned, namely from the hypopyon, staphyloma, and white spots upon the cornea, by the evident marks of disease which in all of these takes place in the anterior part of the eye, the cornea itself; which in all of them is opaque, and which in the hypopyon and staphyloma is commonly elevated into a small tumor or protuberance: whereas in cataracts, the only symptom which occurs, is, blindness to a greater or lesser degree, attended with a white opaque spot behind the iris, the cornea and every other part of the eye remaining perfectly sound. We have already observed, that this opacity is found by dissection to depend upon a morbid state of the lens. For the most part it is the body of the lens itself that is diseased; so that the opacity is removed, and the eye appears perfectly clear on the chrystalline being taken out: But in a few instances, the membrane or capsule which surrounds the lens is the seat of the disease; so that the same degree of opacity still continues even after the lens is removed from the eye. This, however, is by no means a frequent occurrence; but it has now and then been met with, and is termed the Membranous Cataract.

It is difficult, or perhaps impossible, to ascertain the proximate cause of cataract; but I think it probable, that it consists in some degree of obstruction of the vessels of the lens in some instances induced by external violence, but most frequently by some internal cause which we cannot properly account for.

The existence of vessels in the chrySTALLINE is doubted indeed by many, who imagine that nourishment is conveyed to it by a fluid which is met with in a very small quantity within the capsule of the lens. But the fact I believe is now established, that the lens is supplied with vessels from its capsule, injections having been made to pass from one to the other, not only in different animals, but in some instances in the human eye. But whether this could have been demonstrated or not, the existence of vessels in the lens is rendered, I think, sufficiently probable, by a circumstance I took notice of in the history of the disease, namely, the sudden formation of cataracts, which in a few cases has been observed. I have myself met with two instances of this; in one of which the most complete degree of opacity took place in the chrySTALLINE in the course of a few hours from the first sensation of dimness in the affected eye. A fact which cannot be so readily explained on any other supposition.

It may be alleged, where the cataract is so speedily formed, that the opacity may probably arise from some affection of the vessels of the capsule, and not of the lens itself. In some instances this may be the case; but in one of those I have alluded to, the disease appeared to be fixed in the body of the chrySTALLINE, and the capsule remained perfectly sound; for in this case the lens was extracted, which removed the opacity completely.

In confirmation too of this opinion of cataracts being probably produced by some degree of obstruction in the vessels of the lens, we may remark, that they occur more frequently in women about the time of the menses disappearing than at any other period of life: And we know that this period is particularly productive of obstructions in other parts of the body, especially of scirrhous tumefactions, and other glandular swellings.

As long as the opinion prevailed of there being different species of cataracts, a variety of means were recommended

commended in the treatment of them ; but now that the real nature of the disease is known, our sole object is to remove the opacity of the lens ; or when this cannot be accomplished, to remove the lens itself from the axis of vision.

In confirmed cataracts of long duration, we are not to expect that much advantage will be derived from any internal medicine ; but in the incipient state of the disease, before the opacity of the chrystalline is complete, mercury has in some instances proved serviceable. When any degree of inflammation occurs, blood letting, with a strict antiphlogistic regimen, will sometimes be indicated. But for the removal of opacity alone, nothing I have ever tried answers the purpose so effectually as small doses of calomel frequently repeated. *Extractum hyoscyami*, *flammula jovis*, and other vegetable productions, have likewise been celebrated for their efficacy in cases of cataract ; but I cannot from my own experience say any thing with respect to them.

When mercury or any other remedy that is employed, is found to fail in removing the opacity of the lens, our next object, as we have said, is to remove the diseased lens from the axis of vision ; which we accomplish by one or other of two chirurgical operations, namely, by pressing the lens from its natural situation in the centre down to the bottom of the eye, an operation commonly termed *Couching the Cataract* ; and that operation which we denominate *Extraction of the Lens*, by which the diseased chrystalline is removed entirely from the eye.

Each of these operations have been much employed ; so that the merits of both ought long ago to have been ascertained : But although the subject is of much importance it still remains in a state of uncertainty. By some practitioners couching is preferred ; whilst others consider extraction of the lens as the only remedy on which we should place any dependence.

The

The uncertainty in which we still remain upon this point, proceeds, I believe, from this branch of practice having hitherto been for the most part in the hands of itinerants: And as gentlemen of this denomination, have uniformly from their first outset in life, adopted one method of operating only, they have very universally condemned the other; which they themselves neither practise, nor perhaps understand: So that regular practitioners, not being able to determine from their own experience, they have in general remained upon this point very undecided. But the public appearing now to be convinced of the propriety of entrusting this, as well as every other operation of importance, to established surgeons of reputation, opportunities will thus be afforded of determining the point in question by experiment; the only means by which any degree of certainty can be obtained.

In prosecuting the consideration of this subject, I shall endeavour to point out as clearly as possible the result of my own observations upon it, together with that of some of our best employed surgeons. With this view, I shall first describe the operation of couching; and after considering the different steps of the operation of extracting the cataract, I shall attempt to draw a just comparison of the merits of the two.

§ 2. *Of COUCHING, or DEPRESSION of the CATARACT.*

We have already observed that the operation of couching consists in pressing the cataract or diseased chrySTALLINE lens from its natural situation in the centre down to the bottom of the eye. By this means the opacity producing the disease is removed from the axis of vision; and although the sight will never be so perfect as it was before the lens became opaque, if the eye be otherwise sound it will be quite sufficient for the common purposes of life.

In the anatomical description of the eye, which makes the subject of the first part of this chapter, we have

have seen that the lens is placed immediately behind the pupil, where it is lodged in a slight depression of the vitreous humour, to which it is attached by a capsule formed by a portion or lamella of the tunic which includes the vitreous humour itself. In couching, the lens is separated from its capsule; and being pressed down behind the iris, if the operation succeeds, it either remains there during life, or is dissolved in the aqueous humour in which it is lodged.

Before we proceed to this operation, there are some circumstances which particularly require our attention; the most material of which are, the degree of opacity which occurs in the lens, and the situation of the eye with respect to other diseases.

It is a fact known to practitioners, that no operation of importance can be performed upon the eye, without being attended with some hazard of inducing inflammation; which proves tedious, or otherwise, according to the constitution of the patient, and other circumstances of the case. This points out the propriety of proceeding with much caution, and of attempting no operation of this kind that is not absolutely necessary for the welfare or comfort of the patient. Where a patient is rendered so blind by cataracts in both eyes, that he cannot conduct himself in the ordinary occurrences of life, we should not hesitate in advising an operation for his relief. In such circumstances, any risk of his suffering from inflammation is more than counterbalanced by the advantages he will probably derive from the operation. But when the eye only is affected, and where therefore the patient enjoys a perfect use of the other; or where even both eyes are diseased, if the opacity of the chrySTALLINES is not so considerable as to prevent the patient from managing his ordinary business; or if it does not deprive him of his sight in any remarkable degree; in any of these circumstances, a prudent practitioner will rather avoid an operation, and will advise it to be delayed as long as vision remains tolerably perfect.

When

When the eye is otherwise sound, the circumstance we have mentioned of vision not being much impaired is almost the only one which should preclude the operation: But it often happens, that together with an opaque state of the chrySTALLINE, the eye is in other respects so much diseased, as to afford no hopes of vision being restored by a removal of the cataract: In which case, as no advantage could be derived from an operation, it ought not to be recommended. This is particularly the case in the hypopyon, in the gutta serena, and in every affection of the eye attended with an opaque state of the cornea.

Writers on this subject mention another reason, which they allege ought to have considerable weight in determining the propriety of operating in every case of cataract. It has very universally been supposed, that a cataract ought to be in a particular state, in order to insure success from an operation; insomuch that we are advised never to operate unless this state of the disease is found to prevail. The state I allude to, is a supposed state of maturity, which it is believed every cataract will sooner or later arrive at, and which is said to be clearly and evidently pointed out by certain appearances of the opaque chrySTALLINE.

It is true, that both in the operation of couching and extracting the cataract, the lens is sometimes found to be partly soft and in part very firm, and in a few cases it is even perfectly fluid; a circumstance commonly considered as unfavourable: But although this, we believe, may have first suggested the idea of the unripe state of a cataract, as it is termed, yet no advantage has hitherto been derived from the distinction; for notwithstanding a variety of signs have been mentioned, by which the real state of a cataract is said to be evidently marked, yet this is not found to be supported by experience: On the contrary, indeed, it often happens that a cataract proves to be of a firm texture, which was previously suspected to be soft; and vice versa.

Nothing

Nothing, indeed, can render it more clear that this idea respecting the mature state of a cataract is ill founded, than the variety of opinions which prevail respecting it : For while by some it is said that this state of the disease is indicated by a pure white or milky appearance, it is asserted by others, that a light gray or pearl colour is the only certain mark of it.— Now, the fact is, that the real state of a cataract can never be known from the colour of it ; and the best informed practitioners will allow, that no advantage is to be derived from any distinction of this nature.

The idea of a cataract being more ripe or mature at one period of the disease than another, originated, as we have said, from this circumstance of the chrystalline being in some instances found to be fluid, which gave cause to suspect that the first effect of a cataract is to induce a softness of the lens, and that this soft or fluid state of it is gradually altered by the progress or continuance of the disease till it acquires at last a firm consistence, when it is supposed to be thoroughly ripe.

This opinion, however, of the first effect of cataracts upon the lens is equally ill founded with the idea we have mentioned of the real state of the disease being to be distinguished by its external appearance ; for we know from experience, that cataracts are often of a firm texture from the beginning. From my own observation indeed upon this point, I would say, that the most frequent effect of cataracts upon the lens is to produce a preternatural degree of hardness of it ; as, for the most part, an extracted opaque chrystalline is of a firmer consistence than it is ever found to be in a healthy transparent state.

We are therefore to conclude with respect to this circumstance of the ripe or unripe state of a cataract, that in the treatment of the disease no advantage is to be derived from any thing we yet know concerning it. In the common acceptation of the term, indeed, the word ripeness has in this respect no determined meaning

ing affixed to it : I would therefore propose, that instead of being employed to signify the *appearances* of a cataract, it should be applied only to express the *effects* produced by it. In this manner, the term might still be retained with propriety ; for we might very properly say that a cataract is ripe when the patient is rendered entirely blind by it, and when therefore it is ready for an operation ; and, on the contrary, that the disease is still in an unripe state as long as vision is not much impaired by it.

As this circumstance, with respect to the consistence of a cataract, is much insisted upon by the most part of authors who have written upon it, I judged it proper to enter into a particular consideration of it : And, upon the whole, this conclusion I think may be drawn, that in determining upon the propriety of operating, we are never to place any dependence on the appearance of the lens ; and that we are to be solely directed by the effects produced by the cataract, and by the state of the eye with respect to other diseases. As long as vision remains tolerably perfect, whether in both or only in one eye, for the reasons we have already given, a prudent practitioner would rather avoid operating : But when the sight becomes much impaired, if the cornea is found to be transparent, and if the pupil admits of a full dilatation and contraction, according to the degree of light to which it is exposed, we should not hesitate in advising an operation as the only effectual means of relief. And when it is resolved upon to couch or depress the cataract, the following is the method of effecting it.

As it is of importance in this as well as in every operation upon the eye, to guard against inflammation, nothing should be omitted that can in any measure tend to prevent it : For this reason, the patient should be confined, for several days before the operation, to a low regimen ; and two or three doses of some cooling laxative medicine should be exhibited at proper intervals.

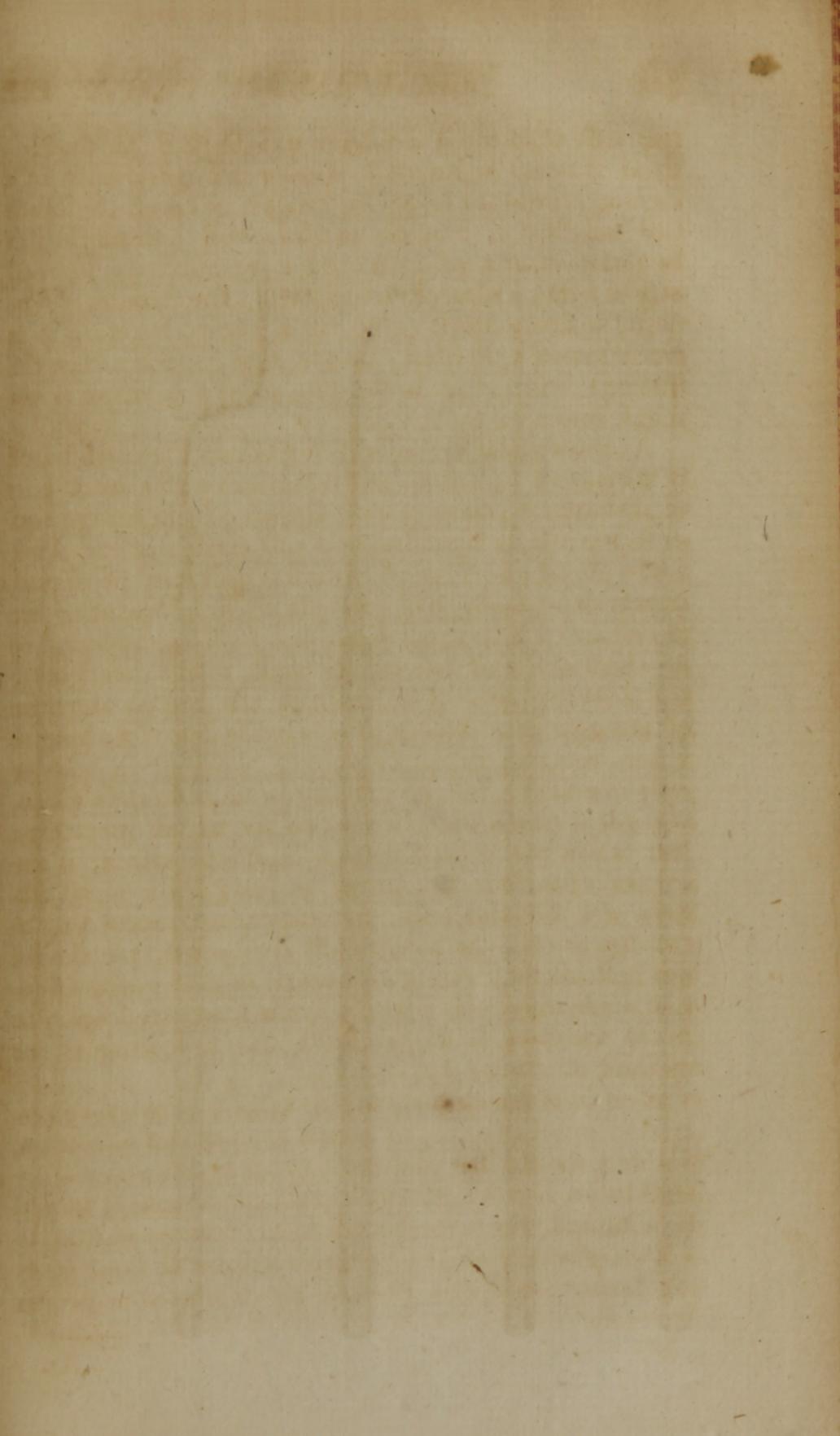


FIG. 1.



FIG. 2.



FIG. 3.



FIG. 4.



FIG.



An apartment should be fixed upon that is perfectly light : but during the operation the sunshine should not be admitted ; for by irritating the eye, it prevents it from being kept so steady even with a speculum, as it otherwise may be. A north exposure ought therefore to be preferred.

The only apparatus to be provided for this operation, is a speculum of a proper construction, and of a size adapted to that of the eye ; and an instrument termed a needle, for the purpose of depressing the cataract. Different forms of the needle are represented in Plate XXXII. and in Plate XXX. are delineated different views of the most useful speculum that has yet been invented.

As it is of much importance to have the eye properly fixed during the whole course of the operation, and as this cannot be done effectually in any other manner than with a speculum exactly fitted to the eye, every operator should be provided with several sizes of this instrument.

The best needle for this operation is that of a flat form, represented in Plate XXXII. fig. 1.

The patient should be placed upon a low seat with his face towards the window, and the surgeon, upon a chair considerably higher, should be seated directly before him : An assistant standing behind must be directed to place the patient's head upon his breast, while he secures it in this situation by his right hand under the chin, and his left placed upon the forehead : And in order to prevent any interruption during the operation, the hands should be properly secured by an assistant on each side.

During the operation, it is of much importance for the surgeon to have his hand firmly secured ; even the most trifling circumstance should be attended to that can have any effect in accomplishing this. For this purpose nothing will be found to prove so effectual as a proper rest being provided for the elbow. The elbow should therefore be placed either upon a table, or
upon

upon the knee of the operator, raised to such a height that it may be nearly on a line with the eye of the patient. Surgeons in general trust to the hand being properly secured by the ring and little fingers resting upon the cheek or temple of the patient: But this seldom proves sufficient for the perfect steadiness required in every operation upon the eye; and whoever will make trial of the mode we have recommended of fixing the elbow, will find it to be much preferable. It is proper, indeed, that any advantage to be derived from resting these two fingers upon the cheek should be likewise laid hold of; but this alone ought never to be depended on.

The assistant is now to raise the upper eyelid with the fingers of his left hand; and the surgeon applying the groove in the upper part of the speculum, in such a manner that it may receive the edge of the eyelid, the opening or circle formed by the brim of the speculum is to be pressed upon the ball of the eye, till the transparent cornea, and nearly about an eighth part of an inch of the sclerotica, is protruded; by which means, if a steady and equal pressure be continued upon the eye, it will be kept firmly fixed without any injury being done to it, at the same time that a sufficient quantity of the ball will be left uncovered by the speculum for the purpose of the operation.

We are at present supposing, that the operation is to be performed upon the left eye. For this purpose, the patient being secured in the manner we have directed, the speculum being applied and secured by the surgeon's left hand, and the surgeon himself being seated, and having fixed the elbow of his right arm at a proper height, he must take one of the couching needles in his right hand, and having fixed it, as we do a pen in writing, between the thumb and fore and middle fingers, while the ring and little fingers are made to rest upon the cheek of the patient, the point of the instrument must now be carried forward past the external canthus of the eye; and being brought
nearly

nearly into contact with the sclerotica, it must be quickly plunged through this coat somewhat below the centre of the eye and about one tenth of an inch behind the iris. There is delineated in Plate XXXIV. fig. 1. a representation of the needle passed into the eye; by which a better idea is given of the operation than can be done by any description.

In order to avoid the iris with as much certainty as possible, the instrument must be introduced with its flat surface towards this membrane, and should be carried forward in this direction till the point of it is discovered behind the pupil, as is represented in the above mentioned figure. By depressing the handle of the needle, the point of it is thus to be raised: and the flat surface of it being turned downwards, it must in this direction be pushed into the upper part of the chrySTALLINE, when the operator, by elevating the handle, must endeavour to carry the lens upon the point of the instrument down to the bottom of the eye; which will be instantly discovered, on the surgeon observing through the pupil that the cataract disappears, and by the patient discovering more light than he has for some time been accustomed to.

Were we certain that the lens would continue at the bottom of the eye, the needle might now be withdrawn, and the operation would be finished: But as we know from the anatomy of the eye, that there is a portion of the aqueous humour lodged between the vitreous humour and the iris; as it is into this part of the aqueous humour that the chrySTALLINE is depressed; and as this humour is of a consistence too thin for preventing the action of the muscles of the eye from raising the lens again on the pressure of the instrument being withdrawn; we need not be surpris'd at the operation being frequently found to fail on its being finished in this manner.

Instead of this, on the chrySTALLINE being pressed to the bottom of the posterior chamber, it should be slowly carried on the point of the instrument towards the

outer and back part of the eye ; a movement which is easily accomplished by the operator raising his hand so as to elevate the handle of the needle, at the same time that it is made to pass somewhat outward over the cheek. By this means, the chrystalline will be partly lodged below the vitreous humour ; which being of a firm consistence, very commonly prevents it from rising again ; and being brought towards the external canthus of the eye, if it should afterwards be forced up by the action of the muscles, not being opposite to the pupil, the passage of light to the retina will not be much obstructed, and vision will accordingly be scarcely more affected than if the cataract had remained at the bottom of the eye.

As soon therefore as this movement is effected, the needle should be withdrawn ; and there being now no farther use for the speculum, it should likewise be taken off : But as it is of importance to have the eye properly fixed during the whole course of the operation, the speculum should not be removed till it is entirely finished.

On the instrument's being taken away, it is usual to try what effect may be expected from the operation by presenting different objects to the patient : But although there may be no harm in slight trials of this kind, they ought not to be carried far ; for mischief may be produced, while no advantage can be derived from them.

After the operation, a compress of soft lint, soaked in a weak saturnine solution, should be lightly applied over the eye ; and this being retained by the common bandage for the head, a triangular napkin, the patient should be confined in a dark apartment, and should be kept upon a low regimen as long as there is any risk of much inflammation : With the view, too, of preventing inflammation, a dose or two of a brisk purgative may be exhibited ; and, when necessary, blood should be taken from the temporal artery, from the jugular

gular vein, or from the neighbourhood of the eye, by means of leeches.

In the course of three or four days, when there is little risk of the eye being hurt by being uncovered, the bandages may be removed; when it will in general be known whether the operation has succeeded or not: For even when no immediate advantage is derived from the operation, the patient remaining for a short while perhaps equally blind as before, he sometimes gradually recovers the power of vision, so as to distinguish objects with as much exactness as if the operation had proved successful from the first. Instances have occurred of the sight becoming gradually better for several months after the operation: Which we suppose to happen from some degree of inflammation taking place in the capsule of the lens, and which cannot be speedily removed.

On removing the coverings from the eye, if the cataract be not observed to be opposite to the pupil, the object of the surgeon is completed; but if it has again got into its usual situation, after a farther delay for the purpose of allowing the inflammation induced by the first operation to subside entirely, another trial must be made with it: And it frequently happens, that a second or third attempt will prove successful when the first has failed entirely. This, however, is in a great measure owing to the circumstance we have mentioned, of the needle being withdrawn immediately on the lens being pressed to the bottom of the eye; for this being done, it is in general supposed that the operation is finished. We have endeavoured, however, to show, that this is by no means the case; and that the cataract will seldom rise again if it be pressed towards the external canthus of the eye, at the same time that it is gently pushed beneath the vitreous humour.

Those who are not accustomed to this method of operating, will perhaps object to it, that by forcing the lens into the vitreous humour, an unnecessary violence is thus done to this part of the eye, by which it must

be so much injured, as to have some effect in preventing the operation from proving so successful as it otherwise might do. This, however, is not found by experience to be of any importance; for I have often done the operation in this manner, and I never observed any inconvenience to proceed from it. We should not wantonly do any thing to hurt the vitreous humour; but we know that it is often much more materially injured in extracting the cataract without much detriment ensuing, than it can ever be in the operation of couching. Thus it often happens, in extracting the lens, that a considerable portion, or even the whole, of the vitreous humour is discharged, and yet the operation proves perhaps as successful as if no such accident had occurred. This is an accident, indeed, that every operator would rather wish to prevent; but it shows clearly, that no injury of importance can be done to vision by the practice we have mentioned, of lodging the cataract in the operation of couching, partly beneath, or even in the substance of, the vitreous humour.

The operation we have described is supposed to be done, as we have already observed, upon the left eye; for which purpose the right hand of the operator must be employed: But in performing upon the right eye, if the needle is to be entered in the usual way from the outer or external canthus of the eye, it must either be done with the left hand of the surgeon, or, if he wishes to use his right hand, he must either sit or stand behind the patient, when, by supporting the head upon his breast or upon his knee, he may in this manner accomplish his purpose. This mode of operating upon the right eye has been frequently practised even by surgeons of eminence, but it is extremely awkward; and besides, the operator can never have such a full command of the eye when he sits or stands behind, as when he is placed before the patient. There are few surgeons, however, so alert at using their left hand, as to render it proper for them to perform this very nice operation

operation with it ; so that with the usual instruments there is no other alternative than that of doing it from behind. But in Plate XXXII. fig. 4. and 5. there is delineated a form of needle, by which the operation may be done with perfect ease and safety on the right eye with the right hand of the surgeon, whilst he is seated before and opposite to the patient. Only in this case, instead of entering the instrument at the usual place, by pushing it inwards from the external canthus of the eye, it must be entered at the internal angle and pushed outwards, as is represented in Plate XXXV. fig. 1. In every other respect the operation is to be conducted as we have already directed ; only the cataract, instead of being carried to the external canthus of the eye, must in this case be drawn by the point of the needle towards the nose. In this manner the operation may be done upon the right eye by any surgeon who can perform it upon the left ; an improvement of much importance in the treatment of this disorder.

As the operation of couching is very universally performed without the assistance of a speculum, it may be considered as an affection of singularity to recommend one. In answer to this, I must observe, that although the cataract may be depressed without the use of a speculum, it may be done more perfectly, and with more ease both to the patient and the surgeon, when a speculum is employed, than when it is not. By means of the speculum, delineated in Plate XXX. the eye may be very firmly fixed, which allows the operator to manage the needle with more ease than can otherwise be done.

It has been commonly objected to the use of a speculum, that it does not secure the eye sufficiently ; and that it always proves detrimental, by exciting inflammation over the eyeball. This observation, I believe, is very well founded with respect to the instrument in ordinary use, of which a delineation is given in fig. 4. Plate XXXI. But it does not apply to the other ;

which, when properly fitted to the size of the eye, secures it exactly; and when finely polished, it is never productive of any inconvenience. As this is the first delineation that has ever, so far as I know, been given of this instrument, and as it appears to me to be an improvement of the highest importance, not only in couching, but in the operation of extracting the cataract, I have therefore thought it right to represent it in different views, by which any tradesman accustomed to this kind of business will readily make one. I think it right to observe, too, that the public is indebted for any advantage to be reaped from this instrument to the late Mr. Millar, who for several years practised with much reputation as an oculist in this place.

Some practitioners, sensible of the impossibility of fixing the eye properly in the manner commonly attempted with the fingers alone, and finding the common speculum insufficient, have proposed another instrument for this purpose: It consists of a sharp spear or prong, fixed in a handle, with a cross flat bar near the point, as is delineated in Plate XXXI. fig. 2.

This instrument has long been employed in some parts of the Continent: It is used by pushing the point of it through the sclerotic coat on the side of the eye opposite to where the needle is to be entered; and it is prevented from penetrating far, by the cross bar near the point. It is now to be secured by an assistant at one side of the patient; and the eyelids being separated by the surgeon himself, assisted by the person behind who supports the head, the eye may in this manner be fixed in some degree, but never with so much ease and certainty as with the speculum we have mentioned.

Needles of various forms and sizes have been used in this operation; but the flat needle, fig. 1. Plate XXXII. answers the purpose better than any I have ever tried. It ought not to be broader than this, otherwise it makes too large a cut in the coats of the eye; and if much narrower, it does not so readily carry the
lens

lens along with it. The round needle, fig. 2. of the same plate, has been much employed by many itinerants; but I have not found, upon trial, that it answers so well as the other. After piercing the cataract it parts with it too easily: And besides, it enters the coats of the eye with more difficulty, and it cannot be so easily moved when introduced as the other; which being broad in the cutting part of it near the point, it forms an opening in the tunica sclerotica somewhat larger than the diameter of the rest of the instrument, which admits of its being afterwards easily moved in every direction.

It has been objected to the flat needle, that by its breadth it is more apt than the round one to hurt the iris; but if the precaution we have mentioned of introducing it with its flat surface towards this membrane be attended to, there can never be any hazard of this. The flat part of the needle may indeed be made broader than is necessary, and this I believe is very commonly done; by which the opening made with it is larger than is requisite; more irritation is thus excited; and when broad near the point, it does not so readily penetrate the lens as when made of a narrower form. The needle delineated in Plate XXXII. fig. 1. is in every respect of a proper size. Fig. 3. represents a needle with a small degree of curvature, by which I have sometimes thought that the cataract may be more easily depressed than with a straight needle; but I have not yet used it so frequently as to be able to speak decisively concerning it. In piercing the eye with it the convex side of the curve must be towards the iris, as this membrane might probably be injured if it were introduced in any other manner.

In describing the operation, we desired that the needle might be entered at one side of the eye, by passing it through the sclerotic coat at the distance of one tenth of an inch from the iris. And we likewise observed, that it answers the purpose better by introducing it somewhat below the centre of the eye, than if

entered, as is usually done, in a line with the centre of the pupil. It ought not, however, to be far below this point. The twelfth part of an inch is fully sufficient; for when the needle is introduced near the bottom of the eye, the cataract cannot be so easily depressed with it.

It has been alleged, that the operation may be performed, not only with more ease, but with more safety, by introducing the needle through the transparent cornea, and after passing it through the pupil, to push down the cataract with the point of it to the bottom of the eye. This proposal, however, will never probably be admitted into general practice; for it is impossible in this manner to depress the lens so easily as when the needle is entered in the manner we have directed: And besides, it can scarcely be done without injuring the iris; a circumstance which, of itself, ought to be considered as a valid objection to it. We now proceed to consider the operation of extracting the cataract.

§ 3. *Of* EXTRACTING *the* CATARACT.

The operation of couching, or depressing the cataract, had been long practised, and was considered as the only means by which an opaque chrySTALLINE could be removed, till the year 1737, when an eminent oculist of Paris, Mr. Daviel, first proposed and practised the method of removing it by extraction.

It is true, that several years previous to this period, Mr. Petit proposed to make an opening through the transparent cornea, for the purpose of removing the lens when it is forced into the anterior chamber of the eye, either by external violence, or when it is pushed through the pupil in the operation of couching, an occurrence which has sometimes happened: but, being considered as extremely hazardous, it was rarely practised; nor was it ever supposed to be proper in any other state of the disease, till Mr. Daviel, about the time we have mentioned, put it frequently in practice,

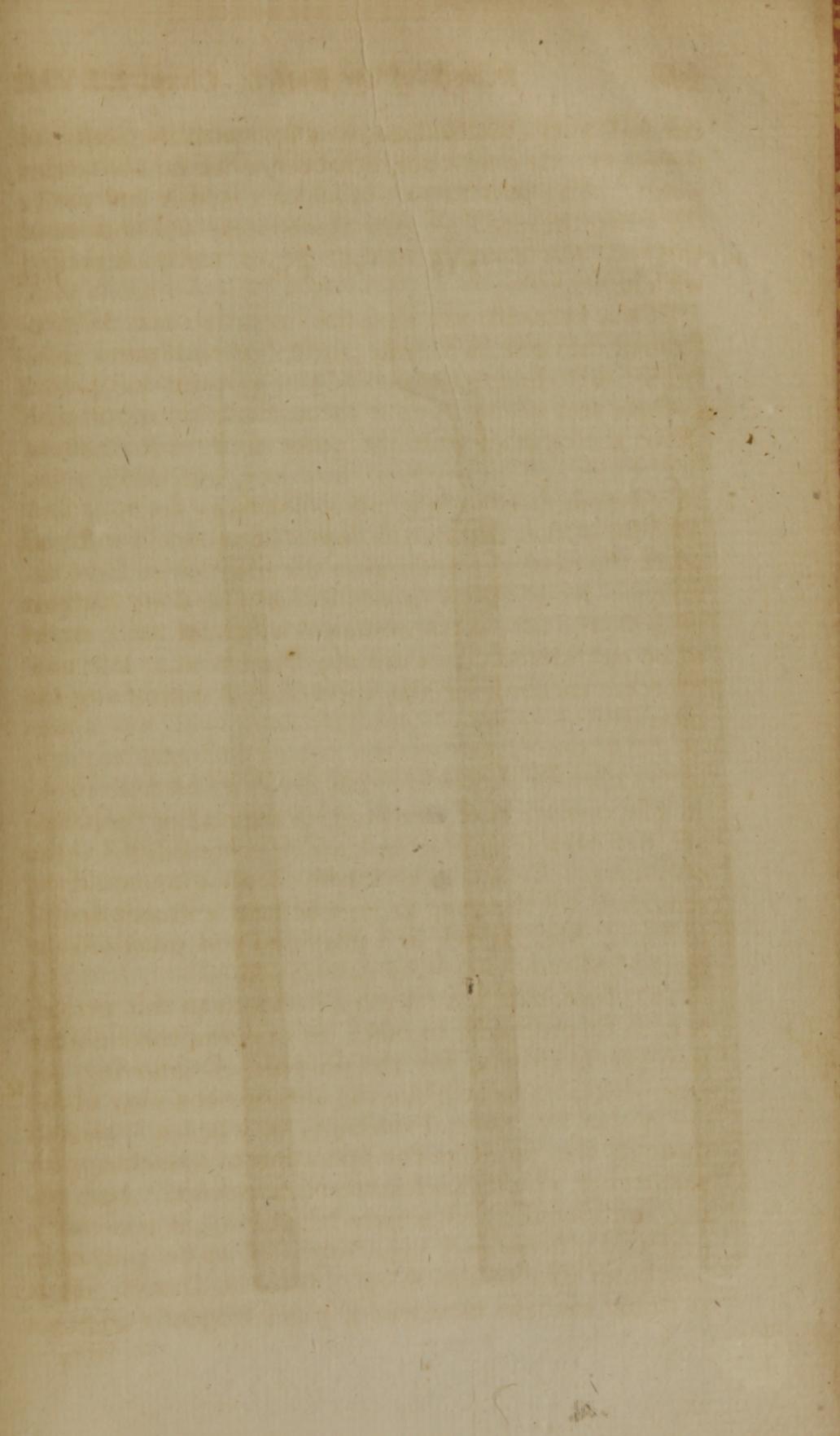


FIG. 1.



FIG. 2.



FIG. 3.



FIG.



tice, in preference to the operation of couching. By some the merit of this operation has been attributed to our countryman Taylor, a famous itinerant of these times; but this will not be admitted by any who have paid attention to the history given of it by those who had the best opportunities of becoming acquainted with it.

This operation consists in an opening being made through the transparent cornea, of a sufficient size for admitting the passage of the lens after it has passed through the pupil into the anterior chamber of the eye. The operation itself was nearly if not exactly the same when practised at first by Mr. Daviel as it is at present; but the method of doing it was rendered more difficult and tedious by the use of a greater number of instruments than are now found to be necessary. At that period knives of different forms were used; as also, scissors, forceps, a lancet concealed in a canula for opening the capsule of the chrySTALLINE, &c. In the present improved state of this operation, the only instruments that are used are, a speculum for fixing the eye, the knife, fig. 1. Plate XXXIII. a small scoop, fig. 4. and a flat blunt crooked probe, Plate XXXV. fig. 5.

In proceeding to this operation, the patient must be placed in the same kind of light, and must be secured in the same manner as we have directed for the operation of couching. The surgeon must likewise be seated in the same manner before the patient, and ought to rest his elbow either upon a table, or upon his knee raised to such a height as to bring his hand nearly on a line with the pupil.

This being done, when the lens is to be extracted from the left eye, the speculum must be applied in the manner we have formerly mentioned, and must be pressed upon the eye with the left hand of the operator with as much firmness as is necessary for securing the eye; but more than this should be avoided, as it not only gives more pain, but is apt to press the cornea into

too near contact with the iris ; by which the latter is in great risk of being injured in the subsequent steps of the operation.

The surgeon is now to take the knife we have mentioned between the thumb and fore and middle fingers of his right hand, allowing nearly an inch to project past the extremity of his middle finger ; and the point of it being brought in contact with the lucid cornea, it must be made to penetrate this coat at the distance of the sixteenth part of an inch or thereby from the iris, in a line running from the external canthus of the eye directly across the centre of the pupil, as is represented in Plate XXXIV. fig. 2.

The convex surface of the knife being still kept next to the iris, it must be carried slowly forward in this direction, till the point of it reaches the other side of the eye directly opposite to where it entered ; and must here be pushed out till nearly a quarter of an inch of the instrument is freely through the cornea. The operator is now, in a gradual manner, to form a semilunar cut in the under part of the cornea, by moving the knife downwards in such a manner, that all that portion of cornea lying between the point at which it entered and that at which it passed out, may be divided at an equal distance from the iris ; as is represented in Plate XXXIV. fig. 4. In this manner an opening will be formed sufficiently large for the passage of the cataract.

While this semilunar cut is forming in the cornea, the pressure of the speculum upon the eyeball should be gradually lessened, otherwise the vitreous humour is apt to be pressed out on the incision being completed. We are advised indeed by some to remove the speculum altogether on the knife being passed out at the opposite side of the eye ; and for this purpose an opening is left on one side of the instrument, to admit of its being taken off, as is represented in figure 3. Plate XXX. But with an operator accustomed to the use of the speculum, there is no necessity for this precaution ;

tion ; for a degree of pressure may be continued with it sufficient for fixing the eye, without any risk of forcing out the vitreous humour ; and by keeping the eye fixed to the last, we are enabled to form the incision with more exactness than can possibly be done when the speculum is removed earlier in the operation. I have seen it indeed often done in this manner ; but as soon as the eye has lost the support of the speculum, the pressure of the knife is apt to draw the eyeball too far down towards the under edge of the socket, by which a smaller segment of a circle is commonly formed than is sufficient for the passage of the lens ; for by the eye being drawn suddenly downwards on the speculum being removed, the under part of the incision is almost always formed at too great a distance from the iris, and is thus made smaller than it ought to be.

When the eyeball has been too forcibly compressed by the speculum, the cataract, together with all the aqueous humour, and a considerable portion of the vitreous, are very commonly pressed suddenly out : but when this part of the operation is duly attended to, nothing escapes at the opening in the cornea but the aqueous humour alone.

As soon as the incision is completed, the operator must lay aside the knife ; and having lifted the flap formed in the cornea with the flat crooked probe, Plate XXXV. fig. 5. he must with much caution pass the point of this instrument through the pupil, in order to scratch an opening in the capsule of the lens : and this being done, the cataract must be forced out by a very equal though moderate pressure applied with the speculum over the globe of the eye.

It happens indeed in some instances, that a good deal of pressure is necessary in order to force the cataract out : but this is always owing to some fault in the previous steps of the operation, almost universally to the incision in the cornea being made smaller than it ought to be, by which the lens is with difficulty forced through the pupil ; or if it be made to enter the anterior

rior chamber of the eye, it does not pass through the opening in the cornea so readily as it ought to do.

In this situation, it is the common practice to force out the lens by repeated applications of pressure. This, however, ought not to be imitated; for nothing proves more destructive to the eye than violence applied to it in this manner: for besides the loss of the vitreous humour with which it is commonly attended, the iris is often materially hurt by it.

When the lens cannot be easily removed from the anterior chamber of the eye by means of a scoop, and in every instance where it is with difficulty forced through the pupil, the operator, instead of persisting to employ much pressure, should rather enlarge the opening in the cornea, using for this purpose a pair of small probe pointed scissors; and this being done, the operation must be finished in the manner we have already pointed out.

With a view to render the passage of the lens as easy as possible, the pupil should at this part of the operation be in the state of the most perfect dilatation; for which purpose, after the incision of the cornea and the opening of the capsule of the chrystalline are completed, a dark cloth or curtain should be placed between the eye and the light, to be removed on the lens passing out.

In a few instances of cataract, the cause of opacity is found to be, not in the lens itself, but in its capsule. When this is the case, extracting the cataract answers no good purpose, as the opacity remains equally strong after as before the operation. Some authors have therefore advised our attempting, in such circumstances, to remove the opaque capsule by forceps, and other instruments passed through the pupil; but this can never be accomplished without much risk of injuring the iris and other parts of the eye: so that it is more likely to do harm than to produce any advantage. For this reason I would rather advise an operator to trust to time and an antiphlogistic regimen, for the removal

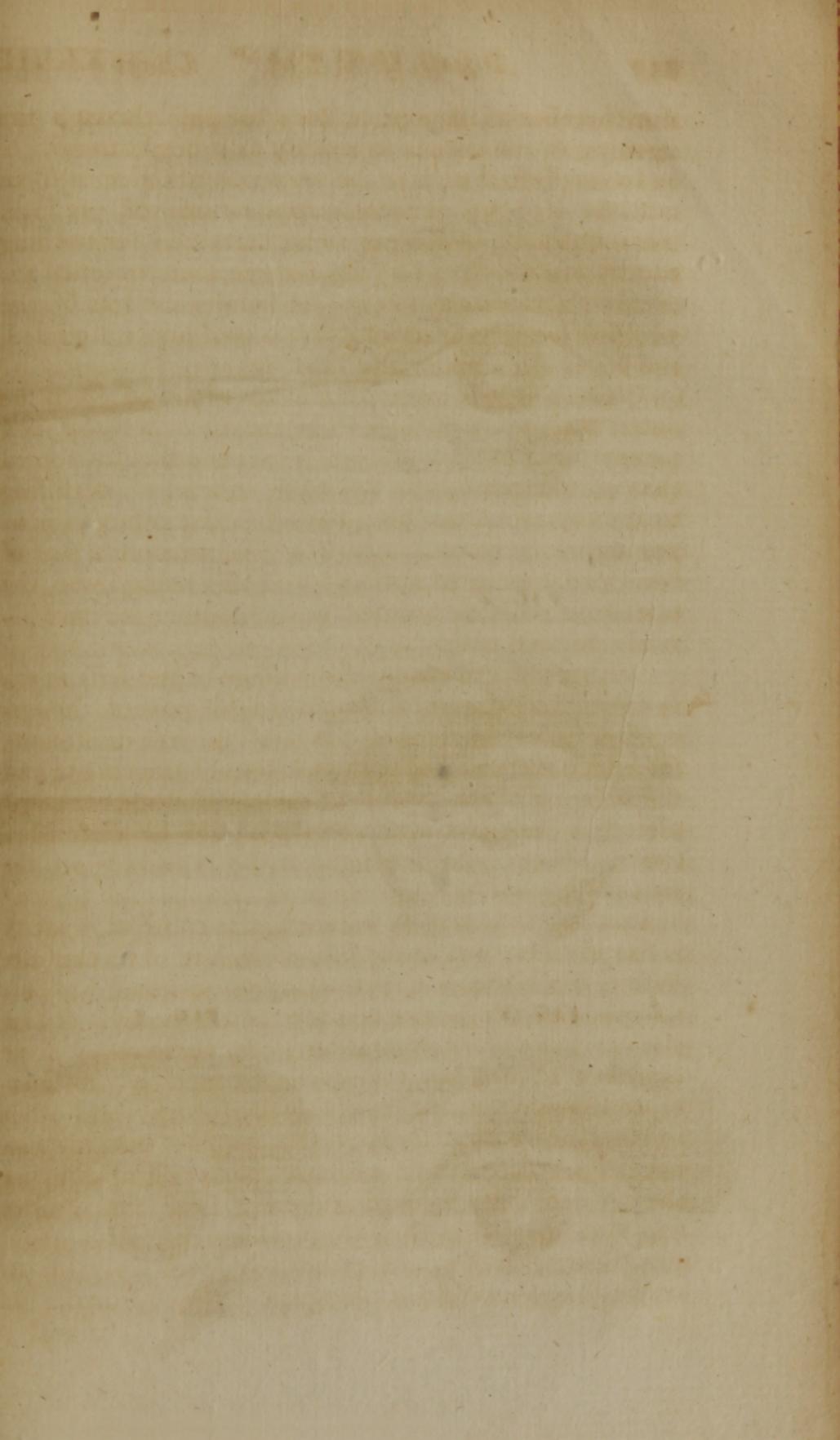


FIG. 1.

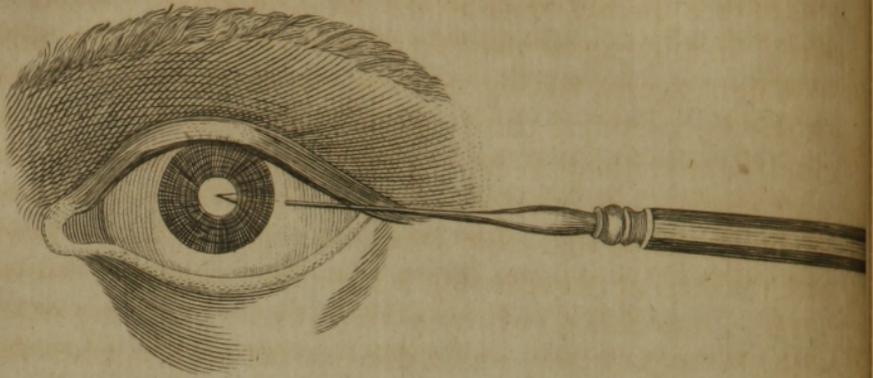


FIG. 2.



FIG. 3.



FIG. 4.



removal of the opacity. No mischief can ensue from this; and I have known instances of cures being performed by it: whereas the contrary practice, so far as I have yet heard, has never in any case effected a cure; and it has frequently destroyed the iris entirely.

When, again, the operation is to be performed upon the right eye, if the surgeon wishes to do it in the usual way with the knife commonly employed, he must use his left hand; but as few practitioners are able to perform this nice operation with the left hand with sufficient steadiness, I have delineated a knife, fig. 2. Plate XXXIII. by which it may be easily done with the right hand, while the patient and surgeon are sitting opposite to each other in the manner we have directed: only in this case, the point of the knife must be entered at the internal canthus of the eye, and must then be pushed outwards to the opposite side, instead of being introduced at the external angle and carried towards the nose.

The operation being finished, the eye should be immediately covered with a compress of soft lint, or of old linen, soaked in a saturnine solution, to be retained by a night cap, or any other bandage that does not compress the head much, or keep it too warm. The same kind of management which we mentioned with respect to regimen after the operation of couching, must be strictly attended to here. For several days after the operation, no light should be admitted to the patient's apartment. A very low diet is absolutely necessary: and the eye being very apt to inflame, repeated blood lettings are frequently requisite from the jugular vein or temporal artery.

As this operation indeed is more apt to fail by the subsequent inflammation upon the cornea than by any other circumstance, it requires our utmost attention to guard against it: and as the healing of the incision depends in a great measure on the eye being kept at rest, every cause of irritation should be avoided. When the operation succeeds, the cure of the
incision

incision is in general completed in ten or fourteen days; but in some instances the cut continues open for several weeks.

In describing the different steps of the operation, we mentioned a circumstance which frequently happens when it is not done with sufficient caution, and which commonly proves alarming; namely, the loss of a considerable part, or perhaps of the whole of the vitreous humour. By this the eye becomes flat, and instantly sinks within the orbit: but although it ought to be guarded against with the nicest attention, it does not always prevent the success of the operation. I have known indeed some instances of the eye always remaining sunk and useless after an accident of this kind; but most frequently the globe begins soon to fill again, and in the course of two or three weeks it has commonly acquired its usual bulk.

Whether or not this takes place from a regeneration of the vitreous humour, or merely from the ball of the eye being all filled with an aqueous secretion, I will not pretend to say. The latter is the common opinion; but why may not the vitreous be renewed as readily as the aqueous humour? I am inclined to think that a renewal of the one happens as readily as that of the other, from having often observed as perfect a state of vision after this operation where all the vitreous humour had been lost, as where none of it was evacuated. A remarkable instance occurred of this in a woman who had the operation performed upon both eyes. The eyes were both apparently sound in other respects: In one, the whole of the vitreous humour was forced out along with the cataract, and the eye sunk entirely to the bottom of the orbit; in the other, the operation was performed with much accuracy; the cataract was extracted, and none of the vitreous humour escaped. In the course of three or four weeks, however, from the operation, both eyes were of the same bulk; their appearance was perfectly similar, and the patient discovered objects equally well with

with each of them. This does not indeed determine the point with certainty, as it may be alleged, that the figure of the eye being preserved by the aqueous humour, the effect produced upon vision by the loss of the vitreous humour cannot probably be great; but we can scarcely suppose that any part of such an important organ has been formed in vain.

We shall now offer a few observations upon the instruments employed in this operation. Knives of various forms have been proposed for it; but the two that are delineated in figures 1. and 3. Plate XXXIII. have been most generally used; and of these fig. 1. is by much the best. The shape is nearly that of a spear pointed lancet; only the back of it is blunt, excepting a fourth part of an inch or thereby near the point, which should be sharp on both edges; and that side of the knife which passes next the iris should be somewhat round, while the other is nearly or altogether flat. The intention of this is to prevent, as much as possible, any risk of hurting the iris, which is very apt to happen with a knife that is flat on both sides, and with both edges sharp through the whole length. The operation has frequently indeed been performed with a knife of this kind; but it is found by experience that it may be done with more safety with one such as I have mentioned. It must be remembered, however, that although a knife for this purpose should be extremely sharp and finely polished, it ought likewise to be firm; for the cornea being of a considerable thickness, it is more difficult to penetrate than is commonly imagined by those not accustomed to this operation, who are therefore apt to be disappointed at finding the instrument in ordinary use too fine. It ought to be nearly of the same thickness with a common lancet.

The form of knife, fig. 3. is much employed in different parts of the Continent; but it neither penetrates the cornea so easily, nor does it afterwards form the incision so smoothly and equally, as the other.

For

For the purpose of opening the capsule of the lens, the flat curved probe we have mentioned answers extremely well, and may be used with more safety than any other instrument hitherto employed. As this membrane is very delicate, it is easily opened even with a blunt probe; and a sharp pointed instrument, such as is commonly used, being more apt to wound the iris, it should be avoided: But whatever instrument is employed for this purpose, it ought to be passed through the pupil with much steadiness, otherwise the iris may be readily injured whether it is sharp or not.

I have thus described all the steps of the operation as it is now practised, with such improvements as it appears to admit: But as it is an operation of much importance, and as it is liable to different objections even in its present improved state, I have been led to consider it with more than ordinary attention, and to make experiments upon different animals with a view to obviate these; the result of which I shall now shortly relate, although I did not think it proper either to place any weight upon them, or even to mention them in the description of the operation; for till experience upon the human body has confirmed the propriety of it, no conjecture, however well founded it may appear to be from experiments upon other animals, should be allowed to have much effect in directing us.

The most material objections which occur to this operation are these: The vitreous humour is apt to pass suddenly off along with the cataract; by which the eye is on some occasions sunk so much as never to recover its form again: The incision being made in the transparent part of the eye, the cicatrix which ensues is frequently so extensive as to obstruct the rays of light in their passage to the retina; by which vision is as effectually obscured, as if the cataract had not been extracted: And lastly, the lens being often too large for passing through the pupil, the iris is frequently much injured
by

by this part of the operation, when in every other point it is perhaps very properly performed.

With respect to the first of these, it may be alleged, that it does not occur when the operation is properly performed; and that it cannot with propriety be stated as an objection to it, merely because it frequently happens from awkwardness or inattention in the operator. This accident, however, is so frequent, that whatever can tend to prevent it must be considered as a very material improvement.

This, I think, may be in some measure effected by the incision being made in a different part of the cornea. When the opening in the cornea, as in the usual way of performing this operation, is made in the most depending part of it, all the aqueous humour is instantly discharged, and the vitreous humour by this means deprived of support at its anterior surface; any pressure made upon the ball of the eye by the speculum, or even by the natural action of the muscles of the eye, is therefore very apt to force it out. Instead of this, when the incision is made in the upper part of the cornea, the lens may be extracted with great ease; and a considerable part of the aqueous humour being still retained by the inferior half of the cornea, the vitreous humour is neither so suddenly nor so entirely deprived of the support which it affords, and does not escape so readily as in the ordinary method of performing the operation. At least this is the case in other animals; and there is reason to imagine, that it will likewise take place when the operation is done on the human eye.

It is probable, too, that another advantage may be derived from the incision being made in the upper part of the cornea. One material objection to this operation, when done in the usual way, arises from the cicatrix induced by the incision on the cornea. The same extent of the cornea will no doubt be cut when the operation is performed in the manner we have mentioned; but the cicatrix being in the upper part

of the eye, it will not probably prove so hurtful, as it is of most importance for us to view objects distinctly which lie beneath the eye. We frequently find that patients who have undergone this operation, see every object much more distinctly when placed above the eye, than when viewed beneath it; a circumstance that cannot in any other manner be accounted for.

The upper part of the cornea is cut with the same ease as the under part of it; the same instruments being employed, and the surgeon, patient, and assistants, being placed in the same manner: Only in this case, the knife must be introduced with the cutting edge of it towards the upper part of the eye, the incision being to be extended in this direction: And as the under half of the cornea remains undivided, the lens, on passing through the pupil, being apt to be retained by it, it must be cautiously removed, either with the scoop; with a small sharp hook, fig. 2. Plate XXXV. or with the small forceps, fig. 4. which were made for this purpose when I was engaged in the experiments mentioned above.

In this manner the two first objections to this operation may be in some measure obviated; and from all the observation I was able to make of it in the course of the experiments I have alluded to, I think it probable that it will answer in every respect better than any other that has yet been proposed; but as I have never put it in practice in the human eye, I cannot speak decisively about it. It is therefore only proposed as a hint for future observation.

But although we may by this means prevent the vitreous humour from escaping, and may avoid the bad effects which usually result from the cicatrix which remains after this operation, yet the third objection remains in equal force against it; the cataract must necessarily pass through the pupil, and in doing so the iris is often irreparably injured.

As this renders the operation much more hazardous than it otherwise would be, it has always appeared

FIG. 1.



FIG. 2.



FIG. 3.



3.

FIG. 4.

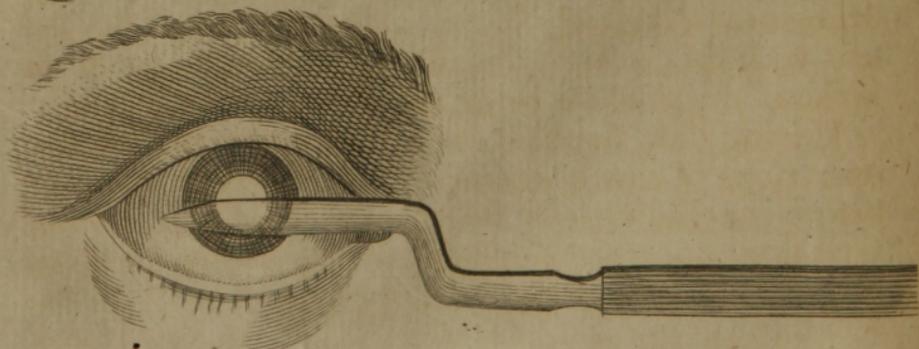


4.

FIG. 5.



FIG. 6.



to me that it would be an object of the first importance to extract the cataract in any other manner that would not expose the iris to this hazard. This may be done by opening the eye behind this membrane, instead of making the incision in the usual place in the lucid cornea; and it would be attended with this advantage, that no inconvenience would ensue from the cicatrix. I have performed the operation in this way on other animals; but it has never, I imagine, been put in practice on the human eye. The objections which occur to it are, that the opening being made in the sclerotica, the inflammation produced by it must probably be great; and this coat of the eye being of a thicker substance than the transparent cornea, wounds made in it are commonly supposed to be more difficult to heal. In some experiments, however, which I made upon rabbits with a view to determine this point, no reason appeared for this conclusion. The inflammation induced by an opening made in the sclerotica was not more considerable; nor was the cure in any respect more difficult than when the operation was done in the usual manner.

If the operation is ever performed in this manner, the opening should be made in the upper part of the eye, by entering the point of the knife about the tenth part of an inch or thereby behind the transparent cornea; and the incision being made of a sufficient size for allowing the cataract to pass, the sharp curved probe, fig. 2. Plate XXXV. should be introduced, for the purpose of extracting it. As the point of the instrument is extremely sharp and fine, it penetrates the lens with ease, and in this manner it may be removed without any pressure being made upon the eye.

Having thus finished the consideration of the two operations of couching and of extracting the cataract, before concluding the subject I shall offer a few observations upon the comparative advantages attending them; and shall at the same time mention those rea-

sons by which I have been induced to prefer the one to the other.

§ 4. *Comparative View of the respective Advantages and Disadvantages of the Operations of Couching, and of Extracting the Cataract.*

The operation of couching, or depressing the lens, was the first that was practised for the cure of the cataract. The extraction of the lens was afterwards proposed, as a more certain means of removing the disease. Both methods have had their abettors, and much has been said in favour of each. To appreciate, therefore, the merits of these operations, and to ascertain that by which our intention may be accomplished in the safest and easiest manner, are objects which deserve our attention.

It has been objected to the operation of couching, 1. That it frequently fails from the cataract rising again into its usual situation. 2. That it must always fail when the lens is in a soft or liquid state, by the fluid contained in the capsule dispersing through the eye when the capsule is opened by the couching needle. And lastly, When the opacity lies in the capsule, and not in the lens, that it cannot be cured by couching.

With regard to the first of these, it must be acknowledged, that the cataract frequently rises again after having been depressed to the bottom of the eye: But when the lens, instead of being pushed down immediately behind the pupil, is carried, as we have directed, by the point of the needle towards one angle of the eye, and lodged partly beneath the vitreous humour, it will seldom rise again. And even where the operation fails through the fault of the surgeon, or from any other cause, the pain attending it is so inconsiderable, that few patients will refuse to submit to a repetition of it once or oftener; and I have never known an instance of its proving ineffectual where this has been agreed to.

The second objection may appear of more importance to those who are not much accustomed to operations

rations on the eye, but it is not so in reality. A cataract in a fluid state, and flowing out from the capsule immediately on its being pierced with the needle, is not a common occurrence; from my own observation I would say, that it does not happen in above one of twenty cases: But were we even to meet with this circumstance more frequently, so far from stating it as an objection to the operation, we would have reason to consider it as an advantage. In this case the violence done to the eye is not so great as when the operation of couching is necessary in all its parts, from the cataract being of a firm consistence; a repetition of the operation can never be requisite; and the milky whiteness communicated to the aqueous humour, by the dispersion of the liquid chrySTALLINE through it, commonly disappears in a short time after the operation. At least that it does so, is consistent with my experience; and the observation is confirmed by the testimony of others, particularly of Mr. Pott, on whose authority we may rely with confidence.

Nay farther, even when the cataract is firm and entire, if it be completely separated from its capsule by the couching needle, it almost always dissolves in the aqueous humour, without leaving any vestige of opacity; an observation much in favour of the operation of couching, as it obviates the objection which is founded on the rising of the cataract after it has been depressed: At the same time it shows, that there is little or perhaps no reason for ever putting in practice the proposal of Mr. Petit for removing a cataract which in couching may have been accidentally pushed into the anterior chamber of the eye, as time will, in most instances, accomplish without pain or hazard what cannot be done by Mr. Petit's method but at the expense of both.

The lens will dissolve in the aqueous humour sooner or later, according to the firmness of it at the time of being separated from its capsule. The opacity produced by the dispersion of a fluid lens in the aqueous

queous humour, commonly disappears in a few days after the operation: Cataracts of a firmer consistence are seldom altogether dissolved in less than several weeks; and in a few instances a small portion of a depressed cataract has been observed in an undissolved state a good many months after the operation; but this is a rare occurrence.

The third objection we mentioned, the alleged impossibility of removing the disease by couching, when the cause of the opacity lies in the capsule and not in the lens, seems *à priori* to be the most conclusive against this operation; but it will not on examination be found to be so. In the first place, this species of cataract is a very rare occurrence. It is met with in a few instances, but by no means so frequently as to induce us to prefer one mode of operating to another for this reason alone.

Secondly, We have already observed that this species of the disease cannot be cured even by extraction. The opaque capsule may indeed be forcibly tore away by instruments passed through the pupil, but not without such violence being done to the eye as must be productive of certain blindness. We can therefore, without hesitation, venture to predict, that although this operation may be performed from time to time by those who are fond of innovation, and who wish to show their dexterity at the expense of those intrusted to them, it will not however, be received into general practice.

Farther, although we will not say that this species of the disease can in every instance be removed by couching, yet an attempt towards it may be made with perfect safety, by endeavouring to separate and depress the capsule with the point of the needle. If this can be done, the operation will prove as successful as if no such cause of disease had subsisted: And when it happens to fail, provided the trial is made with sufficient caution, no detriment will ensue from it.

Besides

Besides these objections, it has been said, in opposition to the operation of couching, that the pain and inflammation attending it are frequently greater than what are occasioned by extraction; and that the vitreous humour is more apt to be deranged by the needle in couching, than by the other method of operating.

But neither of these assertions will be admitted by those who have had sufficient opportunities of putting both operations in practice. They know, that in general the pain and inflammation attending the extraction of the cataract are much more considerable than those which proceed from couching: And it will be acknowledged by all who speak impartially upon this subject, that the operation of extraction is more frequently attended with the loss of some part, or perhaps of the whole of the vitreous humour, than that of couching with any material derangement of it.

We have thus seen that the several objections stated to the operation of couching, are not well founded: That the cataract can be removed by it as effectually as by the operation of extraction: That it is attended with less pain, and less subsequent inflammation; while at the same time it never can occasion those deformities which arise from a large cicatrix on the cornea, or from the sinking of the eyeball, which sometimes occurs from the loss of the vitreous humour.

But these circumstances alone should not be allowed to decide a question of such importance: The ultimate and permanent effects of the two operations ought to have much weight in determining our opinion. Now from much observation, it appears clearly to me, that the operation of couching proves upon the whole more successful than the other; that is, vision is as perfectly restored by couching, and, *cæteris paribus*, a greater proportion of those who submit to it receive benefit from it, than of those who undergo the operation of extraction.

With those who have not had frequent opportunities of observing the consequences of extraction it proves always a very deceiving operation. The removal of the cataract is in general attended with an immediate return of vision, much to the satisfaction both of the patient and operator : But in a great proportion of cases, even of those which at first have every appearance of proving successful, although vision may be tolerably perfect for some time, perhaps for several weeks, or even for months ; yet it generally grows more indistinct, till at last the patients become altogether blind. This is the result of my observation ; and it corresponds with the event of the operation when performed by various good operators.

The late Dr. Young of this place, who practised surgery for a considerable time with much reputation, had at one period a very high opinion of this operation. In the second volume of the *Edinburgh Physical Essays*, he gave an account of his success in six cases in which he had operated a few months before, and which at the time of writing the paper appeared to be remarkably great : but in a conversation with the Doctor on this subject a good many years afterwards, I found his opinion much changed. The Doctor's observations on the consequences of extraction were exactly similar to those which I had made upon it. In the greater number of patients upon whom he had operated, vision was restored immediately on the removal of the cataract ; but in nearly the whole of them the sight began to be impaired in a few months from the operation, and became gradually worse, till total blindness was at last produced.

The progress of the loss of that vision which is restored by the extraction of the cataract, is marked by the following appearances. Some degree of immobility is at first observed in the pupil—It remains inactive when the eye is exposed to light—It gradually becomes smaller ; and at last is found to be so much contracted, as scarcely to appear capable of admitting
a crow's

a crow's quill : It now remains immoveable in whatever light it may be exposed to ; and the patient is often reduced to a worse state than he was in before the operation, being even incapable of distinguishing light from darkness.

This unfavourable event appears to proceed from the violence which, in the course of the operation, is done to the iris. This we know is a membrane of the most delicate texture ; and as the pupil through which the cataract is forced is not nearly large enough for admitting the lens to pass with ease, this can seldom be accomplished but with great hazard of injuring this very nice and useful part of the eye.

It may be said, that the violence thus done to the iris should produce an immediate effect ; and that vision, if not hurt by it at first, should not afterwards be affected. In various cases, the iris is torn in different places, and appears to be irregular in its contraction and dilatation from the time of the operation being performed : but although in these, as well as in other instances where the pupil is only overstretched, blindness does not take place immediately ; yet it is almost as certainly to follow as if it had been instantly produced. The reason of its not occurring immediately after the operation may be difficult or perhaps impossible, to explain : but the fact is exactly as we have mentioned ; and by impartial observers will be acknowledged to be so.

Proceeding upon the idea that the failure of this operation depends in a great measure upon the injury done to the iris by the passage of the cataract, and being anxious to improve an operation for which at one time I had a great partiality, I have offered a proposal for this purpose. By making the opening in the eye behind the iris, this inconvenience may be avoided ; but whether or not this mode of operating will be found to succeed, future experience must determine.

In the mean time, till the operation of extraction is so far improved as to obviate the bad effects we have pointed

pointed out, the means of cure by depressing the cataract should certainly be preferred; as being more easily performed; less apt to injure the other parts of the eye; and as being attended with more real advantage.

SECTION XVIII.

Of the FISTULA LACHRYMALIS.

A SINUOUS ulcer, with hard or callous edges, is in general termed a Fistula; but authors, in treating of diseases of the lachrymal passages, have affixed a different meaning to this term: Every obstruction to the passage of the tears from the eye to the nose, is commonly, though improperly, denominated a *Fistula Lachrymalis*. A sinus of these parts, attended with callosity, ought alone to receive this appellation: but as some confusion might occur from any innovation that could be proposed, I shall avoid, as I have hitherto done, any attempt of this nature; and shall endeavour to describe, as clearly as possible, the various appearances with which the disease is attended, under the general denomination of *Fistula Lachrymalis*.

We have already given an anatomical description of the eye in the second section of this chapter; and must now refer to what was then said of the parts concerned in the disease of which we are now to treat. An accurate delineation is likewise given of these parts in Plate XXXI. fig. 1. *b* represents the puncta of the two lachrymal ducts, by which the tears are carried from the eye into the sac *e*; from whence they are transmitted by a canal which passes in an oblique direction through the *os unguis* into the nose, where it terminates

terminates below the os spongiosum inferius. We formerly remarked, that the os unguis is divided longitudinally by a kind of ridge, which at this part forms the boundary of the orbit; the groove in this bone, through which the nasal duct of the lachrymal sac runs, lies altogether exterior to the orbit, being separated from it by the ridge we have just mentioned.

This short recapitulation of the anatomy of the lachrymal passages, will render the description we are to give of the diseases to which they are liable more intelligible.

The fistula lachrymalis arises, as we have already observed, from obstruction to the passage of the tears into the nose; but the disease assumes a variety of appearances, according to the seat of the obstruction, and to the effects produced by it upon the neighbouring parts. Thus we may readily suppose, that the symptoms produced by the puncta lachrymalia, or by the ducts leading from these to the sac, being obstructed, will be very different from those which occur from obstruction formed in the lachrymal sac itself, or in the duct leading from this sac to the nose. And again, we might, à priori, conclude, that the appearances induced by a recent obstruction of any of these parts, must probably be very different from those which occur from a long continuation of the disease.

The lachrymal puncta, and ducts connected with them, are sometimes obstructed in consequence of burns, wounds, or severe inflammatory affections; so that the tears being thus prevented from passing into the nose, they necessarily fall over the cheek: And where they do not become acrid, so as to excoriate or fret the neighbouring parts, this discharge of tears is almost the only symptom with which this variety of the disease is attended: A dryness is indeed experienced in the corresponding nostril, by the want of a secretion which used to be poured into it; but this inconvenience is never of much importance.

It is this variety of the disease only which ought to be termed Epiphora, or a watery or weeping eye ; for when the obstruction is seated in any other part of the lachrymal passages, the disorder which ensues is attended with symptoms of a more painful and more perplexing nature.

When the lachrymal puncta and ducts remain open, if obstruction takes place either in the under part of the lachrymal sac or in the duct leading from it to the nose, the first warning which the patient receives of it is a small tumefaction forming in the internal canthus of the eye, which disappears upon pressure being applied to it, by a plentiful flow of tears passing into the eye, and from thence over the cheek. In this incipient state of the disorder, some portion of the tears frequently pass into the nose on the sac being pressed in the manner we have mentioned ; a circumstance always to be considered as favourable, as it shows that the obstruction is not altogether complete.

If the tears are regularly pressed out before the tumor acquires any great size, and before they have remained collected in the sac so long as to become acrid, they are in general found to be perfectly clear, and in every respect of a natural appearance when forced out from the puncta. From the resemblance of this fluid to the contents of hydropic collections in other parts of the body, this stage of the disease has been termed a Dropsy of the Lachrymal Sac ; a distinction, however, of no real importance.

When in this state of the disorder the patient is attentive to a proper and frequent application of pressure, and does not allow the lachrymal sac to be over-distended, a complete cure is frequently obtained, or the disease is prevented from giving much uneasiness ; at least this is uniformly the case, so long as the tears retain their natural appearance, and while a considerable proportion of the contents of the tumor can be pressed into the nose.

It happens most frequently, however, either from inattention in the patient admitting of the sac being over stretched, or from some other cause, that this most simple state of the disorder proceeds in a gradual manner to turn worse: The passage into the nose becomes completely obstructed:—The swelling in the corner of the eye increases, but still retains the natural appearance of the skin: The tears are now pressed out with more difficulty; and they are observed not to be transparent, but mixed with a proportion of a thick, opake, white mucus, somewhat similar to, but when minutely attended to found to differ considerably from, purulent matter.

Even in this stage of the disease the patient seldom suffers much pain, or any farther inconvenience than what proceeds from the flowing of the tears and mucus over the cheek: at last, however, the tumor begins to inflame, to become tense, red, and painful to the touch; and the matter pressed out from it has now a greater appearance of purulency.

At this period the tumor has exactly the appearance of a common bile or abscess; and by those not versant in this branch of practice, it is frequently considered as such. It becomes gradually more inflamed and more tense, till the teguments at last burst, and form an opening in the most prominent part of the tumor, at which the tears and matter contained in it are now altogether discharged.

When the opening thus formed is small, it commonly heals again in the course of a few days; but it bursts as soon as any considerable quantity of tears and mucus is collected; and it continues thus to collect and to burst alternately, till the opening becomes sufficiently large to prevent any farther collection. This state of the disorder exhibits exactly the appearances of a sinuous ulcer, with callous, and sometimes with retorted, edges; and it is in this stage very properly termed the *Fistula Lachrymalis*. Tears, mucus, and purulent matter, are now abundantly discharged from
the

the fore. When the bone beneath is found, this discharge is seldom either acrid or offensive to the smell; for the opening being in general in the under part of the tumor, the matter is evacuated almost as speedily as it is formed; but when any of the contiguous bones are carious, they are not only found to be so by the introduction of a probe, but by the appearance, smell, and effects of the matter upon the neighbouring parts. In this case, it is thin, fetid, and commonly so acrid as to fret and corrode the teguments most contiguous to the ulcer: And when the disorder is connected with scrophula or with lues venerea, an occurrence by no means unfrequent, the discharge and appearance of the fore will be different according as it happens to be combined with one or other of these diseases.

We have thus described the different symptoms of this affection, and the progress which it usually makes from the first formation of obstruction in any of the lachrymal passages, to the more advanced stages of the disease; and it is extremely necessary that practitioners be acquainted with the different appearances which the various states of it afford; for the method of cure best suited to one period of the disease, is frequently unfit for, and indeed altogether inadmissible in others.

From the history we have given of the rise and progress of the disorder, it is evident, that in every instance it originates from obstruction formed in some part of the lachrymal passages: The cure must therefore depend upon the removal of this obstruction; but the means of effecting this will vary according to the nature of the cause by which it is produced, and to the particular stage of the affection: Our prognosis, too, must likewise be directed by attention to these circumstances; for we may readily conclude, that a cure will be more easily and more certainly accomplished in the case of a recent obstruction, where the bones are yet perfectly sound, and where there is no suspicion either of scrophula or of lues venerea, than in circumstances of an opposite nature. When obstructions of this
kind

kind are induced by the venereal disease or by scrophula, and especially when the os unguis and other contiguous bones have become carious, nothing will effect a cure till the general taint of the constitution is removed ; and even then we can never be certain of preventing a weeping eye or a frequent flow of tears over the cheek : But when the fistula lachrymalis arises, as it most frequently does, from inflammation of the lachrymal passages, induced either by cold, by the measles, or any inflammatory affection to which the eyes are liable, if it has not continued so long as to hurt the bones beneath, we may in general give a favourable prognosis : for in such circumstances, a due perseverance in the means we shall afterwards point out, though not always, is yet very commonly attended with an entire removal of the disorder.

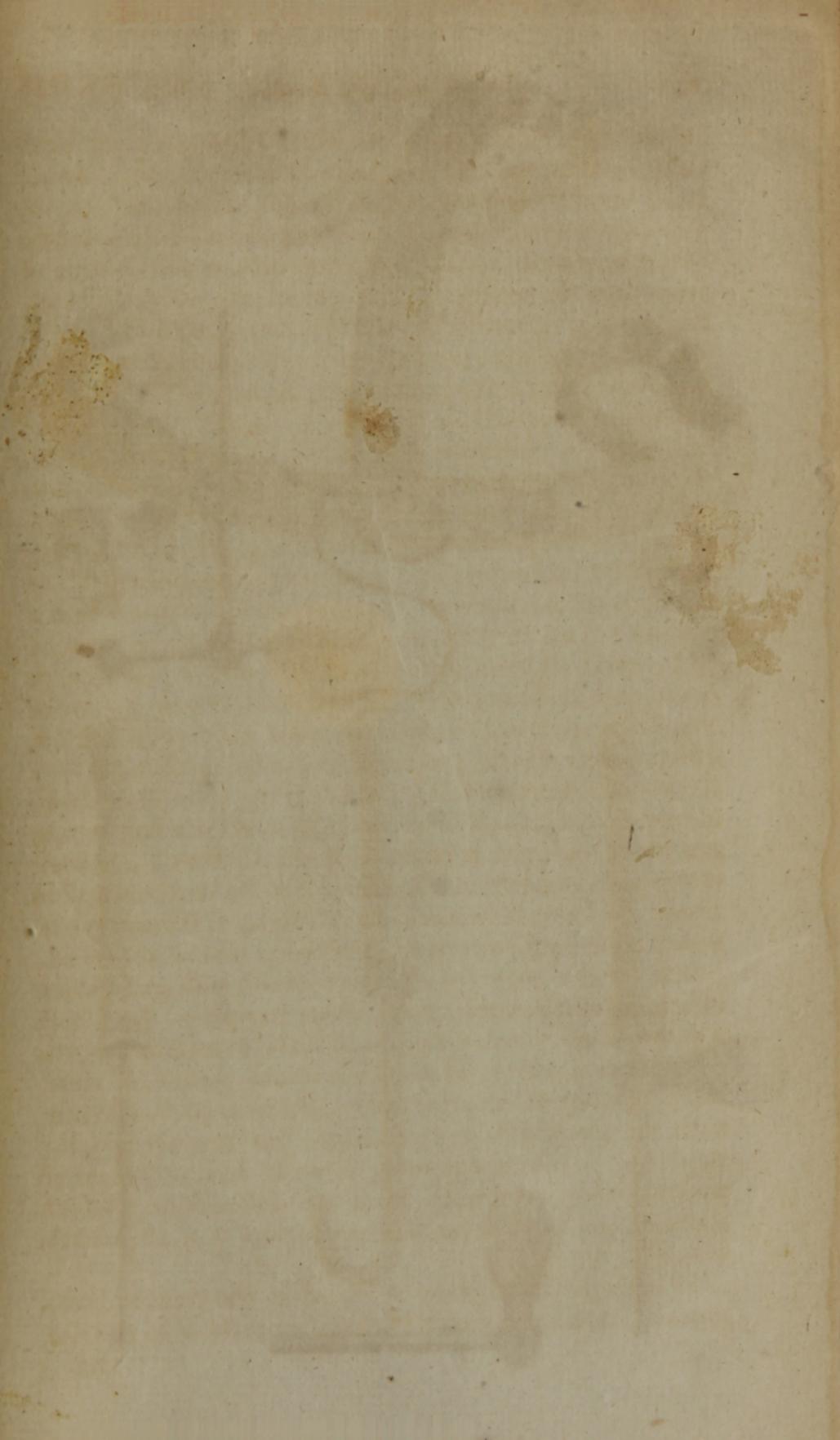
Again, when obstructions are induced in the lachrymal canals by tumors in the contiguous parts, which they sometimes are, particularly in cases of polypi in the nose, where the tumor by pressing upon the inferior extremity of the nasal duct is apt to produce a stoppage to the flow of tears, the prognosis must depend entirely on the practicability of removing the swelling by which the disease is induced ; for till this is accomplished, nothing effectual can be done in the treatment of the fistula lachrymalis.

The lachrymal sac and ducts are lined with a mucous membrane, similar to the membrane which lines the nose ; with which it is connected, and of which indeed it appears to be a continuation. In a healthy state of these parts, the nasal duct of the lachrymal sac will easily admit a crow's quill ; a size perfectly sufficient for allowing a free passage of the tears into the nose : But when this membrane which lines the duct becomes inflamed, as the fulness or swelling thus produced must diminish the diameter of the canal, obstruction will necessarily occur in it in a degree proportioned to the violence of the inflammation. We have particularly mentioned the nasal duct ; for it is

in this duct which the obstruction producing the most frequent variety of the disease is always seated, owing to its near contiguity to the nose; from whence, in cases of violent catarrh, inflammation is frequently communicated to it: but obstruction to the flow of tears into the nose will just as certainly occur from inflammation seated in the ducts leading from the eye to the lachrymal sac; and the principles upon which the method of cure proceeds must be nearly the same in each of them.

When the disorder originates from inflammation, our remedies ought to be exactly such as are found to prove most effectual in inflammatory affections of other parts of the body. General and local blood letting should be prescribed in quantities proportioned to the strength of the patient, together with laxatives and a low diet; and a saturnine solution should be applied to the part affected, either in the form of a poultice, or upon compresses of soft old linen. When means of this kind are timely employed and duly persisted in, obstructions which proceed from this cause will very frequently be removed; but when the parts have been allowed to remain long in an inflamed state before any remedies are used, it often happens that a cure cannot afterwards be accomplished even by the most complete removal of the inflammation: For as inflamed parts, when kept long in contact, are every where apt to adhere; so the sides of the lachrymal passages, when much inflamed, very readily unite together; by which a very obstinate variety of the disease is necessarily produced; and which shows, in a strong point of view, the propriety of treating every affection of this nature with the greatest attention from the beginning; for by doing so, we frequently have it in our power to prevent this obstinate kind of obstruction, which nothing but a very painful operation will afterwards remove.

When the obstruction is seated in the puncta lachrymalia, or in the ducts leading from these to the sac,
and 1



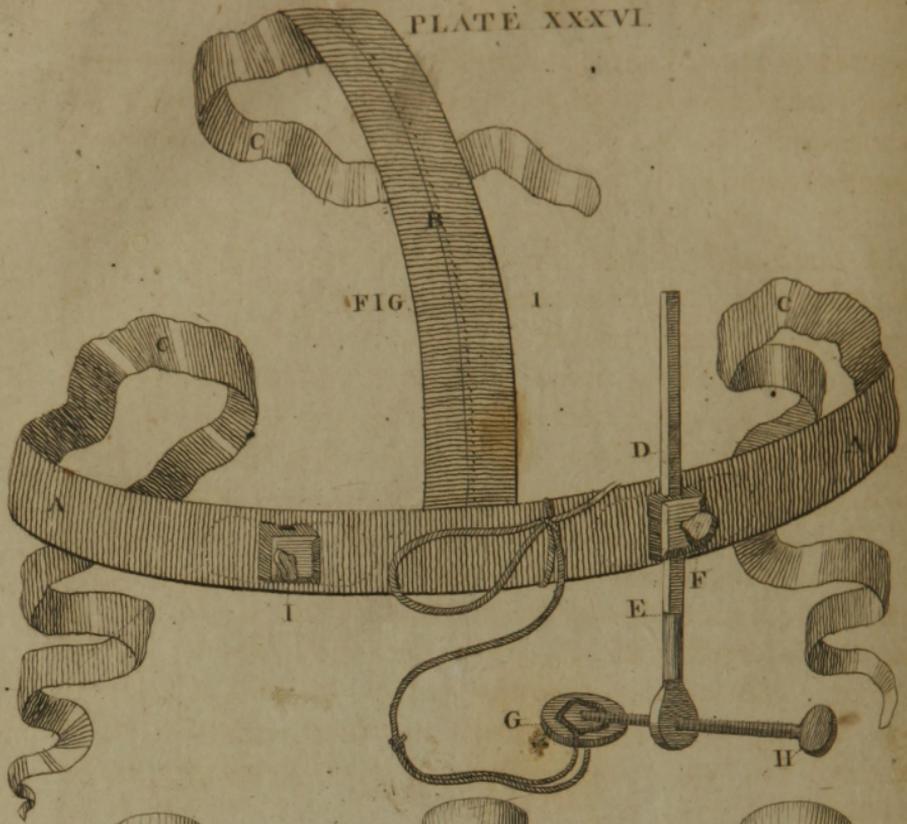


FIG.

2.

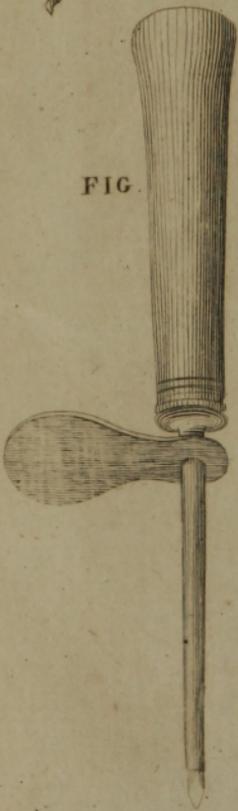


FIG.

5.

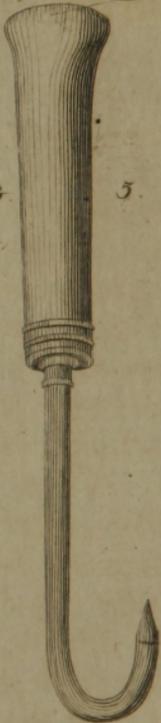


FIG.

3.



FIG. 4.



and when it is found to continue after the inflammation which gave rise to it is removed, we are to endeavour to remove it by inserting a small probe into each punctum, so as to pass it along the course of the ducts into the lachrymal sac. In this manner the openings may be rendered pervious, and may be afterwards preserved by injecting, twice or thrice daily with a small syringe, a weak solution of alum or of saccharum saturni; and by keeping at other times small lead probes constantly inserted, till the sides of the ducts are rendered perfectly callous; when the tears finding a free passage into the sac, a cure will thus be accomplished.

This, we must acknowledge, is a very nice operation: but whoever is versant in the anatomy of these parts, and is acquainted with the exact course of the lachrymal ducts, will find no great difficulty in effecting it. The probes represented in Plate XXXVIII. figs. 5. and 6. and the syringe and small tubes in Plate XXXVII. figs. 1. 5. and 7. are the instruments to be employed for it.

In obstructions of these ducts, it has been likewise proposed to pass a small seton from the puncta through the lachrymal sac into the nose, and to allow it to remain till the passage becomes sufficiently callous.—But, besides the difficulty of effecting this, it is highly probable that it would do more harm than good, as the smallest cord that could be introduced would create a great deal of pain and inflammation.

The obstruction, however, is most generally seated in the duct leading from the sac to the nose, forming a variety of the disease which requires a more complex method of treatment. When it occurs from inflammation, an antiphlogistic course, such as we have recommended, will frequently remove it; but when it happens to fail, either by the disease having been improperly treated from the first, or from any other cause, other means must then be employed. We shall therefore suppose, that any symptoms of inflammation which occurred are removed; but that the na-

sal duct still remains obstructed, and that it is attended with a slight tumefaction in the internal canthus of the eye, along with a frequent flow or discharge of tears over the cheek, the skin covering the swelling still retains its natural appearance.

This is the most simple stage of the disorder: It is neither attended with pain, nor with any material deformity or inconvenience; and by a little attention patients frequently prevent it from rendering the assistance of surgery necessary. By often pressing the lachrymal sac with the finger, the contents of it are discharged before they become acrid; and although this will not accomplish a cure, it will in general render the disease very supportable; and in this stage of it, so far as I can determine from my own observation, nothing farther ought to be attempted. We find indeed, in books, various means recommended for the purpose of effecting a complete cure; but as they are all tedious and painful, and especially as they are by no means certain, as long as no farther inconvenience is experienced from the disorder than a watery or weeping eye, a prudent practitioner will rather advise a patient to submit to this, than undergo the pain, confinement, and uncertainty, of an operation. As a fresh attack of inflammation would be apt to render the disease worse, he will advise him to avoid exposure to cold, and whatever can have any effect in reducing an inflamed state of the eye and neighbouring parts; and in the mean time he will desire him to trust to gentle pressure alone for obviating any effects which may occur from the obstruction.

For the purpose of applying pressure to the lachrymal sac, various machines have been invented; the most convenient form of which is represented in Plate XXXVI. fig. 1. by which any degree of compression that is thought proper may be continued without interruption, and with little inconvenience. But as we are now supposing that the nasal duct of the lachrymal sac is completely obstructed, and that no part of the
tears

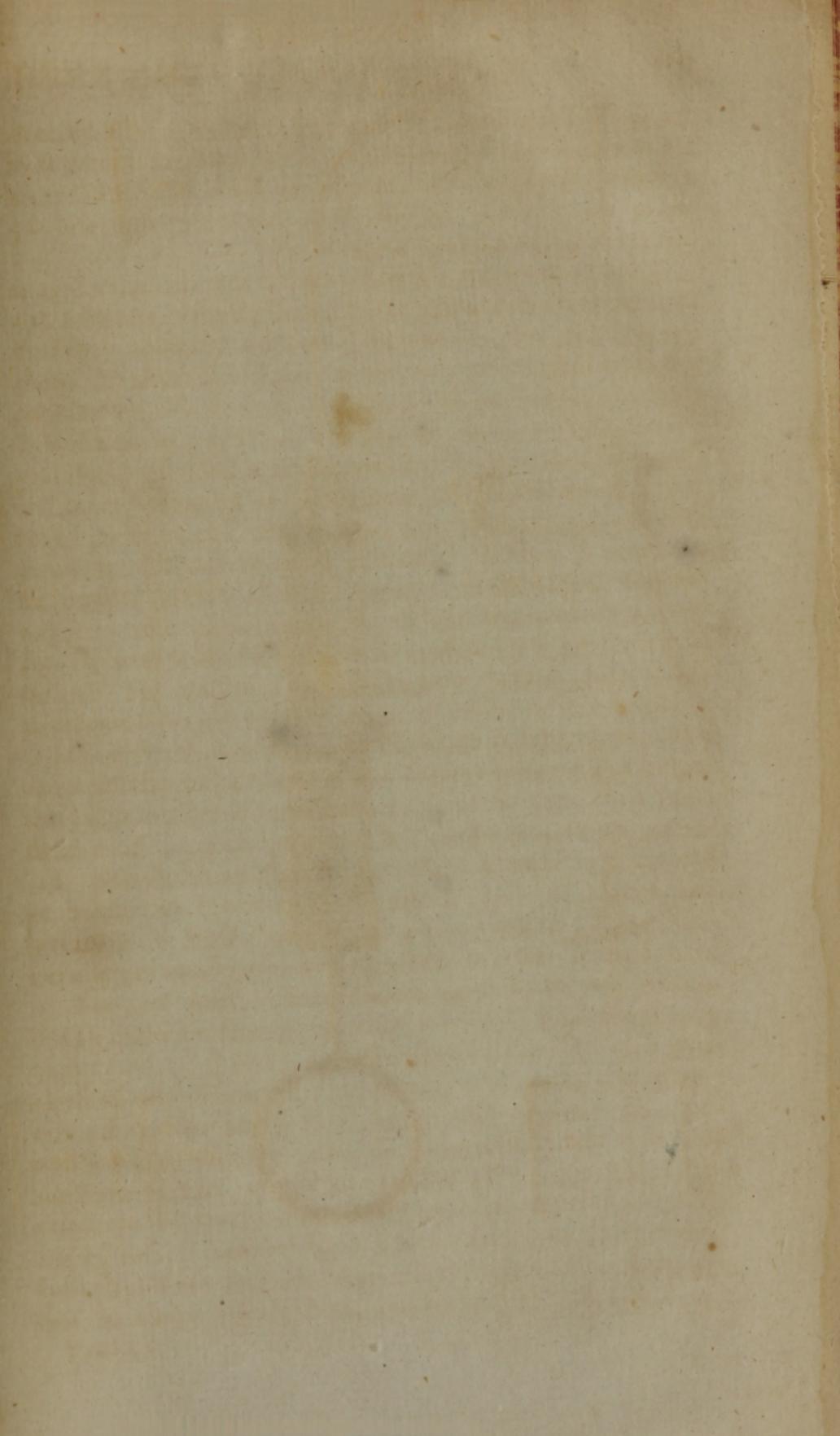


FIG 1

FIG 2



FIG 3



FIG 4



FIG 5



FIG 6

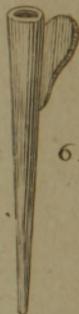


FIG 7

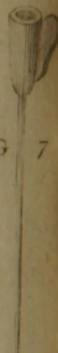


FIG 8



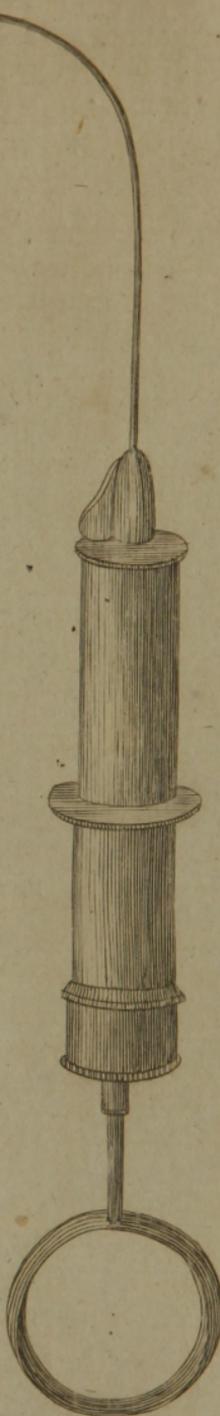
FIG 9



FIG 10



FIG 11



tears can be forced into the nose, no benefit can be derived from a continued course of pressure ; and as any advantage to be obtained from the practice is found to accrue with equal certainty from the finger being from time to time applied upon the course of the sac, I have always in this stage of the disorder, been accustomed to depend upon this alone.

The other means which have been recommended for the cure of this stage of the disease, are, the introduction of a probe into the nasal duct of the lachrymal sac, with a view to force open the obstruction :—The injecting of water or any other mild liquid, for the same purpose :—And lastly, it has been proposed to introduce a quantity of quicksilver into the sac through the lachrymal puncta, the weight and fluidity of which being supposed well fitted for making it pass through any ordinary degree of obstruction.

Mr. Anel, a French practitioner, was the first who brought to any perfection the method of introducing a probe, or the point of a syringe, into the lachrymal sac : but although any one acquainted with the anatomy of these parts, may accomplish this in a sound pervious state of the lachrymal passages, yet in an obstructed state of the nasal duct it can scarcely be done ; and, when effected, it is not found that so much utility is derived from it as was at first expected.

Two modes are proposed for effecting this operation : In the one, a small probe, or tube of a syringe, is inserted at one of the lachrymal puncta ; and being insinuated along the course of the corresponding duct, it is in this manner passed into the sac, and from thence we are directed to carry it through the nasal duct into the nose : Or, when this cannot be fully accomplished, we are desired to force an opening through this duct by an injection thrown in with a syringe inserted at one of the puncta. The syringe above mentioned, with the small tubes corresponding to it, as delineated in Plate XXXVII. is the instrument recommended for this purpose. By the other mode of doing the operation,

eration, a curved probe, or tube, of a larger size, such as is delineated in fig. 4. of the same plate, is to be insinuated into the nostril of the diseased side; and the point of the instrument being passed in beneath the edge of the os spongiosum inferius, it is to be easily moved about till it meets with the termination of the nasal duct of the lachrymal sac; when it must be cautiously carried forward till it passes into the sac itself.

Different objections, however, occur to these operations. The puncta lachrymalia are so very small, that no probe or syringe can be passed through them of a sufficient size for removing any obstruction in the nasal duct. And although a syringe of a larger size may in a state of health be introduced through the nostril directly into the nasal duct itself, in a diseased state of these parts it can seldom be done but with much pain and difficulty. In obstructions of this duct, as they very commonly arise from inflammation communicated from the membrane of the nostrils, the disease first commences in the extremity or termination of the canal; so that it is always difficult and often impossible to introduce a probe or syringe into it; and if the operator is even so fortunate as to accomplish this, it always requires some violence to force it into the lachrymal sac. Hence a good deal of pain is produced, by which the duct and sac are both apt to become inflamed; so that, instead of any advantage being derived from the practice, much mischief is apt to ensue from it.

The proposal of curing affections of this nature by injections is very ingenious; but, for the reasons I have mentioned, it will seldom I imagine be of much utility. We are indeed told, that it will often prove effectual in cases of slight obstruction; and that all the pain and uncertainty of the ordinary means of cure may thus be prevented. But when an obstruction is completely formed, it is altogether inadmissible, from the impossibility of introducing a probe; and when-
ever

ever a partial stoppage* only occurs to the passage of the tears into the nose, much risk will be incurred of doing more harm than good, by the irritation, pain, and consequent inflammation induced by the operation. In such circumstances the patient should rather submit to any inconvenience attending the disease than to an uncertain trial of this kind.

For the same reasons that the passing of a probe, and of injections, into the lachrymal passages, can seldom if ever prove useful, the introduction of quicksilver into the lachrymal sac will likewise in all probability be found to prove unsuccessful: Where the obstruction is already formed, it will not be able to remove it; and unless obstruction takes place, no attempt of this kind is indicated. The practice, however, is ingenious; and as it may be done with more ease, so it is less exceptionable than the use of probes or injections.

¶ We have thus described the modes of treatment which have been proposed in this the most simple stage of the disorder; but we must again observe, that as long as no farther inconvenience is experienced from it than a watery or weeping eye, with perhaps a slight tumefaction forming now and then in the corner of the eye, nothing should be advised but moderate pressure applied from time to time with the finger.

But when either by improper management, or by any other cause, symptoms take place which produce either much pain or deformity, a different mode of treatment becomes necessary. When the tumor in the angle of the eye becomes larger, inflamed, and painful, as the matter collected in it will be found sharp and acrid if it be not soon discharged, some additional distress will probably ensue from the contiguous bones being affected by it.

In such circumstances, a person not acquainted with the anatomy of the diseased parts, and with the cause of the disorder, would be induced to trust entirely to an opening being made in the tumor sufficient for dis-

charging the matter contained in it : For in this state of the disease, it assumes exactly the appearance of a common bile or abscess ; and therefore this method of treatment might be considered as proper and applicable. But although some temporary advantage might thus be derived from the discharge of the matter contained in the swelling, as the cause of the disorder would not be removed, a permanent cure it is evident could not be expected. We are here supposing that the disease originates from obstruction in the nasal duct leading from the lachrymal sac. It is clear, therefore, that the sac only being laid open, will be attended with no farther benefit than that of producing an immediate discharge of its contents ; for while the tears are conveyed into it by the puncta and lachrymal ducts, if they do not find a free passage into the nose, they must necessarily be either discharged by the opening newly formed, or, if this is allowed to heal, they will again collect and produce a tumor similar to the first.

In this situation, therefore, our views must be, to discharge the contents of the swelling ; to procure a free discharge in future for the tears from the lachrymal sac into the nose ; and to prevent it from being again obliterated. And this being accomplished, the external opening must be healed up.

While a swelling of this kind continues firm and hard, it would be improper to lay it open, as it would not only be attended with more pain, but the parts beneath could not be so freely examined as if the skin and other teguments were previously lax and soft. As long, therefore, as much hardness continues, a warm emollient poultice should be kept constantly applied over all the parts affected ; and as soon as the tumor becomes soft and compressible, an opening may with freedom be made into it. On account of the contiguity of the eye, and of the insertion of the orbicularis muscle, it has in general been considered as a nice and hazardous operation, the making an incision
into

into the lachrymal sac; and particular directions have been given, not only for the figure and size of the incision, but for discovering the exact site of the sac.

There is no necessity, however, for treating this point with so much attention; for the situation of the sac is always ascertained with precision by the tumor itself, which is formed, as we have already observed, by tears and mucus collected in the sac; so that any incision that discharges this collection must for certain reach the sac. Neither does the form of the opening make any difference in the hazard attending the operation. A femilunar cut has commonly been recommended; not only with a view to render the opening larger, but in order, as it is said, to avoid with certainty the tendon of the orbicularis muscle. There is no risk, however, of this tendon being injured, if the incision be made where it ought to be, viz. in the most prominent and most depending part of the tumor; and it is easier done with a common lancet than with any other instrument. The point of the lancet should be pushed into the superior part of the swelling fairly into the sac, and should be carried downwards in a straight direction to the most depending part of it. A few fibres of the orbicularis muscle which are inserted into and spread over the lachrymal sac, will indeed be divided by the incision; but no inconvenience is found to ensue from this. And a straight cut, such as we have directed, admits of a very free examination of the parts beneath, at the same time that it serves to evacuate more effectually than any other the tears and mucus collected in the tumor.

An opening being thus formed, the contents of the swelling are to be forced out by moderate pressure; a small doffel of soft lint spread with emollient ointment should be inserted between the lips of the sore, and a slip of moderately adhesive plaster may be employed to retain it. As a plentiful discharge commonly takes place, it is necessary to renew the dressings daily; and with a view to preserve the opening of a size sufficient

for admitting of a free examination of the parts beneath, instead of a doffel of lint, a small piece of prepared sponge, may be inserted into the sore every second or third day : but as the swelling of the sponge by the moisture applied to it tends to irritate and inflame the contiguous parts, it should previously be covered with a single ply of oiled soft linen, which does not hinder it to swell, at the same time that it allows it to be more easily withdrawn ; for the purpose, however, of removing it more readily, a piece of strong waxed thread should be attached to it.

In former times it was the common practice, after opening the tumor, to endeavour to destroy the hard edges of the sore, either with the actual or potential cautery, or with unguents impregnated with red precipitate, and other escharotics. By this the patient was made to suffer a great deal of unnecessary pain ; more deformity was produced ; and the probability of a cure being effected was much less, than when milder dressings are employed. Indeed the only method by which a cure could take place with such treatment, was the total obliteration of the lachrymal sac and ducts connected with it. These being either destroyed, or a considerable degree of inflammation induced upon them, their internal surfaces were sometimes made to adhere together on pressure being applied to them. This, however, could not frequently happen ; for while the puncta lachrymalia and ducts connected with them remained open, the tears still finding access to the parts beneath, would necessarily produce frequent returns of the disorder ; and when by the violence of the inflammation these ducts happened to be obliterated, still the patient would be liable to a constant trickling of the tears over the cheek. This idea, therefore, ought never to be kept in view. Instead of escharotic applications, the mildest dressings only should be employed ; nor should the doffils of lint or of sponge we have advised, be of such magnitude as to produce much pain ; all that is expected from them
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FIG 1.

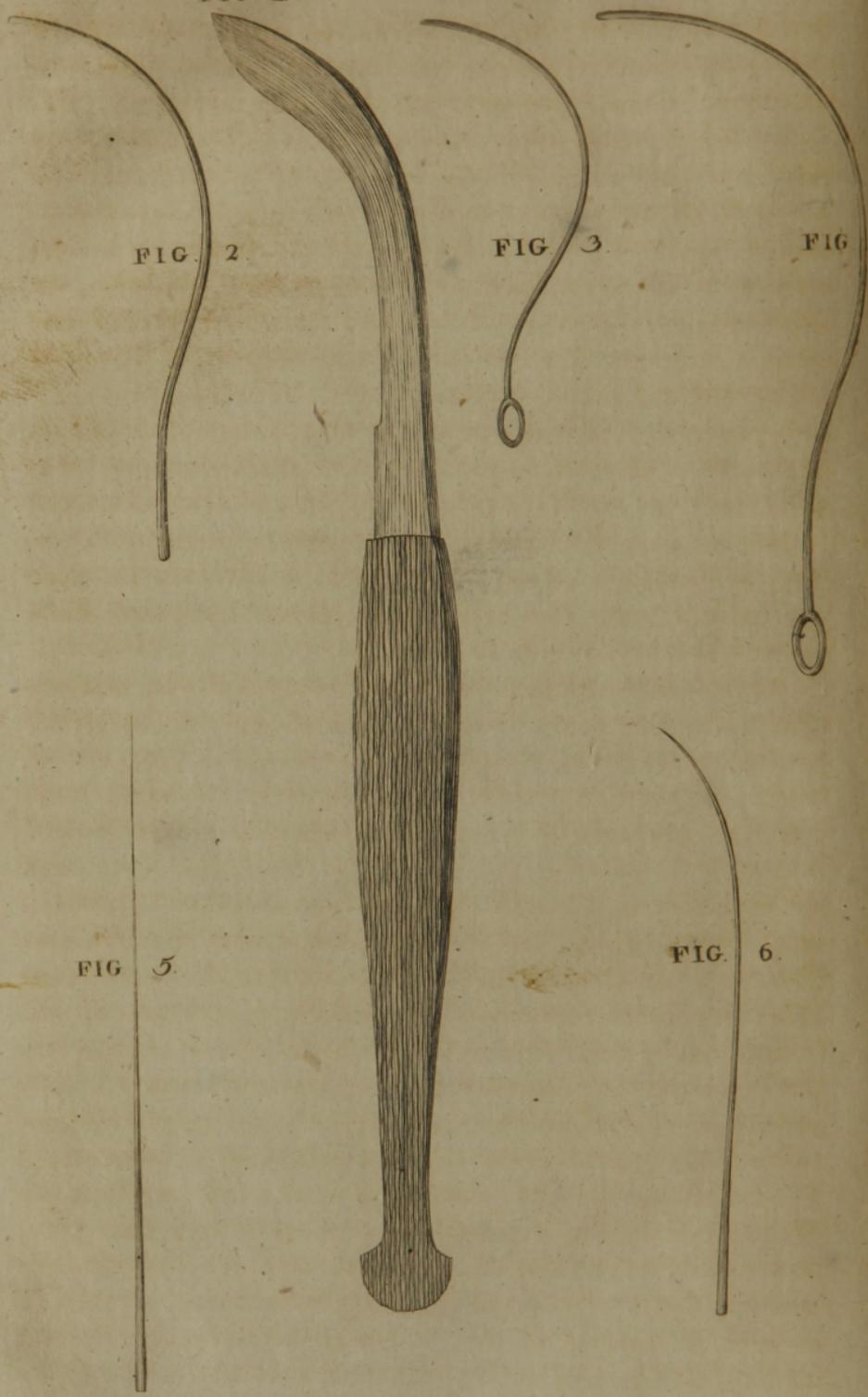
FIG 2.

FIG 3.

FIG 4.

FIG 5.

FIG 6.



being to dilate the lachrymal sac in order to admit of as free an examination as possible for the commencement of the duct leading from it to the nose.

By this management, any hardness remaining in the edges of the cut will soon be removed; and the sore being sufficiently cleared of a tough viscid kind of mucus, somewhat resembling sloughs, which for a few days after the operation it is always covered with, we are now to proceed to the most important part of the cure, the forming a free passage for the tears from the lachrymal sac into the nose.

This part of the operation is effected in two different ways: By clearing the natural duct leading from the lachrymal sac through the groove in the os unguis into the nose: Or, when this proves to be impracticable, by forming an artificial opening directly through the substance of this bone from the under and back part of the lachrymal sac.

As we ought always to avoid every kind of unnecessary violence, we should first endeavour, by every probable method, to discover the natural conduit of the tears, and to remove the obstruction formed in it. For this purpose, a firm round pointed probe should be inserted into the bottom of the lachrymal sac; and if the point of it can be insinuated into the commencement of the nasal duct, some hope may be entertained of the passage being rendered pervious: some degree of force will be necessary indeed for effecting this; but whenever it can be done, which often happens, by the probe being pushed forward in a proper direction with moderate pressure, it ought always to be preferred to every other method of treatment.

The passing of the probe into the nose is the most difficult as well as the most uncertain part of this operation; for when this is accomplished, we are in general able to preserve the opening by keeping a piece of bougie, of catgut, or of lead wire constantly inserted into it, till the passage of the duct is rendered perfectly clear and pervious. But it sometimes happens,
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that every trial we can make for discovering the nasal duct proves ineffectual ; and when the probe cannot be easily inserted into the commencement of it, much force ought by no means to be employed ; for as it will more readily be pushed against the bone than into the duct, it would be much more apt to do harm than good. When it enters the superior part of the canal with ease, it may with safety, and with some probability of success, be pushed forward in the manner we have mentioned ; but when the duct is obliterated through its whole course by the sides of it adhering together, an occurrence which we believe to be frequent, and which we conclude to take place when the duct cannot be discovered by a probe inserted into the lachrymal sac, it would be highly improper, for the reason we have mentioned, to use any violence in endeavouring to detect it.

When therefore every trial for discovering the natural passage between the lachrymal sac and the nose proves unsuccessful, as we know that a cure will not be obtained if the tears be not conveyed into the nose, our views must now be directed solely to the formation of an easy and free artificial opening for this purpose.

In the anatomical description we have given of these parts, we have seen, that the posterior part of the lachrymal sac is lodged in and attached to a groove in the os unguis ; and as the sac is separated from the cavity of the corresponding nostril by this bone only, it is evident that an opening made from the back part of the sac must serve to convey the contents of it into the nose. It is this part of the operation we have now to consider.

We have already observed, that the actual cautery used formerly to be employed for destroying the hard edges of the fore, and as it was a prevailing opinion with almost all the practitioners of the last and preceding centuries, that this disorder is almost always connected with a carious state of the corresponding bones,
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the cautery was likewise used for assisting in the exfoliation of the diseased parts. In consequence of this, a cure was sometimes accomplished by a remedy that was employed only for the removal of what was considered as an accidental occurrence, and not as a cause of the disorder: For the os unguis being extremely thin, a hot iron can scarcely be applied to it without destroying the substance of it entirely; and as this happened in some instances, a cure was obtained even where the practitioners who employed the remedy were totally ignorant of the manner in which it acted; for as they were unacquainted with the real cause of the disease from their ignorance of the anatomy of the parts concerned in it, we cannot attribute their success to any other cause than accident alone.

It is surprising, however, to find even in later times, when the cause of the disorder is well known, and when the principles of the operation are founded on an exact knowledge of the parts affected, that the same method of treatment has been continued. Till of late, the actual cautery was very commonly employed for perforating the os unguis by the best surgeons of this country. Even the celebrated Cheselden patronised this method; and it is still practised in several parts of the Continent.

With all the caution, however, that can be employed, of covering the hot iron with a canula, with wet clothes, &c. it is an uncertain and dangerous practice; for parts must be destroyed, or at least much injured with it, which ought not to be hurt, as it is perfectly impossible to convey a red hot iron to the os unguis, and to destroy part of this bone, which alone ought to be perforated, without much mischief being done to the contiguous parts.

The cautery ought therefore to be laid entirely aside; and this the more readily, as the same intention can be accomplished with equal certainty, and with more ease and safety, in a different manner, merely by forcing any firm sharp instrument from the back part
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of the sac through the os unguis ; but nothing answers so well for this purpose as a common trocar. A curved instrument of this kind has commonly been employed, such as is represented in Plate XXXVI. fig. 5. but the straight trocar, delineated in the same Plate, fig. 2. is preferable. By means of it the opening through the bone may be made, either by twirling it round between the fingers, by moving it forward and backwards with the fingers and palm of the hand, or by pushing it straight forward, according to the inclination of the operator ; and the surrounding parts may be protected, at the same time that the instrument is more steadily fixed than it otherwise can be, by passing it through a canula, such as is delineated in fig. 4. Whereas when the curved trocar is employed, no canula can be used along with it ; and in perforating the bone, it cannot be turned and moved with such freedom as the other.

In proceeding to this part of the operation, the patient's head should be supported by an assistant ; and the surgeon, sitting or standing between him and the window, must introduce the canula of the trocar into the opening made in the tumor ; and the end of it being carried to the under and back part of the sac, it must be kept firm in this situation with one hand, while the stilette is inserted into it with the other ; and the point of it must now be carried gradually forward till it has passed freely into the nostril ; which is known to take place on a small quantity of bloody mucus passing out at the point of the nose.

In making this perforation, much attention is necessary in carrying the instrument forward in a proper direction. If turned in any degree outward, it would penetrate the orbit ; posteriorly, it would pass into the ethmoid bone ; and if pushed in a horizontal direction towards the nose, the os spongiosum superius would be injured by it, while the intention of the operation, that of affording a free passage for the tears into the nose, would be entirely frustrated. In order to avoid

void these inconveniences, the instrument should be pushed on towards the nose in an oblique direction downwards from the inferior part of the lachrymal sac. Care should be taken, however, not to endeavour to follow the course of the natural passage of the tears, as by some we are directed to do; for in this manner we are not only apt to injure the maxillary bone, which is not by any means necessary, but the opening here cannot but with much difficulty be made so free and large as when the perforation is made in that part of the os unguis where the lachrymal sac terminates, and where the commencement of the nasal duct takes place.

On the instrument having penetrated the nostril, it should be moved with some freedom; not by carrying it farther in, as this might injure the parts within the nose; but by giving it a free rotatory motion, so as to render the opening made with it sufficiently pervious: And this being done, the filette should be withdrawn, when a lead probe, fully equal to the size of the canula, should be introduced, and then the canula may be likewise taken out. One extremity of the lead should pass freely through the opening in the os unguis, and the other must project about the eighth part of an inch or thereby past the level of the external fore. With a view to prevent it from slipping altogether into the nose, this projecting part of it should be somewhat curved after the canula is withdrawn. The fore must now be covered with a small pledgit of lint spread with emollient ointment, and the whole may be retained with a slip of adhesive plaster; for no bandage can be properly adapted to these parts without being productive of much inconvenience.

In this manner the operation is completed: but much attention is necessary on the part of the surgeon to preserve the opening that is thus formed, and to prevent it from filling up in future. With this view, the lead probe must be continued for a considerable time, in order to render the passage as callous as possible,

ble, care being taken to withdraw it every day or two for the purpose of clearing it and the fore from any impurities; and at each dressing a quantity of infusion of oak bark, a solution of alum, or any other astringent, should be injected with a small syringe from the external opening into the nose. The syringe, fig. 1. Plate XXXVII. answers this purpose properly.

No certain period can be fixed at which we can say the passage will be sufficiently callous, and at which the lead probe may be withdrawn; for this will in some measure depend upon the constitution of the patient, as well as on the particular state of the parts themselves. In some instances, it may possibly be done with safety in a shorter period; but I have never ventured on taking away the lead till the eighth or ninth week from its first introduction. The inconveniences attending it are considerable; and we are to remember, that the operation proving successful or otherwise is to depend almost entirely on due attention to this part of it; for if obstruction should afterwards occur, either from the opening in the bone filling up with callus, or from the softer parts adhering together, the patient will soon be in the same diseased state as he was before any attempt was made towards a cure.

On withdrawing the lead, the external opening should be cleared from any mucus with which it may be stuffed; and as by this time it will be reduced to a very small size, it will soon heal merely by laying the sides of it together, and covering it with a piece of adhesive plaster: Or, when this does not prove effectual in a few days, touching the edges of the fore with a bit of caustic will in general complete the cure very quickly. In the mean time, moderate pressure should be applied upon the course of the lachrymal sac, either by the finger of the patient being frequently laid upon it, or by means of the machine, Plate XXXVI. fig. 1. And this should be continued for a considerable time, till there is reason to imagine that the sac and contiguous parts have a-
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gain recovered the tone they lost by the long continuance of the disease, as well as by the operation.

What we have said respecting the propriety of continuing the lead probe for a considerable time, and of applying pressure afterwards on the course of the sac, is equally applicable when the natural passage of the tears has been discovered as when an artificial opening is formed in the manner we have mentioned. Indeed more attention is necessary to this point in the one case than in the other; for we find by experience, that the disease is more apt to return when the operation is finished by the tears being carried through the nasal duct, than when an artificial opening is made for them; owing as I imagine, to a wider and more free passage being commonly formed by this last mode of operating.

Instead of a probe of lead, some practitioners employ a piece of catgut or of common bougie; but neither of these answers the purpose so well. They are more difficult to introduce; they retain the mucus of the part, and therefore are not so cleanly; they are apt to be entangled by the newly divided bone; and they are not found to prove so effectual in rendering the passage callous as the other.

We have thus described the different steps of the operation; and the practice we have advised is such as experience has proved to be the most successful. It must indeed be acknowledged, that it does not in every instance succeed: for cases frequently occur which render fruitless every attempt that can be made for curing them. After performing the operation in the most satisfactory manner; when the passage for the tears has been rendered completely pervious; and even where external pressure has afterwards been continued in the most attentive manner; the disease is sometimes found to return again. In such instances, however, we conclude, that scrophula, or some other disease of the constitution takes place; by which alone, or by the contiguous bones being carious, this operation

tion, when properly performed, can be rendered abortive. It may sometimes indeed fail by too small an opening being formed in the os unguis; but this is the fault of the operator, and not of the operation. There is no cause for timidity on this point: For although it has been alleged that mischief may ensue from breaking this bone with the trocar, yet daily experience tends to prove the contrary; for even where it has been broke with much freedom, I never knew an instance of any inconvenience arising from it.

With this view to prevent the bad consequences which those not accustomed to this operation have supposed would occur from the splintering of this bone with a trocar, it has been proposed to take out a piece of it entirely with a sharp cutting instrument, such as is delineated in Plate XXXV. fig. 3.

By applying this instrument to the os unguis, in the same manner as we have directed for the use of the trocar, a portion of the bone may be easily cut out; but there is no necessity for this precaution. The operation is more effectually done with the trocar: and as no danger is found to occur from it, it ought to be preferred.

In the treatment of this disorder, when it is unfortunately found to return even after the operation has been properly performed, if it is imagined that this is owing to a carious state of any part of the contiguous bones, a cure may yet be accomplished by laying the tumor again open; by endeavouring to accomplish an exfoliation of the diseased bone; and by afterwards forming another opening in the os unguis in the manner we have directed. But when a relapse of the disease is experienced, without any cause of this kind, as any opening we might form in the bone would in all probability be soon filled up by the same affection of the system continuing which rendered the first attempt fruitless; it could answer no purpose to repeat it, were it not with a view to make trial of a different mode of operating.

It was proposed a considerable time ago by different practitioners, to obviate the uncertainty attending this operation, by introducing a small canula of gold or silver, either through the natural passage of the os unguis, or, through an opening made with a trocar; and by leaving the canula, and healing the skin over it, thus to form a passage which no disease of the constitution can have any effect upon. By those who consider the usual operation for the fistula lachrymalis as very uncertain, it has been proposed to employ a canula of this kind in every case; but as this operation, when properly performed, proves for the most part completely successful, and as patients in general consider it as a formidable matter to have any extraneous body left in a wound with a view to remain, I would not advise it in any case till we find by experience that the other does not succeed. In every case, however, where the usual operation has failed, the method of cure by a canula ought to be tried; and I believe it will frequently succeed.

Every instrument of this kind should be made of gold, as being less apt to be acted upon by the fluids of the part affected than any other metal; and much care should be taken to have the canula well polished, and as exactly fitted as possible to the parts in which it is to be placed. When properly fitted, it gives little pain, even from the first introduction; and at last it frequently fits with so much ease, that the patient is apt to suspect it has dropped out. In Plate XXXVII. figs. 2, 3, 8, 9, 10, and 11, different forms are delineated of these tubes, but of these fig. 3. and 10. are to be preferred. Those here represented are of a length which is found to answer in the most part of adults; and their diameter should be as large as the opening in the bone can admit, with a view to prevent, with as great certainty as possible, the tears and mucus which may pass into them from stopping them up. The upper part of the canula should be somewhat wider or thicker than the inferior part of it, otherwise it is apt

to pass entirely through the opening in the os unguis into the nose. This ought by all means to be guarded against ; and it is effectually done by this form of the tube being adopted.

When a canula is to be employed, the previous steps of the operation must be finished in the manner we have mentioned ; only there will be no necessity for continuing the lead for any considerable time. It ought however to be continued till any inflammation excited by the operation is gone, and till the opening formed in the os unguis is become somewhat callous, when the size of the tube being ascertained by the diameter of the lead, it must now be inserted into the wound ; and the length of it should be such as admits of the inferior point of the tube passing fairly through the os unguis, while the upper part of it is easily covered by the skin and other teguments. Much attention should be paid to the length of the tube : For if it be too short, it will not answer the purpose ; and if too long, it will irritate and inflame the skin which covers it ; by which the cure of the sore will be impeded, and after all it will be necessary to take it out for the purpose of shortening it : Whereas when the canula is of a proper length, the sore heals as readily as if no extraneous body was applied to it.

In describing the progress of this disorder, we had occasion to observe, that the tumor which forms in the corner of the eye when it inflames and suppurates, proceeds at last to a state of ulceration. This circumstance, however, does not point out any difference in the method of treatment ; only in this case, instead of using a lancet for laying the sac more freely open, an incision should be made with a scalpel upon a director introduced at the ulcer. In every other point the cure is to be conducted as we have already directed ; by rendering the natural passage of the tears pervious when this is found to be practicable ; and, when this cannot be effected, by making an artificial opening through the os unguis.

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When, again, the *os unguis* and other contiguous bones are found to be carious, we must preserve the fores open till the diseased parts are all removed; when, if a large enough opening is not formed for the passage of the tears by the pieces of bone which have been taken away, it may now be made, and every other step of the operation may be done in the manner we have already pointed out. In local affections of these bones, a cure may thus be in some instances accomplished; but where the caries depends upon a venereal taint, as is not unfrequently the case, although a well conducted course of mercury may cure the general disease of the constitution, it is seldom able to prevent very extensive exfoliations of the affected bones; by which the natural passage of the tears being destroyed, and the bones through which they should be conveyed being either altogether removed, or perhaps rendered perfectly flat, they must in future pass entirely over the cheek; for in such circumstances art can afford no relief.

EXPLANATION

EXPLANATION OF THE PLATES.

PLATE XXII.

[Opposite to page 58.]

Fig. 1. A bistoury with a probe of flexible silver joined to it. The curved bistoury with a blunt point, represented in Plate VII. Vol. I. answers exceedingly well in almost every case of fistula in ano; but as the addition of a silver probe has by many been considered as an improvement on this instrument, I have thought it right to give a representation of it.

Fig. 2. A bandage for the paracentesis of the abdomen, originally invented by the late Dr. Monro. This bandage should be made of soft leather, lined with flannel. *A*, the body of the bandage, which should be of such a length as to pass from one os ilium, across the abdomen, to the other, to be there fixed by the straps *BBBB*, to the buckles *CCCC*. The straps *DD*, by passing over the shoulders, serve to fix the buckles *EE*, which pass through between the thighs; and in this manner almost every part of the abdomen may be sufficiently compressed. When the operation of tapping is to be performed, the bandage must be fixed in the manner we have now directed, care being taken to leave the window *F* open, exactly opposite to the part where the perforation is to be made; which for this purpose should be marked with ink. On the water being drawn all off, and a pledgit being applied upon the wound, the opening *F* may be shut by the straps *G* and the buckles *H*, as is represented by the letter *I*. In this manner, any necessary degree of pressure may be applied; which, after the operation of tapping, is a circumstance of much importance, and should never be omitted.

PLATE XXIII.

[Opposite to page 98.]

Fig. 1. An instrument for fixing the canula after the operation of bronchotomy, described in page 89, &c. *A*, a plate of thin polished steel, with a curvature corresponding to the anterior part of the neck. *BB*, the extremities of the plate *A*, with which the straps *CC* are connected, for the purpose of fixing the instrument by means of a buckle on the back part of the neck. *E*, a moveable frame which should be made to pass easily up and down on the two perpendicular branches of polished steel *DD*, fixed to the inside of the plate *A*. In this frame there is an opening a little above *E*, for receiving the double canula represented by the inferior letter *F*. The letter *F* opposite to *E*, represents a small screw, which passes through the under part of the frame; and by pressing upon the under part of the canula, it thus serves to fix it exactly where it is placed after the operation.

As the frame is made to slide easily upon the two branches *DD*, and as the double canula *F* can be inserted to any depth in the trachea, and can be fixed, as we have said, by the screw passing through the under part of the frame, this instrument is accordingly found to answer every purpose expected from it. It is the invention of Dr. Monro, who in different cases employed it with advantage.

Fig. 2. The instrument mentioned in page 96, for perforating the trachea in performing the operation of bronchotomy. *G* the point of the perforator passing through the double canula *H*.

Fig. 3. A representation of the double canula unconnected with the perforator.

PLATE XXIV.

[Opposite to page 99.]

Fig. 1. An instrument, termed a Probang, for the purpose of pushing such substances into the stomach as are fixed in the œsophagus. It consists of a piece of soft sponge, firmly tied to a piece of flexible whale-

bone, fifteen or sixteen inches in length. The whale-bone should be well polished; and in order to render the introduction of it as easy as possible, it ought to be well rubbed over with fine oil.

Fig. 2. A scarificator, for the purpose of opening abscesses in the fauces, or for scarifying the amygdalæ when in a state of inflammation.

Fig. 3 The scarificator covered with a silver canula. *A*, the handle of the scarificator; *B*, a screw nail fitted to the holes in the scarificator; by which the length of the point to be left uncovered at the extremity of the canula *C* may be exactly regulated.

PLATE XXV.

[Opposite to page 123.]

Fig. 1. The handle of the trephine. This part of the instrument has in general been made of steel; but it is used with more ease and freedom when made of timber, and of the form here represented.

Fig. 2. The saw, or head of the trephine. The upper part of it must be made to fit with exactness an opening in the under part of the handle, so that when inserted into it the hole *B* may be opposite to the end of the screw *A*; when, by turning the screw, the two pieces may be firmly connected together.

C, The nut of a screw passing through a slit in the handle, and fixed in the upper part of a moveable pin *D*. In using this instrument, the point of the pin *D* is made to project past the teeth of the saw, till an impression is made upon the skull of a sufficient depth for retaining it, when the pin should be removed. This is easily done by moving the nut *C* to the upper part of the slit, and fixing it by turning the screw.

All the parts of the trephine are here represented of a full size for use. The diameter of the saw, viz. the breadth from one side of the head to the other, should not be less than an inch. Of this size it is used with the same ease as when made considerably smaller; and the opening formed by it being larger, it answers the intention of the operation better.

Fig.

Fig. 3. A head of a smaller size, such as is commonly employed. The pin *E* is in this instrument fixed by a screw into the bottom of the head, and is taken out by means of the key, fig. 4: But the method of moving the screw, as is represented in fig. 2. is in every respect better than this.

Fig. 5. A perforator for forming a small hole in the centre of the piece of bone on which the trephine is to be applied, and into which the pins *DE*, figures 2. and 3. must be inserted. The perforator must be exactly adapted to the handle of the instrument; to which it must be fixed by the screw *A*, in the manner we have directed for connecting the head to it.

PLATE XXVI.

[Opposite to page 144.]

Fig. 1. A representation of all the parts of the trephine connected together, and ready for use.

Fig. 2. Forceps, for the purpose of removing detached portions of a fractured skull: They are also used for taking out any piece of the skull that has been separated or cut out by the trephine, when it does not come away with the head of the instrument. Any other form of forceps would answer the purpose equally well, but the one here delineated is most frequently employed.

Fig. 3. A head of a trephine with longer teeth than the instrument in common use; and along the course of the saw there are three vacuities in which the teeth are altogether wanting. By this mechanism it is supposed that a piece of bone may be cut out more quickly than with the common trephine, and that the instrument will not need to be so frequently removed for the purpose of clearing the cut of the small fragments of bone produced by the saw. When the teeth of this saw are sufficiently firm and properly set, it cuts both quickly and smoothly; but I have not yet used it so frequently as to be able to speak decisively about it.

PLATE XXVII.

[Opposite to page 151.]

Fig. 1. This figure represents the instrument named a Trepan. As the page does not admit of the full size, every part of it is about one third less than it ought to be for common use. The upper part of the handle of the instrument is made of timber; all the rest of it should be of polished steel.

For the reasons we have elsewhere mentioned, every operator should be provided with this instrument, as well as with the trephine. And as the same heads may be made to fit both the one and the other, the expense attending them is inconsiderable.

Fig. 2. An instrument commonly termed a Lenticular. It is used by some practitioners for scraping the edges of the opening in the bone formed by the head of the trepan when they are in any degree rough.

For this purpose it is sharp on one side; and the button on the top is meant to receive the pieces of bone which fall from it. There is very rarely, however, any occasion for using it. I have never found it necessary; but as it forms a part of the apparatus employed by modern surgeons in the operation of the trepan, I have judged it proper to give a delineation of it.

Fig. 3. A raspatory for removing the pericranium. This instrument, if used with caution, may prove serviceable by admitting of an easy and free application of the trepan; but no more of the skull should ever be denuded than is merely necessary for allowing the saw to be applied with freedom.

PLATE XXVIII.

[Opposite to page 158.]

Figures 1. and 2. The different parts of a levator, nearly the same with that of Mr. Petit, mentioned in p. 158. Fig. 1. A frame supported by two feet, with a pin and moveable ball on the superior part of it. This pin must be of a size corresponding to the holes in the levator, fig. 2. and the ball must be made to

move

move with freedom in every direction; by which means the point of the instrument may be carried with ease from one part to another, while the frame on which it is fixed is kept firm in its situation by an assistant.

Fig. 3. The two parts of this instrument joined together, and ready for use.

Fig. 4. The levator employed in common practice. But as this instrument, while it elevates one part of the skull, must press with considerable force upon another, it ought to be laid entirely aside. And this can the more readily be done, as the levator, fig. 3. is found to answer every purpose for which the other is employed, while it is not productive of any of the inconveniences which frequently result from it.

PLATE XXIX.

[Opposite to page 235.]

Fig. 1. A bandage for the eyes; by which any quantity of light can be admitted that a patient may wish for, while at the same time the eyes are sufficiently protected, without being kept too warm, or too closely tied down, as is commonly the case with the bandages usually employed. It consists of two pieces of polished timber excavated into the form of cups, corresponding to the size of the eyes for which they are intended: And these being covered with a black or green ribband, the instrument is complete.

Fig. 2. A cup of an oval form, for the purpose of bathing the eyes either with water or with any other liquid. Being of an oval form corresponding to the size and figure of the orbit, the eye can be more effectually washed or bathed in any liquid contained in it than it can easily be in any other manner.

Fig. 3. A bag of the *resina elastica*, fitted with an ivory pipe for the purpose of throwing warm water between the eyelid and the ball of the eye, in order to remove sand, lime, or any other extraneous matter that happens to be lodged between them.

Figs. 4. and 5. Pipes of different forms, which may occasionally be fitted to one of these bags.

Fig.

Fig. 6. A flat hook, which may be made either of polished silver or steel, for separating the eyelids from each other. This may be frequently done by the fingers of the operator, or by an assistant; but in many of the more minute operations on the eye, a flat hook of this kind is employed with much advantage; so that every surgeon accustomed to this branch of business ought to be provided with them.

PLATE XXX.

[Opposite to page 238.]

The figures of this plate represent different views of an instrument frequently mentioned in the course of this volume. Various forms of a speculum oculi have been delineated in books; but they have seldom been used in practice. They have in general been found either to compress the eye too much, so as to induce pain and inflammation; or not to fix it sufficiently. The instrument here represented, when properly polished, creates very little uneasiness, at the same time that the eye may be so compressed by it as to be rendered perfectly steady. The handle of it may be either of steel or timber, but the rest of it ought to be either of silver or of fine polished steel. Operators should be provided with specula of different sizes. The views here delineated are taken from a size which answers the eyes of the most part of adults.

A well adapted speculum is an useful instrument in many diseases of the eyes, but particularly in the operations of couching and extracting the cataract. As it has been imagined that it may be an advantage to be able to withdraw the speculum while the knife or needle remains in the eye, it has been proposed to leave a vacant space for this purpose in the circle which surrounds the eyeball, as is represented in fig. 3. The speculum should be always kept, however, upon the eye, as long as either the extracting knife or couching needle remains in it, otherwise the eye cannot be rendered sufficiently steady: But to those who are of a different opinion, this form of the instrument delineated in fig. 3. will answer the purpose exactly.

PLATE XXXI.

[Opposite to page 278.]

Fig. 1. A delineation of some parts of the eye, referred to in different sections of this volume. It is taken from an accurate representation of the eye by Zinn.*

a, These points represent the openings or orifices of the glands of Meibomius; by which a viscid glutinous substance, commonly termed the Gum of the Eyes, is separated and discharged.

d, The caruncula lachrymalis.

c, The membrana semilunaris, which seems to have some effect in directing the tears towards the puncta lachrymalia *b*, from whence they are conveyed by their corresponding ducts into the sacculus lachrymalis *e*, and are afterwards transmitted to the nostril by the nasal duct.

In the treatment of the fistula lachrymalis, it is of the utmost importance to be well acquainted with the anatomy of these parts. This delineation of them will convey a more exact idea of them than could be given by description.

Fig. 2. A sharp pointed instrument described page 334. From its figure it has commonly been termed a *Hafta*. It has long been used in different parts of the Continent for fixing the eye in the operations of *Extracting* and *Couching* the *Cataract*. This proceeds, however, from the want of a more perfect instrument; and as the *speculum* we have delineated in Plate XXX. answers the purpose with much more ease and certainty, the other will probably be now laid aside.

Fig. 3. A very useful form of knife for various operations upon the eyeball and eyelids, and especially for scarifying turgid blood vessels in an inflamed state of these parts. A lancet is commonly used for this purpose: But this knife is used with more steadiness; and being round or blunt on one side, it does not so readily injure the contiguous parts.

Fig.

* Vide Descriptio Anatomica Oculi Humani Iconibus illustrata. Auctore Johanne Gottfried Zinn, M. D. &c.

Fig. 4. A speculum oculi, such as is used in common practice. But the speculum we have already described answers the purpose in every respect more completely.

PLATE XXXII.

[Opposite to page 327.]

Fig. 1. A couching needle of the best form I have ever tried. It penetrates the eye more readily than the round needle, fig. 2. and the cataract is more easily depressed with it.

Fig. 3. A needle of a flat form similar to fig. 1. with a small curve near to the point. By this curve I have sometimes thought that the cataract may be more easily depressed than with a straight needle; but I have not yet used it so frequently as to be able to speak with certainty about it.

Figs. 4. and 5. Two needles, described page 332, for performing the operation of Couching, by entering the instrument at the internal angle of the eye, and pushing it out towards the other. By which means the operation may be done upon the right eye with the right hand; whereas, with the common straight needle, the left hand must be used for the right eye; by which the operation is seldom performed with sufficient steadiness.

All these instruments are delineated of a size exactly fit for use. The handles should be made of light timber, and the steel part of them should be polished in the most exquisite manner. None of them should exceed forty grains in weight.

PLATE XXXIII.

[Opposite to page 337.]

Fig. 1. The form of knife recommended in p. 337, for the operation of extracting the cataract. It should be tolerably firm and highly polished. Near the point both sides of it should be sharp, by which the cornea is more easily penetrated, but backwards the upper edge of it should be round; which not only gives more strength to the instrument, but renders the risk less of hurting the iris with it.

Fig.

Fig. 2. A knife of the same form in the cutting part of it with fig. 1. But by means of the curvature the operation may be performed on the right eye with the right hand of the surgeon.

Fig. 3. A knife commonly used in Germany for the operation of extracting the cataract. The form of this knife does not admit of its penetrating the cornea so easily as fig 1. which is now therefore very generally preferred.

Fig. 4. A small scoop for removing either the whole body of the lens, or any part of it, when in the operation of extracting the cataract it happens to lodge either in the pupil or in the anterior chamber of the eye between the iris and transparent cornea.

PLATE XXXIV.

[Opposite to page 341.]

Fig. 1. A delineation of the eye with the couching needle inserted into it.

Fig. 2. The knife employed for dividing the cornea in extracting the cataract, is here represented inserted across the eye, between the cornea and the iris. And in fig. 4. the cut is delineated which ought to be formed in the cornea in the usual method of performing this operation. Fig. 3. represents the cornea divided in the superior part of it, in the manner we have mentioned in page 345.

PLATE XXXV.

[Opposite to page 327.]

Fig. 1. A delineation of a right eye with one of the curved needles of Plate XXXII. inserted into it; by which it is evident that a cataract may be couched in the right eye with the right hand of the surgeon, with perfect ease and safety.

Fig. 6. Represents a curved knife inserted beneath the cornea in the operation of extracting the cataract with the right hand from the right eye.

Fig. 2. A sharp curved probe for removing the cataract when the operation is performed by making an opening behind the iris, as is directed in page 347.

Fig.

Fig. 4. Small forceps, which may occasionally be employed for the same purpose.

Fig. 5. A flat curved probe, which should be made either of gold or silver, for inserting through the pupil in order to tear or form an opening in the capsule of the lens, so as to admit of an easy expulsion of the cataract.

Fig. 3. A tube of steel with an edge sufficiently sharp for penetrating a hard bone, by which a portion of the os unguis, corresponding to the size of the tube, may be removed, when in the operation of the fistula lachrymalis this may be judged proper.

PLATE XXXVI.*

[Opposite to page 361.]

Fig. 1. An instrument mentioned in page 375, for the purpose of compressing the lachrymal sac. *AA*, A curved plate of steel covered with flannel or silk, and adapted to the forehead, upon which it is fixed by the ribbands *CC*. *B*, Another plate of steel connected to the former; which passing back towards the occiput, serves to fix the machine with more certainty by means of the ribband *C* at its extremity. *D*, A small moveable bar of steel, passing through an opening in the plate *AA*, to be firmly fixed at any particular height by the screw *F*. *G*, A small cushion or button of steel covered with silk or soft flannel; which being placed upon the corner of the eye immediately above the lachrymal sac, any necessary degree of pressure may be applied by means of the screw *H*. The moveable bar *D* is separated into two pieces by a screw at *E*; so that by turning this screw, the cushion *G* may be turned more or less outward at pleasure, according to the particular form of the part on which it is to be applied.

The instrument, as it is here delineated, is intended for the left eye; but it is easily made to answer the right eye by moving the bar *D* into the slit or opening on the opposite side of the plate *AA*.

Fig. 2. A trocar and canula, for perforating the os unguis in the operation of the fistula lachrymalis.

Fig.

Fig. 3. The filette ; and fig. 4. the canula represented separately.

Fig. 5. A curved trocar ; the instrument commonly employed for the fistula lachrymalis.

In page 372, I have mentioned some objections which occur against this form of the trocar ; and at the same time I have endeavoured to show, that the straight trocar which we have just described, is in every respect preferable.

PLATE XXXVII.

[Opposite to page 363.]

Fig. 1. A small silver syringe for the purpose of throwing liquids into the lachrymal passages. Fig. 4. A curved tube, adapted to the syringe, and of a proper size for being inserted by the nostril into the extremity of the nasal duct of the lachrymal sac. Fig. 5. A small tube, of a size corresponding to the lachrymal puncta, for throwing injections through these openings into the sac. Figs. 6. and 7. Tubes of a larger size for throwing liquids through the sac into the nose by an external opening, when this has either been made by an incision, or when the sac has burst in consequence of tears and matter collecting in it.

Figures 2, 3, 8, 9, 10, and 11. Tubes of different forms, which have been employed in the operation for the fistula lachrymalis, when the passage through the os unguis cannot in any other manner be kept free and pervious. Of these, however, figs. 3. and 10. are the best. The small bulge with which they are formed, not only prevents them from passing through the opening altogether into the nose, which cylindrical tubes are apt to do, but when they are once properly fixed, it prevents them from rising against the skin, which they are otherwise ready to do. The tubes here represented, are of sizes, both as to length and thickness, which answers for the most part of adults ; but these are circumstances which must depend upon the nature of every case, and will accordingly be liable to some variety.

variety. Tubes for this purpose should be made of gold polished in the finest manner.

PLATE XXXVIII.

[Opposite to page 369.]

Fig. 1. A curved scalpel, employed by some practitioners for extirpating the eyeball. By its form it is supposed to be well suited for this purpose; but the common straight scalpel is by experience found to answer better.

Figures 2. 3. and 4. Curved probes, of a proper size for inserting by the nostril into the nasal duct of the lachrymal sac, when it is judged proper to attempt to clear these passages in this manner.

Figures 5. and 6. Probes of a smaller size, for inserting into the lachrymal puncta.

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