Newman (R.)

With Compliments of the Author.

ELECTROLYSIS

IN THE

TREATMENT

OF

STRICTURE OF THE URETHRA.

BY

ROBERT NEWMAN, M.D.,

PERMANENT MEMBER OF NEW YORK STATE MEDICAL SOCIETY, ETC., ETC.

REPRINT FROM THE TRANSACTIONS OF THE MEDICAL SOCIETY OF THE STATE OF NEW YORK, FOR 1874.

SURGEON GEN'L'S OFFICE
196
LIBRARY.

ALBANY:
CHARLES VAN BENTHUYSEN & SONS,
PRINTERS, STEREOTYPERS AND BINDERS.
1874.

ELECTROLYSIS

IN THE

TREATMENT

OF

STRICTURE OF THE URETHRA.

BY

ROBERT NEWMAN, M.D.,

PERMANENT MEMBER OF NEW YORK STATE MEDICAL SOCIETY, ETC., ETC.

REPRINT FROM THE TRANSACTIONS OF THE MEDICAL SOCIETY OF THE STATE OF NEW YORK, FOR 1874.

ALBANY:
CHARLES VAN BENTHUYSEN & SONS,
PRINTERS, STEREOTYPERS AND BINDERS.
1874.

Electrolysis in the treatment of Stricture of the Urethra.

By Robert Newman, M.D., New York.

All the strictures of the urethra entrusted to my care during the last few years, have been treated by electrolysis. The results from this system of treatment have been very gratifying to me, and particularly so to my patients, who were kept under observation for some time after the operation. None were suffered to relapse, and the cure has been in every instance permanent. One of the worst cases of impassible stricture which came under my notice, was cured, and a No. 12 sound could be introduced by the patient himself. Fifteen months have elapsed; the urethra has retained the above calibre, and is in sound and good condition. Such clinical facts seem to warrant more than a passing notice in the records of successful surgical operations.

The object of this paper is to give a history of certain cases, the *modus operandi* of electrolytic treatment adapted to strictures of the urethra. By asserting that I have had no failures to record, that I have succeeded in every case, I do not wish to be understood, or even imply that every other treatment is to be condemned, that all other methods or operations for stricture should be abandoned, and that electrolysis alone should be relied on; or to express an opinion that *all* strictures *can* be cured by electrolysis. For the present I do not wish even to compare the different methods. Each must stand upon its own merits; each mode of procedure may possess advantages, and if properly selected and applied to each individual case, may result in entire or partial success. But having succeeded in curing some of the worst and most complicated cases of stricture of the urethra by galvanism, I certainly shall not abandon a method which possesses so many advantages, and has been so successfully practiced by myself, knowing, as I do, that the treatment is rational, scientific and reliable.

History and Bibliography.

The history of this operation is brief; the paucity of its literature is manifest. Crussel and Wertheimber made the first experiments, but did not succeed in establishing the operation, and legitimizing

it. It is freely admitted that the use of electricity in its diversified forms, with all kinds of instruments, for the cure of stricture of the urethra, has been attempted long ago; but the electrolysis under consideration, and its availability to cure stricture, hereafter to be more fully described, is of recent date. After researches in both foreign professional literature and our own, within my reach, I have not been fortunate enough to find more than a few scattered cases. Among the most important, and bearing directly on the subject, I find:

Mallez et Tripier, Traitement des rétrécissements urètraux par la galvano-caustique chimique négative, Compte Rendu de l'Acad. des Sciences. Bulletin Thérapeutique, Mai 30. Med. 58.

Mallez et Tripier, De la guérison durable de rétrécissements de l'urèthre par la galvano-caustique chimique.

Althaus in Goerschen's deutsche Klinik, No. 34–36. Heilung der Harnrochren-Stricturen durch die Electrolyse.

Keys' Electrolytic treatment of Stricture of the Urethra. New York Medical Journal, December, 1871.

Bautisto Campos, De la galvano-caustique chimique, comme moyen du traitement des rétrécissements de l'urèthre. Paris, 1871.

Dutrieux, De la galvano-caustique chimique dans le traitement des rétrécissements organiques de l'urèthre. Press. Med. Belge, No. 25, 1872.

Mallez et Tripier, Lancet, October, 1871.

Multiple Strictures of the Urethra by Electrolysis, by S. F. Frank, M.D. Medical Record, Feb. 2, 1874, p. 62.

Besides the above, we find the following two papers, not exactly belonging to the subject, still bearing some relation to it:

Cases illustrating the action of the continuous electric current on Spasms of the Bladder, Urethra and Ureters, by Reliquet, of Paris. Practitioner, August, 1872, p. 98.

On the detachment of Urinary Concretions from the Walls of the Bladder. Wiener Medic. Zeitung, Mai, 1872.

Theory of Electrolysis.

Electrolysis is the decomposition of a compound body by electricity. The electricity used in our treatment of stricture is the constant current of galvanism. The body to be decomposed must be a conductor, and must possess certain elements susceptible of decomposition by the galvanic current, and must contain water and a salt. Non-conductors are chalk, fat, oil, rubber, dry gases and a

multiplicity of other substances. Some are wholly, others are only slightly susceptible to the influence of the galvanic current. This knowledge is of great advantage, because it teaches that *all* strictures of the urethra will not yield alike to the electrolytic treatment. Success depends on the organic quality, form and composition of the neoplasm of the stricture. Blood and muscular tissues are good electrolytes, hence the inflammatory strictures readily yield to the electrolytic treatment. Fibrous tissues are more or less decomposed by its action, and that in proportion to the elements which enter into their composition. If the parts to be acted upon are devoid of water, its action will be slow, because water or moisture is necessary, and forms one of the real elements of successful decomposition. Chalk being a non-conductor, it follows that calcareous strictures, which are dry and brittle in their narrow calibre, will not yield well, if at all, to electrolytic action.

We will now consider the action of the two poles of the battery. If we decompose water by electricity, we find that the oxygen is attracted to the positive, and the hydrogen to the negative pole. Now we should remember that *pure* water is not easily decomposed, but the difficulty is overcome if the water holds salts in solution. If the water contains salt, the positive pole will attract the acids, and the negative pole the alkalies and bases. Hence it is that the positive pole acts like a caustic acid, and burns like fire, which is painful, leaving a hard retractile cicatrix.

On the other hand, the negative pole acts like a caustic alkali, which does not hurt during its application, and leaves a cicatrix which is small, soft and not retractile.

Having become acquainted with the different properties of the poles, which possess each their own specific powers, it is evident from the foregoing that for the immediate destruction of strictures, the negative pole must be selected.

The next important question which arises, and which is a valuable factor for successful treatment is, what is the best material to be used on the negative pole? We should select hard metals, those that stand in no danger of being decomposed or easily oxidized; hence platinum, gold and silver are best; but lead, brass or tin do well; even copper is available.

If we use the latter metals, the chemical decomposition may produce a small amount of precipitate, which is a slight objection, but not a positive hindrance to the ultimate success of the operation.

The specific action produced by electrolysis in the treatment of

strictures, has received different names: this diversified nomenclature has produced considerable misunderstanding, and time has done little to remove the confusion and obscurity in which the action of electrolysis is still involved.

Dutrieux calls it galvano-chemical cauterization. Dittel names it a chemical galvano-caustic. I wish to add my mite, hoping to help in removing the obscurity in which the action of electrolysis is still concealed underneath technicalities of scientific phraseology. My experience of its action, after observing it minutely in all its known relations, leads me to name this electrolytic action "Galvanic chemical absorption," and I depend mainly on the chemical decomposition caused by electrolysis.

It seems that all who have written and experimented on the subject mean the same thing, but expresses it differently. This diversity in the nomenclature has provoked the criticism of the editor of that special department in Virchow's Jahresbericht. Dutrieux, he says, depends for the action of electrolysis on the caustic effects of the negative pole, which leaves a soft and less retractile cicatrix, and wonders that Newman relies on chemical absorption as an effect of the electrolytic action!

That the same thing is meant, is evident from my previous statement, as well as from the description of the *modus operandi* by Mallez and Tripier, who lay great stress, and rely upon chemical, and *not* on the caustic effect which would result from the application of the positive pole, or the approximation of the two poles. Why, with such a definition, which is taken from Mallez and Tripier, the French surgeons call the action "par la galvano-caustique chimique," I do not understand, but believe I have proven that we mean the same thing.

Next, I must define my term "absorption," as some may object to it as not definite enough, or understanding that it pertains only to the action of lacteals. But I believe I am justified in using the term, as Webster's definition of absorption is as follows: "The process or act of being made passively to disappear in some other substance, through molecular or other invisible means, as the absorption of light, heat, electricity, etc." And such is the action exactly, as we will see hereafter.

The negative pole acts as a caustic alkali. If increased tension is used, it will destroy tissue, but mildly applied it acts as a chemical absorbent on the altered tissue, and restores the part to its normal condition. No one would think of curing a stricture by cauteriza-

tion. The history of that treatment in uterine diseases has left too many painful reminiscences. The Gynæcologist loudly protests against a treatment, which has proved so mischievous and unfortunate in uterine diseases, and this applies equally well to attempts to follow it in cases of stricture of the urethra. Many failures have been recorded, thus Dittel's three cases: "Billròth's Surgery, page 174." But may not these unfavorable results be attributed to badly selected cases, such as bony or callous strictures? These are unsuitable and are less amenable to the electrolytic treatment, for reasons stated before.

The theory on which my first experiments were made, has been corroborated by an experience of some years, and proved to me that electrolysis in curing stricture of the urethra, is of the most substantial value.

I will now consider the instruments best suited for proper application.

The Galvanic Battery.

A battery presenting a large surface will cauterize more rapidly and more intensely than any other known caustic.

By using a superabundance of electrical current, induced by a large surface with the hope of augmenting its sphere of action, too much inflammation is induced, destruction of the surrounding healthy tissue takes places, suppuration supervenes, and thus aggravates the disease. The current should never be strong enough in its action to lead to destruction of tissue; it should be confined to an effort to restore the affected parts to their normal condition.

The current of proper strength in its application should be confined solely to the diseased locality. This is not always easy to accomplish with the batteries at command, and the failures on record may be mainly due to their defects; one of the most important is the want of thoroughly controlling the strength of the electrical current. I have used the Drescher batteries in all my experiments, for the following reasons:

First.—The tension* of the current can be augmented gradually, cell by cell, without any interruption of the current, and the patient will hardly perceive the increase of intensity, which can be used above the power of Stoehrer's and other batteries.

* The French writers have used the word "intensité," just as we use the word quantity. But translators have rendered *intensité* into English by the word "intensity," and have used it in the sense of tension. This mistake of the translators has brought much confusion into the subject. It is better to dispense with the word intensity, and use only the terms "quantity" and "tension."

Second.—The *quantity* of electricity is reduced to a point sufficient to produce the most intense action on a very limited surface.

Third.—The quantity of electricity of *all* the cells can be increased or diminished at will, by the screw-lifting arrangement, by which the elements can be immersed into the battery fluid to any desired depth.

The size of the elements in many batteries is far too large; the quantity of electricity produced is too great, and there is "too much of a good thing." The electricity generated is too powerful to produce and fulfill its proper indication. The result of all this is, that if employed in the above way, too great a destruction of tissue takes place, and occasions great pain to the patient, who soon refuses to submit himself to a process which involves such suffering.

Another, and serious fault of certain batteries is, that they can only be graded by pairs. This arrangement involves a great objection, because the augmenting or diminishing of two cells at a time, alters the galvanic current and produces a sudden shock, which causes the patient pain and a general "malaise," which merges soon into nervous irritability, besides many other serious difficulties which I noticed during my first experiments.

I therefore prefer batteries which by their peculiar arrangements can be graded, one cell at the time, and by a Rheostat, can be divided into small units to overcome resistance.

The galvanic battery I use consists of many small cells; each cell contains two elements, carbon and zinc. The fluid in which the elements are immersed is diluted sulphuric acid and bichromate of potassa.

The catheter used for the negative pole consists of a metal bulb, to which a rod of wire is attached, and over which a flexible catheter is fixed, cut off at its extremity and connected with the metal bulb; a smooth and continuous surface is thus obtained.

The bulb is egg-shaped, about half an inch long, its length proportionate to its diameter. The flexible catheter acts as a perfect insulator, and at the free end, the rod is connected with the copper wire from the negative pole of the battery. The catheters are made in sets of different sizes.

The Physiological Effect of Electrolysis on Mucous Lining.

In describing the different degrees of quantity and tension of the current, the result of actual observation and experience, the salient points will be perhaps more intelligible if subdivisions be made.

The contact of the positive pole with the mucous lining by a metal, bulb-shaped catheter, causes great pain. The electrolysis thus applied feels and acts similar to a strong vegetable acid, destroys tissue, and is not easily borne.

But if the negative pole is used with the same electrode, no pain follows the application, provided the current is not too strong ; it thus produces only a sensation of pricking and burning.

a. If a limited electrolytic power be selected and applied by the usual method, the current is gradual and slow in its action, and we observe—

First.—The mucous lining of the urethra is often covered with an alkaline secretion. The electrolytic action coagulates it in a semi-solid mass. The same result may be observed if the albumen of an egg be submitted to the action of both poles.

Second.—In the absence of this secretion, moisture only being present, a general stimulation takes place.

Third.—Agitation.

Fourth.—Lifting and loosening of epithelium.

Fifth.—Attraction and disentegration.

Sixth.—Coagulation of alkalies.

Seventh.—The epithelium shrivels up.

Eighth.—Detached and lost.

Ninth.—Mucous lining dries, and gradually changes color from a pinkish red to white.

Tenth.—At the commencement of the caustic action, absorption slowly takes place, tissue is absorbed and disappears.

Eleventh.—The metallic extremity of the bougie insinuates itself in the deeper tissue, producing a depression ; an aperture is made which forms a new passage.

Twelfth.—The electrolytic action having made a passage, the albuminous secretions on the walls of the urethra are acted upon by the negative pole coagulating it, and bearing resemblance to boiling froth.

Thirteenth.—By degrees a scab is formed.

b. Electrolysis may become caustic in its action if too strong currents are used, destroying tissue, leaving a denuded surface behind, which in the healing process throws out plastic lymph, fills up the cavity, and forms solid and adherent walls.

c. If electrolysis of great power is used, it rapidly opens a passage. The perforation thus made forms a scab upon the walls of the urethra. To illustrate this physiological effect, and at the

same time the power of the battery used, I will describe here a few experiments made on dogs.

Experiment I.—A good-sized dog was placed under chloroform, merely for the purpose of operating and observing, without being interrupted by the animal's struggles. The application was made on the external mucous lining of the penis, which was pushed forward in front of the sheath. To the positive pole of a 40-cell Drescher galvanic battery was attached a forceps, with which the lower portion of the penis, where the prostatic portion is situated, was firmly held. This prevented the penis from slipping back, and the effect of the positive pole could be observed. The negative pole, connected with the copper wire, was a silver bougie, egg-shaped, the size corresponding to No. 0 wire gage. The circuit was completed by bringing the bougie as the negative pole in contact with different parts of the penis. Distinct effects were produced, as described before, in the following time:

5 cells produced distinct effect in.....5 seconds.
10 " " " ..... 2 "
20 " " " ..... 1 "

When all forty cells were used, a boiling commenced immediately, smoke arose, a hissing sound was heard, a froth was formed around the point of the bougie, and a hole was produced in a short time. The effect produced by the two poles differed widely, and could be observed as follows: The positive pole had caused a destruction of parts in an uneven, ragged manner; the surface looked like an ugly sore of a yellow color, mixed with grey at the margin. It simulated somewhat the ulceration of a chancroid. At the negative pole were seen only points, small in circumference, of a whitish color. Even a little was left of the pinkish hue, and there was no destruction of tissue. A smooth surface presented, but the normal lubricating moisture had given way to a dry state. This dryness at the negative pole, and the destruction of tissue, with an ulcerating surface at the positive pole, gave rise to a partial phymosis afterwards.

Experiment II.—A dog was prepared as in the first experiment. The positive pole, by means of a forceps, held firmly the mucous lining of the penis far back, where the prostate lies. The bougie, of an egg-shaped form, connected with the negative pole, was introduced into the urethra two and a half inches deep. Then the electrolysis was used with all forty cells at once, and continued for twenty seconds. A boiling was distinctly seen and heard around the negative pole. At the positive pole a destruction of tissue and an ugly

sore was produced, exactly as in the first experiment. The dog felt sick, had no appetite, and could not urinate for two days. The malaise was increased by the sore and the destruction at the positive pole, which caused again an inflammation and phymosis. After two days, the obstacle in the urethra gave way at once, the plug formed by the electrolysis popped out, and the dog passed water strongly mixed with blood. The dog made finally a good recovery.

Many other experiments have been made, and all prove the correctness of the theory explained before. The last experiment was only made to ascertain the tolerance of a strong current. As a therapeutical agent I condemn such a method, and would not practice it on a patient. My experience has proved conclusively that the means of curing stricture consists mainly in using *weak currents;* and mischief may be done by strong currents, which destroy tissue rapidly, instead of causing chemical decomposition.

I shall now briefly consider the

Therapeutical Action of Electricity

in disease. For convenience, it is advisable to state the different forms of electricity.

The exact action of all forms of electricity is by no means thoroughly understood, and it is hardly within the scope of this paper to advise or recommend which method or current should be adopted, or in what disease, organ or tissue this or that form or current is to be employed. To enter into such a field of inquiry would involve researches of much labor to collect and collate statistics, and tabulate them; and such a work, however conscientiously performed, would, from the very nature of things, be defective, open to grave objection, and be subject to criticism. But to comprehend the conclusions drawn from the theory upon which I base the success in curing strictures of the urethra by electrolysis, it becomes necessary to describe in general terms the modes and forms in which, how, and for what purposes electricity is generally used.

As seen by the foregoing, the two poles differ in their action, and therefore give different results. It further appears that the poles vary in their action with the material used. For example, by a general application with sponge electrodes, a certain result is obtained; the same current, similar in every way, will, by the use of a metallic electrode, become electrolytic. The Faradic or induced current, as a general application, with the sponge electrode, is mainly used (and even preferred) to ascertain muscular contractility. Hence it is

employed in paralysis, because it vitalizes, and stimulates the muscles into activity, sustains the action of the heart, impresses the circulation, and exerts a powerful influence over the motor nerves.

If the Faradic current is employed with metal electrodes, or a sponge electrode as positive, and the bougie with metal bulb as the negative pole in the urethra, it prevents, or cures spasmodic action; hence, is a cure for spasmodic strictures.

It appears that the two poles are identical in their action, and manifest no significant difference, at least it is not so marked as in galvanization.

The galvanic, or constant current, as a general application, may be used with more or less advantage or benefit in all cases (although the Faradic is preferred as a general tonic and stimulant), and acts as such principally on the sympathetic, motor, and sensory nerves, and its effects to equalize the circulation are very significant. But if galvanization is used with metal electrode to obtain electrolytic action, the result obtained will be widely different.

The positive pole will coagulate the blood, attract acid and oxygen: in fact, by a peculiar action the battery has yielded an acid product, which acts as actively and produces as painful and sloughing a sore as will the most powerful mineral acid, and leaves behind a hard and retractile cicatrix on the tissue with which it has been in contact; while the negative pole will dissolve blood, augments its fluidity, attracting hydrogen, coagulates albumen, attracts alkalies, and acts as a caustic alkali on the tissues, leaving behind a small, soft cicatrix, which is not retractile.

Now, the knowledge of the foregoing facts is of paramount importance, and they are all the more essential, inasmuch as they happen to be the great factors with which we should be acquainted for the intelligent application of the method under consideration.

Method of Application.

The first thing the operator will have to consider is, the pathological condition of the particular stricture he has to deal with. Next, to devise a plan for his future action, select the method he intends to employ, and the treatment he means to follow; what he wishes and what he can accomplish in a single seance, and what he reasonably can effect. He must know WHEN to operate, and the time that should elapse before the operation is repeated. The patient should not be subjected to pain.

Of course no stereotyped rule can be laid down which should be followed by all alike. Each case depends on its own inherent pecul-

iarities, and must be treated accordingly. The successful issue of each case depends entirely on the operator's choice of method, and he should employ that one which offers the best chances of success, and which he deems the most effective.

There are three principal methods, as follows :

First.—Electrolytic action, by mild currents, from batteries united for tension, produces gradual chemical absorption, as before described. The current is gradually increased or decreased.

Second.—By galvano-cautery. By reason of its great tension, this agent violently forces a passage. The effect of this powerful action is swiftly to burn its way through the impediment, the result being a firm and hard scab on the walls of the urethra.

After the employment of the galvano-cautery, the patient must be left alone, and not interfered with until the scab has come off, and many weeks must elapse before a normal mucous lining is formed, even on a healthy urethral wall.

A scab thus produced, firmly adheres to the walls of the urethra, and cannot, without danger, be removed by the operator ; interference would be highly reprehensible. Non-interference being compulsory, from four to six weeks are consumed before it becomes detached. If an attempt be made to accelerate the separation by instrumental manipulation, serious consequences are sure to follow.

The boundary between the scab and the adjacent healthy mucous lining is always a weak spot, and any exploring instrument used in contact with, or beneath the scab, might cause rupture of the urethra. The best rule I can suggest is, " Non-interference is the best policy."

Third.—The third method is a mixed operation, or a combination of the former two. The passage is made by the action of a powerful electrolytic current, which may denude the surface of the urethra ; the walls are kept apart to prevent adhesion. This indication is fulfilled by the introduction of the catheter immediately after the operation, and retaining it *in situ.*

My predilections are in favor of the first method, and I use it because it is more desirable. If circumstances permit, I operate with it in preference to all others, because it is safe, and never has been followed by accident or ill effect. In fact it is the procedure here advocated, practiced and illustrated by cases. It is the method which treats the stricture through mild currents, by a " *galvanic chemical absorption.*"

The third method I only practiced when obliged to do so ; that

means, when the first method cannot be used with good effect, then the current must be increased. Only a very few aggravated cases will need this procedure. The after treatment must be conducted carefully, as the retention of the catheter in the urethra may cause irritation, cystitis and urethral fever. But even if it occasions, under very unfavorable circumstances, some inconvenience, it is preferable to the otherwise unavoidable perineal section, which, according to statistics, is dangerous. This method is particularly indicated, if the stricture is impassable and tough. The strong current may denude the walls of the urethra, and the plastic lymph thrown out will cause adhesions. To avoid such adhesions, the catheter is retained. The new entirely flexible rubber catheter is a great improvement for this purpose, as it is less irritating and self-retaining, thereby avoiding the dangers which might otherwise follow.

The second method I never have practiced, and cannot say anything about it, but it appears to me dangerous. It is mentioned here only as a theory, the practice of which I condemn.

A modification of this galvano-caustic method has been used by Dr. Wakeman, of this city. The doctor described his method to me in this manner: He uses the same variety of battery as I do, but attaches to the bougie, which is pushed down to the stricture, both poles. Thereby both poles are united, and the current acts on the same point, the effect of which must be a galvano-caustic. Dr. W. says he has used this method with success.

To the want of method in the operator, or to the badly selected cases, the failure and ill success of the operation may mainly be attributed. By well directed examination, cases suitable to the electrolytic treatment should be taken.

Examination of the Stricture.

Stricture is a pathological condition of the urethra, which by alteration of tissue has narrowed its calibre. Authors who have written on this subject, and enriched by their works its literature, have named different kinds of urethral strictures, divided and subdivided them. I deem this nomenclature of little importance, and unnecessary for my present purpose. For convenience I will, however, define the causation of the alterations found in the tissue.

The object of surgical interference is the restoration of the urethra to its normal physiological and anatomical condition, which includes power, healthy action, and, above all, its form and natural calibre. This being accomplished, the cure is completed. The method which will accomplish this gratifying result with the least pain or incon-

venience to the patient, with least interference with his daily avocation, is certainly the best.

The history of a case is always an important factor in its diagnosis. This maxim holds good in stricture of the urethra. It will often reveal its primary or remote cause; the cause will indicate, to a certain extent, the kind of stricture we have to deal with, and this contributes much towards a successful issue, and a great deal will be accomplished. If this is satisfactorily done, it will aid materially in determining the method to be relied on. For all practical purposes, we may divide strictures in three classes:

1. Spasmodic strictures;
2. Inflammatory strictures;
3. Organic strictures.

Spasmodic strictures may occur as a consequence of irritation, venereal excesses, masturbation, excess of acid in the urine, pyelitis, diabetes mellitus, arthritis, cystitis, nervous debility, etc. I have already observed that spasmodic stricture is amenable to cure by the Faradic current. This current is of much value if employed to confirm the diagnosis; but spasmodic contraction of the urethra, usually called stricture, is not a *real* stricture, and has no bearing on, or relation to, the electrolytic treatment, and is here referred to merely as a comparison.

The last two kinds of stricture are amenable to treatment by electrolysis. Both are generally the consequences of neglected acute urethritis, or the result of traumatic lesion. I have no intention to describe in this paper the different forms of strictures; I confine myself to the delineation of the last two. In the inflammatory stricture the calibre of the urethra is narrowed by the product of inflammation thrown out by exudation internal to the mucous lining. The case may be complicated by the presence of more or less granulations; whereas in organic stricture the calibre is lost by the pressure upon the altered parts, and heteroplasia of the deeper tissues. The knowledge of this pathological condition is a fact of much value for the intelligent and successful application of electrolysis. If this is understood, it necessarily follows that the organic stricture needs a stronger, and the inflammatory a milder current of galvanism in order to effect chemical absorption. Certain facts should be inquired into concerning the history of the case, such as the general condition of the patient, see whether inherited diathesis can be discovered, a peculiar dyscrasia, or if any complication be present at the seat, or anywhere adjacent to it. For example, if the stricture be compli-

cated with cicatrices; if there is syphilis, or tertiary symptoms. If either of these complications be present, the case is not a favorable one for electrolysis. The patient, under these circumstances, needs first constitutional treatment. Having now ascertained the history of the case, and noted carefully all its details, the investigation is still further continued by direct examination of the stricture in the following manner:

1. By instrumental manipulation and digital touch.
2. Exact measurement.
3. Ocular inspection.

1. *The digital touch.*—The exploring instrument transmits to the fingers certain sensations, which experience soon classifies, and which culminate in a highly tactile expertness. I use for the purpose a whalebone *bougie à boule*, which has a small, olive-shaped head and slender neck; this adds to its flexibility. Such an exploring instrument gives, from its peculiar shape, a delicacy of touch not to be obtained by any other known bougie. It defines with professional certainty the nature of the stricture; the progress of altered tissue can be ascertained and defined by it with a comparatively small experience, and with great certainty. I will now divide the progress of the stricture, and for convenience will admit four stages.

Assuming that the diagnosis has been made, and the preceding means employed, in order to ascertain the condition of the stricture, certain sensations will be revealed by touch; and in order to better comprehend this, I shall compare them with some well known material.

1st stage conveys a feeling of velvet or velveteen.

2d stage conveys a feeling of paper.

3d stage conveys a feeling of parchment.

4th stage conveys a feeling of cartilage.

In the normal state of the urethra, the bougie glides with comparative ease over its moist mucous lining. The skilled finger will readily detect any alteration or deviation, its relative and comparative severity, and the slightest encroachment on its normal standard will be revealed. The velvet touch represents a slight alteration only.

The *paper* touch represents the inflammatory stage.

The *parchment* touch represents fibrous tissue.

The *cartilaginous* touch represents calcareous or callous deposit, and signifies the worst form of stricture.

By the use of the olive-shaped whalebone bougie, the defects or

any abnormal condition of the urethra along its whole tract is soon detected. The instant the bougie enters the stricture, a peculiar feeling is manifest to the fingers of the operator; its penetration is announced with a great degree of certainty; there is a peculiar grasp, "a taking hold," which is distinctly felt on entering or withdrawing the bougie.

2. *Measurement.*—In order to ascertain with certainty the exact locality, length, size, etc., of the stricture, I generally introduce into the urethra a sound as large as the meatus will admit; by this manœuvre we ascertain at the beginning of our manipulation, the normal calibre of the urethra. The sound is then pushed gently forward, until we reach the stricture; that being accomplished, we carefully note in inches, by actual measurement, the distance the first stricture is met with from the meatus. Next we ascertain how large a sound the stricture will allow to pass; at the same time an attempt is made to ascertain the length of the stricture. Having discovered the available sound, the exploration is continued until the whole of the stricture has been explored. If any more strictures are discovered during the investigation, they are measured in the same manner as the first; a note of their topography is made and carefully recorded, because in all future operations the perfect knowledge of the localities of the impediments is of extreme importance for their proper treatment.

3. *Ocular inspection* by the endoscope will reveal important facts, such as form and color, character, or any complication by which the case may be surrounded.

The form of a stricture is not of necessity always annular. The contraction may vary, and assume many different forms. Thus, they may be irregular slits of different sizes, and in all directions; oval, round, square, triangular and serrated, in fact of infinite variety.

A fact of vast importance and an extremely valuable factor in the diagnosis, is the following:

When the tube of the endoscope is withdrawn from the urethra after an exploration, if the stricture be sensibly indurated, and especially if it be a slight one, the canal closes immediately behind the tube with great abruptness, as it is withdrawn; a circumstance which is in striking contrast with the gradual closing observed on the withdrawal of the instrument from a healthy urethra.

After a careful and minute examination is made, and the state, size, etc., of the urethra duly noted, a plan of action and future

treatment in accordance with the previous principles enunciated is decided on, and immediately carried out.

The Modus Operandi.

First.—The susceptibility of the patient to the galvanic current is to be ascertained, and is accomplished in the following manner: The two sponge electrodes are grasped in the palm of the hand; the metallic slide is carefully and slowly moved onwards, cell by cell, the strength of the current is thus entirely under the control of the operator, and should be augmented until the patient feels a pricking sensation. The toleration with which the patient endures the current without inconvenience, indicates the tension suitable for the operation, and may be varied according to circumstances; still, it should always be in accordance with the well-known laws and influences which govern electricity.

The position which the patient should assume during the operation, is a matter of slight importance; his own convenience should be consulted; he may either stand or sit, or may lie on his back with his knees drawn upward. In my practice the patient generally stands in front of me. Anæsthetics are not used, because I deem them unnecessary. On the contrary, I want the patient conscious, so that I may have the advantage of his statement as to the sensations experienced, during the progress of the operation, which, if righty performed, occasions no pain.

One of the bougies with metal bulb, as already stated, is now taken up; the size to be selected will depend on the method determined upon.

If the stricture is not too firm or fibrous, I generally commence with a bougie which is three or four numbers larger than I judge the stricture to be, and on the well based supposition, that the current will, through its peculiar action, absorb the stricture to such an extent, that the dilatation it produces will be equal to the difference of three or four sizes.

Having ascertained by actual measurement the locality of the stricture or strictures (if there be more than one), I push a small India-rubber ring over the bougie for each of them. This little manœuvre has many advantages; not the least important is, that I am made aware as soon as the india-rubber ring arrives at the meatus, that the extremity of the bulb must be in contact with the stricture.

Having the plan of the urethra through actual measurement

before me, I operate with additional certainty, and beyond a peradventure, as to the part which is acted upon.

The operator of some experience in this kind of manipulation is always made perfectly aware by digital touch where the sound is, at any time during the operation. The bougie, well lubricated, is now connected to the cord electrode of the negative pole, and then introduced into the urethra down to the first stricture; a sponge electrode is attached to the positive pole of the battery; the current is completed by placing the sponge either over the superpubic region, the thigh, or inner aspect of the patient's hand. I prefer the latter, because it is more pleasing to the patient, without weakening the effect of the negative pole. The current should now be very slowly and gradually increased, one cell at a time, or still more divided by resistances, until the patient feels there is a certain strength in the current. The galvanic current should never be so strong as to cause either pain or a burning sensation; because, in that event, the current in its action would approach the galvano-caustic, instead of the electrolytic, which is not contemplated. Generally the power obtained from eight cells is adequate, and will fulfill all the indications, and be found sufficient to overcome and penetrate the stricture. It will be found that an application of three to five minutes will be enough to make an impression; less time may answer for the bougie to advance and slip through the impediment.

During the whole of the operation, the bougie must be held loosely and gently in its place against the obstruction; all pressure or force, however slight, must be avoided. The bougie will take care of itself, doing its own work by the electrolytic power its action involves; whereas, pressure would not only defeat the object and purpose of its application, but expose the patient to serious danger from hemorrhage, or even rupture of the urethra.

The operation being completed, care should be taken to reduce the battery to 0, by gradually moving the slide back to the starting point, cell by cell, and only one at a time. When the slide is returned to the point from which it started, the current should be interrupted.

It will be observed that on withdrawing the bougie electrode, there is found surrounding its metal bulb a frothy, yellowish mass, which bears a strong resemblance to coagulated albumen. This product is part of the stricture, which has been decomposed by the electrolytic action of the battery. There are failures on record, but in my opinion this want of success is mainly due to a too prolonged or a too frequent application of the current, and to the causes previously

enunciated. The applications, to warrant a successful issue in any given case, should be repeated at intervals of at least two weeks, and in some instances a longer period should elapse before I would repeat the operation. However, if all things are favorable, and circumstances give me absolute control of the case, I would prefer a period of four weeks to intervene between the operations. This treatment must be continued until the urethra has recovered, and resumed its normal calibre, whatever this may be. As a rule, every patient may be well satisfied if his urethra admits a No. 12 English sound, and has no reason to complain that a stricture is troubling him. But if a large man has a normal urethra, the calibre of which corresponds to a sound No. 15 or more, our treatment with electrolysis must be continued until the size of such urethra is sufficiently restored to correspond with the normal calibre. At times I have found a normal urethra of the size of No. 11, the meatus even a little smaller, admitting the No. 11 sound only after careful stretching; and it was clearly proven that such urethra never had been larger. In all such cases I am well satisfied with a restoration to size No. 11, and would not think of enlarging such a urethra any further.

The question may be raised here, whether our treatment is ever followed by urethral fever, cystitis, or any other complication. To this I answer, that during the three years in which I practiced the *first* method, I never had any untoward symptom. But any complication may arise if either the patient or the operator give cause. Urethral fever is caused by a rough handling of instruments, or an over-exertion of the patient after the operation. Avoid the causes, and you will have no consequences. The other methods of electrolysis heretofore mentioned may have intercurrent effects from the strong currents used, or by complications of the disease, which no surgeon can control. For this reason I only recommend the first method; but the third method must be employed in certain cases, in order to avoid more dangerous means, which is the more justifiable, since Dr. Bumstead, in his excellent work, admits that "either of the modes of treatment (of stricture) now described, may be followed by rigors and other unpleasant symptoms, which are known as urethral fever, and sometimes terminate in speedy death." (Venereal Diseases, p. 300.) To illustrate this, I will now narrate an interesting case, in which circumstances forced me to practice the third method in order to avoid the more dangerous perineal section.

Case 2131.—*Traumatic impassable stricture of nine years' standing treated successfully by the third method of electrolysis.*—Mr. S. M. S.,

of Hartford, was sent to me by Dr. Storrs, of Hartford, on July 22, 1872, with the following history of a traumatic stricture: Mr. S. was in the mounted service during the war. In 1863 contracted an abscess in the perineum, which resulted in a urethral fistula. In 1864, Dr. Blackman, in Cincinnati, closed the fistula. The operation was a cutting one, and the wound was left open to heal by granulations. Soon a stricture of the urethra followed, which was treated by the introduction of sounds at intervals. The stricture grew gradually worse, until no instrument would pass it. For the last six weeks the urine only dribbles away by drops, and not the smallest sound or even catgut will pass the stricture. The kidneys are disturbed, occasionally congested. The urine is pretty constantly albuminous, which is occasioned by the difficulty of passing water. For years he never had entirely emptied his bladder, as a residue was always left, causing cystitis. The ureters were often filled with urine, producing disturbance of the kidneys. On examination, I found that a large steel sound No. 12 entered the meatus easily, and passed down to the seat of the stricture, which was six inches from the meatus. Whalebone bougies, catgut and other instruments of the smallest size were tried, but none passed the stricture. Next an examination was made with the endoscope. The large tube enters, with a little difficulty, a distance of six inches, where it encounters the stricture. On inspection, we see that the stricture is well formed, and a plastic exudation, like a duck's web-foot, presents a grayish white appearance, with elevations standing out like granulations. On the right side the remnant of the opening can be seen, very narrow, irregular, congested, irritated, and bleeding on slight touch. Next electrolysis was used with Drescher's galvanic battery. A bougie No. 6, the end of which had a metal bulb, was introduced to the seat of the stricture, and attached to the battery as the negative pole; the circuit was completed by the sponge electrode in the hand of the patient. The current was kept up for eight minutes, but the bougie would not enter the stricture. Then a bougie No. 3 was substituted, and passed into the stricture slowly, and worked its way until it was seven inches in the urethra. Here it could be felt distinctly that the bougie was at the end of the stricture, and it was then pushed easily into the bladder to its whole length—nine inches. Hence the stricture was one inch long, from six to seven inches deep. After this operation he felt somewhat relieved.

Aug. 12.—Battery of twelve cells for twenty minutes, with metal bougie No. 6, entered the stricture three-eighths of an inch, but

would go no further, nor pass the whole stricture. Hemorrhage prevented further operation.

Aug. 13.—Has had a good night's rest. Urine passes with difficulty, and burns a little. No instrument will pass the stricture. Chloroform was given, and electrolysis used. A steel sound No. 7 as negative pole was introduced, and full twenty cells used for twenty minutes. At last the sound passed the stricture and into the bladder. Chloroform was then discontinued, and a bougie No. 15, with a metal end, and the other part insulated, introduced as the negative pole. The patient was conscious, and saw how the bougie No. 15 passed through the stricture into the bladder. The bougie was slowly withdrawn under a galvanic current of fourteen cells. The patient felt no bad effects afterwards, no pain. One hour afterwards he passed water. He left for home in a few hours.

Sept. 9.—After last operation he has improved, and passed a steady stream of water, equal to about No. 3 or 4. But within the last few days he has grown worse, and the urine only dribbles away with difficulty and pain. Endoscope (large tube), shows an immense inflammation and irritation at the stricture, and many small granulations have sprung up; therefore it was thought not advisable to interfere operatively at this time, as no good result possibly could be expected under the circumstances. In order to allay irritation and gain space, urethral suppositories were ordered.

Sept. 15.—Feels better; says in five years he has not felt so well. He passes water better, and is free from any irritation or pain.

Sept. 17.—His constant hard labor in his business, and the travels on the railroad, have excited the parts to such a degree, that he has a relapse, and cannot void urine, which only dribbles away in drops. No instrument will pass the stricture, not the smallest. My friend, Dr. W. H. Maxwell, of this city, saw him in consultation, and coincides that an operation for his relief is unavoidable, but is not advisable here in a hotel, where our patient is without care, away from his friends. Consequently he went home, and on September 25th the operation was performed in Hartford, in the presence, and with the kind assistance of Drs. Storrs, Fuller, Ellsworth and Russel, all eminent practitioners of Hartford. Under chloroform another effort was made to overcome the stricture, which was still impassable to all instruments. Then the electrolysis was used, but my usual bougies were not stiff enough, and becoming too flexible, might have made a false passage. Now the only alternative was a different form of electrolysis, with strong currents, to overcome the stricture, or

perineal section. But, as this latter plan could be pursued if the other failed, therefore electrolysis was decided upon. A steel sound No. 7 was introduced to the seat of the stricture, and the free end connected with the negative pole of the galvanic battery. The circuit was completed by a sponge electrode as a positive pole, and held firmly on his thigh. The electrolysis was kept up with twenty cells for nearly half an hour, during which time the sound made slow but steady progress. The advance was directed with one finger in the rectum, and only guided by the anatomical relations. At last the sound could be moved within the bladder. In consultation, the plan of the after treatment was decided upon, of which the important point was to keep the urethra open, and thereby to prevent adhesion. The patient was then left under the care of Dr. Storrs, to whose judicious treatment I am indebted for the final result. Dr. Storrs' notes are as follows:

Wednesday night restless; first micturition only blood; second time, before daylight, a full stream. Ordered morphine, gr. ss.; dose every two hours.

Sept. 26.—Morphine only two doses; pulse 120; sensibility of skin and thirst; urine in full stream.

Oct. 1.—Urine with more difficulty; smaller stream and straining; pulse 80; catheter No. 3 passed, then a No. 5 was left for the night; suffering pain, and frequent vomiting.

Oct. 2.—Catheter removed; patient fell asleep; when attempting to urinate, the flow ceased suddenly; after pain and straining, a calculus was voided; then the urine flowed in a large stream, and in an easy way, such as had not been known for years.

Oct. 5.—Catheter No. 5, easy.

Oct. 21.—Catheter No. 11, easy; considered well.

Dec. 12.—Sound No. 12 introduced by himself.

I firmly believe that the calculus voided by the urethra was encysted in the bladder near the sphincter, and that the electrolytic action loosened it from its encasement. The sudden stoppage of water on Oct. 2, was caused by the calculus dropping into the urethra. The patient has been kept under observation, and has remained well. Only to confirm the success, he passes, in long intervals of many months, a sound No. 12 into his bladder, and reports well.

The first method, as described before, I practice now almost exclusively, and consider it the only safe one. I have about thirty cases

on record, of which the following, in brief, I will mention, as details would cause too much repetition :

Case 2045.—*Two Strictures, Complication of Syphilis.*—W. H. B., an actor, of this city, came under my treatment in March, 1871. Found on examination two strictures at one, and at five and a half inches. Had syphilis, which aggravated the strictures, and undoubtedly this complication caused the strictures to impart a feeling of cartilage, which brings them almost under the calcareous species. The patient received constitutional treatment, and a few seances of electrolysis cured the strictures. He has been heard from recently, and has remained well.

Case 2092.—*Two Strictures, Chancroid. Failure of Dilatation. Success with Electrolysis.*—R. A., hotel keeper, came under my treatment in March, 1872. Had been treated in the country for stricture by dilatation, with no success. Found a chancroid in the urethra, which was treated first. The two strictures were found situated at one and a quarter, and four and a half inches from the meatus, respectively.

Mar. 22. Electrolysis was used with a bougie No. 10, with a metal bulb as negative ; positive electrode in the palm of the hand. Ten cells of the galvanic battery were used for nine minutes, and the bougie passed slowly through the strictures into the bladder.

April 14. The operation was repeated with a bougie No. 12. The patient has been heard from only recently, and has not had a relapse.

Case 2098.—*One Stricture, Spermatorrhœa, Impotence, Melancholia.*—March, 1872 : R. T., merchant, in Philadelphia, came to my office in an advanced stage of hypochondriasis, complaining of general malaise, spermatorrhœa, impotence, small stream of water, pain in the urethra, etc. A steel sound No. 12 entered the urethra easily, but was arrested at seven inches. Sounds of smaller size were all arrested likewise at the same point. There is no doubt that a stricture exists, and at last a sound No. 7 passed it with difficulty. The trouble must exist either at the junction of the membranous and prostatic portions, or in the latter. Galvanism was used with ten cells. Bougie No. 10, with metallic end as negative into the urethra ; met the same obstruction at seven inches. The positive pole was a nickel bulb, and grasped firmly with the closed hand. After five minutes of the electrolytic current, the bougie passed the stricture slowly, and slipped into the bladder. The withdrawal of the bougie was followed by a thick gleety discharge. It seems that this matter had accumulated behind the stricture, irritated the pros-

tatic portion and the ducts, and thereby was accessory to creating a spermatorrhœa. On passing water, shreds came along of a thick, white mass, which were the product of electrolysis. The operation has not caused pain, and the patient traveled home without any unpleasant feeling.

April 16. On examination with a sound No. 10, found the stricture at the exact place. The sound passed the stricture after persistent and patient efforts.

Then the galvanism was used as before, with a bougie No. 12 as negative, and with the same result.

May 9. In Philadelphia, a sound No. 12 could be easily passed into the bladder, which proves that the stricture is cured. The patient has been kept under observation for two years, and was seen only two weeks ago; he is perfectly well; has been married since, and is the father of a healthy child.

Case 2129.—*Gonorrhea and Stricture.*—July, 1872: M. M., merchant, has a gonorrhoea for four months, which has been aggravated by strong injections, which was followed by phymosis and epididymitis. On examination, found a large urethra; at one and a half inches a stricture, which permits the passage of a No. 9 sound; at five inches a soreness is encountered, which was afterwards diagnosticated by means of the endoscope, as granular urethritis. After proper treatment of the complications, the stricture was cured by electrolysis in three seances, as follows:

July 30. Galvanic battery ten cells. The bougie No. 12 absorbed the stricture in five minutes.

Aug. 17. Bougie No. 13 passed the stricture in five minutes, during which the galvanic current was gradually increased to fourteen cells.

Sept. 14 Galvanism with nine cells for eight minutes. Bougie No. 15 passed through the whole urethra slowly.

Patient was ordered to introduce sometimes a No. 15, with an ointment, in order to overcome and heal the soreness of the urethra.

He has been seen since frequently, and during the twenty months following the electrolytic treatment, no relapse has occurred.

This is a typical case in which circumstances permitted the treatment to be carried out as recommended in a former part of this paper. The urethra of this patient has retained the calibre of No. 15.

Case 2155.—*One Stricture and Gleet.*—Nov. 1872: Mr. P. had

gonorrhœa fifteen years ago ; Cystitis with hæmaturia one year ago, and since, a serous discharge with diminished stream of water.

Found one stricture one inch from meatus, which was cured with electrolysis in two sittings. Patient has left the city, and has not been heard from since.

Case 2162.—*Gonorrhœal Stricture.*—Dec., 1872 : W. R. B., clerk, had gonorrhœa last spring. The discharge ran for five months. Last week had connection, and found on the following day a discharge ; it has now run slightly for one week ; stream of water is small ; straining troublesome ; *bougie à boule* enters into a pouch at two and a half inches ; sound No. 11 encounters a stricture at five and a half inches ; therefore, it seems that the discharge emerges behind the stricture, and is caused by it. Conclusion is, the cure of the stricture will remove the discharge. Two galvanic applications were made at intervals of four weeks, after which a bougie No. 13 passed the whole urethra easily. The patient was dismissed as cured on Jan. 21, 1873. He has remained under observation, and is perfectly well.

Case 2164.—*Simple Stricture.*—Dec. 30, 1872 : H. B. S., from Connecticut ; defective history ; has one stricture at two and a half inches, which was restored to a normal state in one seance ; on a subsequent visit was found well.

Case 2165.—*Three Strictures.*—Dec. 30, 1872 : S. J., saloon-keeper, was brought to my office by Dr. Good.

The patient has had strictures for a long time, which resist all dilatation ; are tough, and cause painful micturition with a small stream.

Whalebone *bougie à boule* finds three distinct strictures at two, four and five and a half inches, of a parchment feel.

Galvanism was applied ; the sponge electrode as positive pole was pressed in the iliac region, and a bougie with metallic bulb pushed into the urethra as the negative pole. In six minutes, with the current of fourteen cells, all strictures were overcome. Immediately after the operation, he passed water without pain or difficulty. The stream was full, and larger than he has had for many years. The patient has not been heard from since.

Case 2179.—*Stricture of three years' standing.*—Jan., 1873 : T. G., from Missouri, has a bad stricture at five and a half inches, of three years' standing, caused by a prolonged gonorrhœa.

The treatment was tedious, and was retarded by the patient's imprudence. At last the galvanism absorbed the stricture, so that a

sound No. 15 could be introduced easily into the urethra. The patient went home after three months' treatment, and has since reported well.

Case 2192.—*Three Strictures.*—April 16, 1873: G. S. B., from Oneida Co., was sent to me by Dr. Good. *Bougie à boule* discovered three distinct strictures at two and three-quarter inches, at three and three-quarter inches, and at six and a half inches respectively. In withdrawing the small bougie No. 4, it remained engaged in the second stricture, which was decidedly fibrous. Strong fibrous bands held the extremity of the bougie firmly, and to disengage it, it was almost necessary to rupture that stricture to a certain extent.

The electrolytic action was applied as in the other cases, and the bougie No. 8 connected with the negative pole passed slowly through all the strictures in five minutes. The patient reappeared two days afterwards, and reports marked improvement. He says he must return home, and therefore wishes another galvanic application. It is against all rules to repeat such an operation after so brief an interval; but necessity knows no rules. The patient had to go home, and felt so much better after the first operation that he desired a repetition, and promised to return as soon as necessary. Therefore an exception from the rule was made, and the galvanism applied again with an excellent result. The bougie No. 11 passed slowly through all the strictures in four and a half minutes. The patient passed a full stream of water, and felt marked relief. Before his departure home on the next day, he came again to state that he is well, feeling no soreness or fatigue. I heard from him in the fall, and he reported well.

Case 2204.—*Stricture and gleet.*—June, 1873: J. R., saloon-keeper, is near his wedding; has a gonorrhœa, which, under the treatment of a druggist, grew worse; has also an abscess in the glans, near the frenum; has fever and pain in consequence of the inflamed urethra After subduing the inflammation by internal means, the discharge continues. On examination with *bougie à boule*, a stricture was found at four inches. There was a contraction, a hard, fibrous resistance. Galvanism applied; positive in hand, bougie No. 11 in urethra as negative, soon passed the stricture. Then an injection of water brought by its return a large semi-solid white mass, looking like dead skin thrown off. This was the product of the galvanic action, the real stricture absorbed. It had an alkaline reaction, fibrous in appearance, and looked like the core of a carbuncle. There is no doubt that a former gonorrhœa had caused the stricture, behind which a pouch had formed, which acted as a receptacle, and created

a discharge, by which means the stricture grew worse. Now it is natural that no remedies adapted to gonorrhœa or gleet could have stopped the discharge; but the treatment of the stricture cured the gonorrhœa. The patient felt no pain from the operation, and was easier immediately. Two days afterwards a sound No. 12 passed easily into the bladder, and no discharge followed. He married, received afterwards a little treatment, and all went on well. He has been under constant observation, and has remained in good health.

Case 2229.—*Three strictures.*—Sept., 1873: Mr. E. S., New Haven, about twenty years since had a gonorrhœa; was treated only with medicines; had no injections, and finally recovered. Twelve years ago had renal difficulties; passed acid formations from the kidneys, but never passed calculi. Two years ago the stream of water grew smaller by degrees, and sometimes he could not void urine at all. Was treated for stricture, but was not relieved. On examination, the *bougie à boule* encounters three strictures:

First, at three and one-eighth inches, which is overcome by rotating, and directing the points to the anterior wall of the urethra. The bougie is not caught on the return, but slips easily back.

Second, at five and a half inches, from which point the calibre of the urethra remains narrowed until the

Third stricture, at six and a quarter inches, which is only overcome by bending into the curve, and slowly pushing and pressing forward. This last is the worst stricture.

Oct. 3.—Galvanic battery used. A No. 13 bougie, with metal bulb as negative pole, passed through all the strictures in four minutes. The bougie, during the action of electrolysis, was firmly grasped by the strictures, and even by the prostate, and advanced slowly and by degrees into the bladder, so that the full measure of the bougie introduced was ten inches. The battery used was very weak, and therefore twenty cells were in operation. The positive sponge electrode was held in the palm of the hand. The electrolysis was kept up seven minutes in all.

Oct. 21.—Galvanic application repeated as before; nine cells for ten minutes. The bougie No. 15 as negative had scarcely any difficulty, and entered soon through all the strictures.

Oct. 31.—Slight galvanization. Bougie No. 15 entered easily, without detention or pain. The patient passes a large stream of water now. For other ailments he is still under treatment, but the urethra has had no relapse.

More cases could be reported, but as there is a similarity in many,

it would be only a repetition of facts. Other cases have been treated recently, and the record would not be so valuable, but I believe the clinical facts here recorded are sufficient basis for the theory elicited in the first part of this paper. And in conclusion I can only repeat that I only recommend the first method as a perfectly safe one; and the success of the electrolysis depends mainly on the chemical decomposition or absorption by mild currents, very gradually increased, and repeated at sufficiently long intervals.

145 West Forty-seventh street,
New York, February, 1874.