lanced. Discharge of pure blood. General condition of patient as good as usual.

July 30th.—Ligatures all away. External wound entirely healed.

Aug. 1st.—Quite comfortable. Discharge diminishing. A small piece of gutta-percha was moulded between upper and lower jaws of right side, and a bandage around the head and chin to keep the bone up in place.

Aug. 3d.—Steadily improving. Jaw in good position.

Aug. 5th.—Discharge from right nostril about normal. Patient walks about Hospital grounds, without suffering any inconvenience or pain.

Aug. 12th.—Still doing admirably. *No purulent discharge.* Some pain on pressure where the jaw was sawed across. Plug between jaws continued. No appreciable motion of parts of bone.

Aug. 22d.—Progressing very favorably. Bandage and gutta-percha removed. Union of maxilla firm. Four weeks since operation.

Aug. 28th.—Discharged at his own request, well. Still wearing the wire about the teeth.

Sept. 2d.—Reported himself at the Hospital, in excellent condition. The wire removed. Union perfect; able to chew; now six weeks since the operation. Respiration clear. Examined with the rhinoscope by Dr. Langmaid, and the pharynx found healthy. A slight catarrh from the right nostril; nothing more.

ON THE TREATMENT OF PERMANENT URETHRAL STRICTURE.

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THE frequency of urethral stricture and the great obstinacy with which it yields to curative means, have caused the subject of its pathology and treatment to occupy the attention of the most eminent surgeons; and many are the means that have been tried in order to conquer this very common ailment. The object of the writer of this brief article is to describe the simple method by which M. Maisonneuve, of the Hôtel Dieu, claims to have obtained many radical cures; but perhaps before giving an account of his operative procedure and instrument, a few general considerations may not be out of place.

Until recently, investigations on this subject have been carried on, comparatively speaking, in the dark, as the anatomical situation of the lesion is such as to render its study impossible except on the autopsy table, and this only showed that in a certain number of cases a more or less complete contraction of the walls of the urethra was found, caused by the presence of a dense fibrous tissue, generally in, or close to, the membranous portion, of the same gross appearance

and microscopic structure as the cicatricial tissue which we see on the common integument as the result of the healing of any lesion of continuity. But as to what the causes might be that produced this tissue, or the manner of its production, *post-mortem* examinations told nothing.

It being a characteristic of the human mind, and of the medical mind especially, to give a hypothetical reason for any existing fact, the causes of which are unknown, many hypotheses were advanced to account for the formation of strictures. The most natural supposition was, that, as on those parts of the body that are exposed to sight we see this, or similar, tissue formed as the result of some traumatic injury, such should also be the case in the urethra; and, indeed, instances were found in which there seemed every reason to believe that such was the fact. Contractions of the urethra were observed where there was a clear history of some previous injury, such as external violence, formation of false passages by catheterization, blows on the penis when in a state of chordee, &c. &c. But, on the other hand, in by far the greatest number of cases no such history could be obtained. It was, however, noticed that almost all such patients either were, or had been, suffering from a chronic gonorrhœa.

This fact was found to be so constant that the conclusion of cause and effect seemed to be justified; and the next step was to discover in what way the gleet could produce the stricture. The theory that it was the result of the use of strong injections found many supporters. This theory was the result of the "*post hoc, propter hoc*" process of reasoning; as it was proved that most patients who had stricture had used such injections. As, however, Ricord, by the same logic, proved that flax-seed tea was the cause of stricture, and as, moreover, we see that nitrate of silver, even in the solid stick, can be used on a mucous membrane with great freedom without causing a cicatrix, this supposition cannot be sustained. The explanation which has been most generally adopted, and which is found in most works on the subject, is in accordance with the pathological ideas of the day, and is, in a few words, as follows:—The chronic irritation of the mucous membrane of the urethra from a gleet produces an exudation of plastic lymph into the mucous and submucous tissues. This lymph becomes organized and forms a dense fibrous tissue, which contracts in the same manner that a cicatrix does, and thus produces the obstruction or stricture.

Virehow, when he revolutionized pathology with his cellular theory, showed that this explanation of the genesis of stricture was not correct. He has proved that no organized tissue can be formed from an exudation, but that all pathological as well as physiological tissues must spring directly from some tissue already existing, and that this is accomplished by means of a proliferation of the cellular elements (*zellenwucherung*). The result of his investigations has been to show that a tissue which heretofore has been known as merely

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covering and binding together the various elements and organs of the body, plays a most important part in many pathological processes. This tissue is known as connective tissue (*bindegewebe*), and the proliferation of its cellular elements is the origin of many pathological processes and new formations (*bindegewebeswucherung*).

Such is the structure of the urethral stricture; it is due to a fibrous tissue, resulting from the hypertrophy of the physiological connective tissue of the urethra, which fibrous tissue has a strong tendency to contract, and thus to diminish the calibre of the canal.

It is, however, to M. Desormeaux that we are indebted for the discovery and demonstration of the manner in which this increase of connective tissue is produced by a gonorrhoeal urethritis. He has shown by means of his endoscope that between the stage of acute urethritis and a fibrous stricture there always exists a granular condition of the urethra, which he calls "*urethrite granuleuse*." During this stage of the disease, cellulo-vascular granulations can be seen in the urethra in the membranous portion, or just anterior to it. These granulations are of the same character as those which we see at the base of any healthy wound or ulcer in the process of healing, and, like these, gradually change into fibrous tissue, which contracts.

We may, then, consider that a permanent urethral stricture is due to the existence of a contracting fibrous cicatrix, caused by the healing of an ulcerated condition of the mucous membrane, which ulcerated condition is the result of a chronic urethritis.

The symptoms of stricture are too numerous and well known to be recapitulated here, but a few words with regard to some of them may not be misplaced.

In all works on stricture great stress is laid on the size and character of the stream of urine as a means of diagnosis. As the size of the stream depends on the calibre of the urethra, and as this varies considerably in different cases, it alone cannot be of much value as a diagnostic sign.

A forked or twisted jet of urine is given in most books as one of the reliable symptoms of stricture, and the student is left to infer that this peculiarity of the stream is in some unknown way due to the obstruction. It is undoubtedly true that patients with stricture will often, especially on first rising, pass a double stream, or even one consisting of three or more jets, like that issuing from the nozzle of a watering pot; this, however, is not caused by stricture (at least not directly), but by the coagulation of the gleet discharge on being exposed to the air, which glues the lips of the meatus urinarius together at one or more points, and thus breaks the stream. As by the force of the flow of urine these adhesions are broken, the forked character of the stream ceases, and the patient passes a single jet. The twisted, or, as it has been called, the corkscrew jet, is not dependent on, or connected with, the stricture in any way, but is the normal form of the jet of urine. Professor Zeissl, of Vienna, ex-

plains this form of the jet of urine as follows. The shape of the meatus during the act of micturition is not like a simple slit, but more like an 8, in which the top and bottom have been drawn away from each other—or rather like an ellipse, the sides of which have been pressed in until they almost touch each other; so that the stream may be considered as consisting of two jets, one issuing from the superior and one from the inferior part of the meatus, being connected by a thin sheet of fluid which issues from the middle part. It is to the fact of these two jets crossing each other that the rotation of the stream is due. The upper jet falls upon the lower one, and by its force gives a rotary motion to the whole stream. That this is the case may be easily shown by slightly twisting the penis on its axis, when it will be noticed that the stream will change its twist from left to right, or from right to left, as the upper jet happens to fall on the right or left side of the lower one. Another characteristic laid down in the books as belonging to stricture is, that the last drops of urine dribble out and fall perpendicularly, instead of being projected in the same direction as the rest of the stream. This takes place, but in a less degree, in a normal stream, as, when the bladder ceases to contract and the internal vesical sphincter closes, whatever urine remains in the urethra is passed out merely by the action of the *acceleratores urinæ* and the *compressor urethræ*. The reason that this is most marked when there is an urethral stricture is, that the obstruction preventing the free passage of the urine through the urethra, the portion of the canal posterior to the obstruction becomes distended, and consequently when the sphincter closes there is more urine left in the urethra to dribble out. This dribbling of the urine may also depend on a partial paralysis of the muscular coat of the bladder. In short, it may be stated that the only *sure* proof of the existence of a stricture is that given by an exploration with a bougie.

With regard to the treatment of strictures, the indication is clear. The cause of the trouble being an obstruction in the urethra, the indication is to remove it; but unluckily, although the indication is clear, the means by which it is to be carried out are not.

As we know of no means by which the tissue forming the obstruction can be made to disappear and be re-absorbed, the next best thing that we can do is to force a passage through it, or, more correctly speaking, increase in size the small passage that exists; and this has been the aim of the various methods of treatment that have been adopted. These methods are as follows:—gradual dilatation, sudden and forcible dilatation, and incision.

The method by gradual dilatation consists in the daily passage of bougies, gradually increasing in size until the obstruction is fully dilated. This method is safe and not painful, and the only objections to it are, that it cannot always be done, and that the stricture is sure to contract again if the passage of a bougie is omitted for any length of time. The fibrous tissue in some chronic cases is so

firm and unyielding that even the most gradual increase in the size of the bougie will prevent its passage. In such cases we must resort to incision or forcible dilatation. The latter method has been strongly recommended; the best instrument is one which is known as Holt's dilator. This consists of a staff formed by two blades, which are united at one extremity, and between which there is a small rod. The staff is introduced into the stricture, and a tube is then put on the central rod and passed down between the two blades; as it is pushed down it separates the blades from each other, and thus forcibly ruptures the contraction. The objections to this method are, that it is sometimes very difficult if not impossible to get the stiff and unyielding staff through the obstruction; that if its point is made small enough to pass through a tightly contracted stricture, there will be considerable danger of forming a false passage in endeavoring to get it in, and that we have no means of limiting or even determining the amount of laceration of the tissues produced. Moreover, many strictures do not implicate the whole circumference of the urethra, but are confined to one of the sides, while the other remains covered with normal mucous membrane; in such cases the result of forcible dilatation would be, that that part would give way under the pressure that possessed the least power of resistance, i. e., the healthy mucous membrane rather than the tough fibrous tissue, and as this rupture must heal by the formation of cicatricial tissue, we shall have substituted in the place of a stricture occupying one side of the urethra, an annular one extending all around the canal. It remains to consider the method by incision.

From what has been already said, it must be evident that there can be, strictly speaking, no such thing as a radical cure of stricture, for inasmuch as the trouble consists in the existence of a fibrous contracting tissue which we cannot cause to be re-absorbed, and as, whether we break through this tissue, cut through it with caustics, or cut through it, there must always be a lesion of continuity, which in healing must produce new tissue of the same character, we have merely succeeded in obtaining a temporary freedom of passage, the tendency of which is to contract again and become as bad as ever.

This can, however, be prevented by the use of bougies, and it is to the judicious after-treatment by this means, much more than to the operative means used, that the successful treatment of stricture is due.

There are, however, some points to be considered in selecting the method of operation, and in the choice of an instrument. The operation, as performed by M. Maisonneuve, combines the advantages of simplicity, facility of execution, protection from hæmorrhage and urinary infiltration, and is not very painful. The instrument he uses is an urethrotome invented by himself. It consists of a staff, grooved on its concave side, with a screw at its smallest extremity, a capillary elastic bougie which screws on to the staff, and a small triangular blade, which, by means of two small slots, fits into the groove of the

staff, and can be moved up and down. This blade is the shape of an isosceles triangle, with an obtuse apex; the apex is blunt, the two equal sides are sharp, and the base runs in the groove of the staff. The capillary bougie is first passed through the obstruction; the staff is then screwed on to it and passed down, the bougie going before it and as it were leading the way, and as it enters the bladder coiling itself up. When the staff is well through the stricture, the blade is fitted into the groove and pushed down; its blunt apex passes along the superior wall of the urethra, which is thus kept from the sharp edges, but as soon as the stricture is reached, the sharp side of the blade presses against it, and, guided by the staff, cuts its way through the obstruction. The whole instrument is then withdrawn, and a large-sized catheter is introduced and kept in for twenty-four to forty-eight hours. Such is the simple method of urethrotomy for which we are indebted to M. Maisonneuve. Its advantages consist in the use of the capillary bougie, by means of which we are enabled to pass the staff through the stricture without any danger of forming a false passage, and in the power which we have of regulating the depth of the incision; this depends on the altitude of the triangular blade used. Each instrument has three blades of different sizes. The introduction of the large catheter prevents the possibility of any hæmorrhage by its pressure against the cut surfaces, and also protects the wound from contact with urine, until it is sufficiently glazed over with lymph to prevent the possibility of urinary infiltration. Unfortunately, M. Maisonneuve is not content with having originated the best known operation for incising an urethral stricture, but claims that by this operation he effects a radical cure. That this claim cannot be admitted is, it is hoped, sufficiently shown by what has been previously said. The cure, so far from being a radical one, is only just begun. The urethra must be kept dilated by passing bougies, at first daily, and then gradually decreasing in frequency, so that by the end of the third month once a week will be sufficient. The patient should be taught to pass a bougie on himself, and it should be plainly stated to him that for some years, if not forever, the neglect of so doing will expose him to a return of his trouble. Fortunately, the necessity of occasionally passing a bougie is not a great hardship, certainly nothing in comparison with the amount of suffering caused by a tight stricture.

In conclusion, it may be stated that gradual dilatation should always be tried, and urethrotomy be resorted to only when the stricture will not yield to this method. The remarks with regard to the after-treatment are equally applicable to all operations for the cure of stricture, from the simple gradual dilatation to perineal section.