

carried on as above described, except that flexible instruments should be used until the stricture is dilated sufficiently to receive a No. 15 or 18 sound. The great danger of making a false passage in using a conical steel sound smaller than No. 15 cannot be too strongly impressed upon those who have never had an opportunity to observe how easily this unfortunate accident can occur. Though with steel sounds progress is more rapid and discomfort to the patient is less, yet for all sizes below No. 15 or 18 soft instruments should be used.

Since less dilatation is usually accomplished at each sitting with the flexible bougies than with sounds, the resulting congestion and irritation are less and subside more rapidly, so that the intervals between sittings should be shorter. The proper interval varies from two to five days, and should be determined in each case in the same manner as when sounds are used.

In some cases of old stricture, though the patient be able to pass a small stream of urine, great difficulty is experienced in introducing even the finest instrument. The opening is usually eccentric and may possibly be covered with a flap of mucous membrane; or the canal through the stricture is tortuous and presents many small pockets, open follicles, or false passages (Fig. 26). Such strictures are often termed "impassable," but so long as a stricture has a calibre sufficient to allow the escape of urine, it is possible to enter it with filiform bougies if these be used with the proper skill, patience, and perseverance. The methods of using filiform bougies have already been described in detail.

It sometimes happens that a number of prolonged sittings at intervals of a day or two are necessary before

an instrument can be made to enter the stricture; but these attempts should not be given up unless there be retention or other urgent symptoms demanding immediate relief, or unless the use of instruments is followed by urethral fever or by other unfavorable result. Sometimes the end of the bougie enters the stricture far enough to be grasped, but will pass no further. In such a case the bougie should be left in this position for ten or fifteen minutes, when it probably can be introduced still further. If it refuses to pass further at the end of half an hour, it may be tied in place and left for twenty-four hours, at the end of which time, if it will not enter the bladder, it will at least have dilated the anterior portion of the stricture, which will consequently be more readily entered by other instruments, some of which will eventually pass to the bladder.

When a filiform bougie has passed a stricture after several unsuccessful attempts, the next step in treatment depends on a number of conditions. If the previous manipulations have caused little urethral irritation, if there are no symptoms demanding immediate interference, and especially if the operator has located the opening of the stricture, so that he can find it readily at the next visit, the bougie should be left in place for from fifteen minutes to an hour and then be removed. Retention due to swelling of the mucous membrane may follow, but it rarely lasts for more than a few hours, and it can usually be relieved by a hot bath and, if necessary, by an opiate. At the end of forty-eight hours a large bougie can usually be passed, and treatment by gradual dilatation is then fairly begun. If the stricture is somewhat irritable, is complicated by partial or complete retention, and has been entered with great difficulty,

and especially if the urethra be sensitive to instrumentation, the best method of treatment is by continuous dilatation.

*Continuous dilatation* is accomplished as follows: The first filiform bougie that passes should be tied in and allowed to remain for twenty-four hours. After a few hours the stricture dilates and allows the urine to pass beside the bougie, so that retention rarely occurs. At the end of twenty-four hours the dilatation is usually considerable, and the filiform may be replaced by a bougie a size or two larger, which may be tied in for another twenty-four hours. Successive sizes may thus be used for a few days until the stricture will admit a No. 8 or No. 10 bougie. Further dilatation is best accomplished by the gradual method. The chief objection to the employment of continuous dilatation is that it occasionally results in cystitis or produces urethral fever. The danger can be lessened greatly by using all antiseptic precautions, including irrigation of the urethra and the bladder, and by giving full doses of boric acid throughout the treatment. The new bougie or catheter substituted each day should be one or two sizes smaller than the largest that can be introduced. An instrument that completely fills the stricture produces more pressure and increases the danger of complications without producing more rapid dilatation than one a size or two smaller. Very small bougies, however, may easily be washed out of the urethra by the urine. The outer end of the bougie should be tied with two or three pieces of soft cotton twine to the pubic hairs. If these pieces of twine are also fastened to a ring (large enough to permit erection) of narrow tape encircling the penis an inch or two from the glans, the bougie will be held more

securely. Unless some means be employed to secure the bougie, it may slip out of the urethra, or it may escape backward into the bladder and necessitate an operation for its removal.

Continuous dilatation should not be employed in patients who do not tolerate well the presence of a bougie in the urethra, nor in patients who will not remain in bed during the treatment. It should be substituted by some other method if it is attended by decided urethral fever. Slight fever and chills are not sufficient reason for suspending treatment, but such cases require careful and constant watching.

When continuous dilatation is not applicable to a given case, the first filiform bougie passed may be used as a guide for the introduction of a tunnelled sound or a catheter. The method has already been described in detail. If the attempt is successful, gradual dilatation may follow. If the tunnelled sound cannot be introduced, and if continuous dilatation is not permissible, urethrotomy must be performed.

Dilatation, as previously described, is the most effective as well as the safest method of treatment in most cases of stricture; but there are not infrequently encountered cases which refuse to yield to this method, and which may be rendered worse by attempting to continue it. Treatment by internal urethrotomy when the stricture is located in the pendulous urethra, and by external urethrotomy or by the combined method for stricture of the deep urethra, is necessary in the following classes: 1. Most of the true strictures of the meatus. 2. Cicatricial and traumatic strictures which refuse to yield to either gradual or continuous dilatation. 3. Resilient strictures which rapidly re-contract after dilatation.

4. Strictures in which attempts at dilatation are followed by marked urethral fever and chills. 5. Strictures complicated by abscess, fistulæ, extravasation, or other conditions which render a perineal section necessary, the stricture being divided at the same operation. 6. Strictures with which retention is complete or of long standing, or with which the general health is involved and immediate relief is necessary. 7. Some strictures complicated by an enlarged prostate. 8. Strictures in individuals who cannot give the time necessary for treatment by dilatation.

Many operators cut all strictures of the pendulous urethra, but the majority of surgeons of the present day cut such strictures only when they refuse to yield to dilatation. The cutting operation must be followed by the regular use of the sound if the results are to be permanent, and internal urethrotomy is attended not only by some danger to life, but also, when the operation is extensive, by danger of subsequent deformity of the penis, rendering erections imperfect or painful and interfering with the expulsive power of the urethra, so that micturition is followed by dribbling of urine. Many of the "strictures of large calibre" which have been reported as cured by internal urethrotomy alone were undoubtedly mere normal contractions of the urethra. Cutting should be reserved for those strictures to which dilatation is not applicable.

*Meatotomy.*—Strictures at the meatus or just within it do not yield to dilatation, which in this part of the urethra is painful and irritating. Such strictures should be cut. Congenital narrowing of the meatus does not call for operation unless interfering with the normal functions of the urethra and productive of symptoms, or

unless it is necessary to introduce large instruments for treatment of the deeper portions of the urethra. Meatotomy may be performed with a straight bistoury or with a probe-pointed tenotome with a convex edge. The incisions should be made slowly and carefully, upon the floor and in the median line, until the tissue forming the stricture has been divided completely. In case of congenital narrowing the opening, in order to allow for some contraction, should be made slightly wider than it is expected to remain. When hemorrhage occurs, it can be controlled by pressure, and, if necessary, the glans may be compressed continuously by wrapping around it several times a narrow strip of rubber plaster. The plaster will have to be removed with each act of micturition, but the patient can easily re-apply it. Beginning the second day after the operation, a full-sized sound should be inserted once a day until healing is complete; reunion of cut surfaces is thus prevented. Treatment of the deeper portions should, if possible, be suspended during this period. Meatotomy rarely necessitates confining the patient to bed.

*Internal Urethrotomy.*—This operation should be limited to strictures within four inches of the meatus. For strictures of the bulbous and membranous portions external urethrotomy or Harrison's combined internal and external operation is much safer than the internal operation. No surgeon should perform internal urethrotomy of the deep urethra unless he is prepared to follow it, if necessary, with the external operation.

When possible, all cutting operations upon the urethra should be preceded for two or three days by the internal administration of boric acid in from 10- to 20-grain doses four times a day. Such a course sterilizes

the urine and greatly lessens the danger of urethral fever and other complications. The operation should be immediately preceded by irrigation of the urethra with a saturated solution of boric acid or a 1 : 10,000 solution of bichloride of mercury. In case of cystitis the bladder also should be irrigated. All instruments used should be absolutely clean and sterile. For several days previous to the operation instrumentation of the urethra should be avoided, to the end that urethral irritation may be reduced to a minimum. Strictures within two inches of the meatus, requiring but slight cutting, may be operated upon without confining the patient to bed, but for deeper seated strictures and for those requiring extensive cutting the patient should be prepared carefully as for any other surgical operation, and should remain in bed for two or three days after its performance.

For internal urethrotomy but three of the many instruments recommended for the purpose need be mentioned. In the pendulous urethra all incisions should be above, in the roof, and in the median line. If the stricture will admit a No. 5 (French) bougie, a Civiale urethrotome, or Gross's modification of the instrument (Fig. 41), which



FIG. 41.—Gross's modification of Civiale's urethrotome.

has an acorn-shaped head, is the simplest instrument. The bulb is passed through the stricture, the blade is exposed by a mechanism in the handle, and the instrument is withdrawn sufficiently to cut through the stricture from behind forward. The blade is then sheathed and the instrument is withdrawn from the urethra. A steel sound should then be passed through the cut stricture,

but not to the bladder, in order to ascertain if the stricture be divided completely. If the division is not complete, the urethrotome may again be introduced and the stricture be divided thoroughly. If the cutting has been at all extensive, it is often best to tie a full-sized soft catheter in the urethra for the first twenty-four or forty-eight hours. Hemorrhage, which is not often severe, may be controlled by winding a strip of rubber plaster about the glans, as recommended after meatotomy. Twenty-four or forty-eight hours after the operation a full-sized steel sound should be passed through the stricture. This procedure is repeated daily for three or four days, and then a few times at intervals of three or four days. To render the result permanent, it is usually necessary to continue the occasional use of the sound in the same manner as after treatment by dilatation.

When strictures of a calibre larger than No. 18 or 20 require cutting, the Otis urethrotome (Fig. 42) is prob-

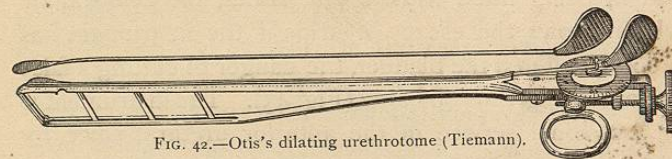


FIG. 42.—Otis's dilating urethrotome (Tiemann).

ably the best instrument in use. The closed instrument is introduced into the urethra until the point occupied by the knife is half an inch behind the stricture. By means of a screw in the handle the parallel blades are separated until the stricture is put fully on the stretch; the blade is then withdrawn, cutting the stricture from behind forward. The cutting should be followed by the use of sounds as above described.

The Maisonneuve urethrotome, formerly used for in-

ternal urethrotomy in the deep urethra, is probably the best instrument for this purpose, since it can be attached to a filiform guide and thus be conducted through a stricture; but this operation is one to be avoided if possible, unless it be followed by perineal puncture and drainage as recommended by Harrison in his combined operation. Some of the modifications are superior to the original instrument in having protecting

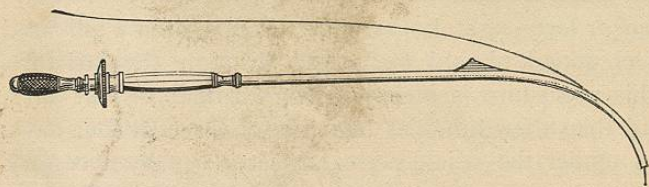


FIG. 43.—Teevan's modification of Maisonneuve's urethrotome with guide (Tiemann).

sheaths for the knife, which can thus be made to cut the stricture-tissue without damaging the rest of the urethra, and in being fitted with a wire stylet, the removal of which allows the escape of urine if the instrument has properly entered the bladder, the danger of cutting a false passage being thus obviated (Fig. 43). The instrument is of occasional service in the anterior urethra, since, by means of its guide, it can be inserted into a stricture too narrow to admit the smallest Civiale urethrotome, and the stricture may then be divided partially from before backward. For this purpose the knife should run in a groove in the upper surface, in order to make the incision in the roof of the urethra.

The indications for internal urethrotomy have already been considered. This operation should be performed when the stricture is situated within four inches of the meatus and cannot be properly treated by dilatation.

*External urethrotomy (external perineal urethrotomy, perineal section)* becomes necessary when stricture of the bulbous or membranous urethra is not amenable to treatment by dilatation, or when complications necessitate the immediate division of stricture. The operation should always be preceded by an attempt, while the patient is under ether, to pass a full-sized steel sound, in order that the possible mistake of cutting a mere spasmodic stricture may be avoided. If a filiform bougie can be passed, it is used as a guide in what is known as "Syme's operation" or in the combined method of Harrison; but when a filiform bougie cannot be made to enter the bladder, the much more difficult procedure of external perineal urethrotomy without a guide (generally known as "Wheelhouse's operation") must be performed.

These operations, fully described in all text-books on surgery, and therefore requiring no description in these pages, should be undertaken by none but skilled surgeons.

*Divulsion* of stricture in the deep urethra is practised by some surgeons when the patient will not consent to a urethrotomy, but it is a dangerous procedure. Rarely the method may be of advantage in the pendulous urethra, for the purpose of dilating a tight stricture sufficiently to admit a Civiale urethrotome. For this purpose a Thompson rapid dilator should be used, since it can be threaded on a filiform guide.

Other methods have been recommended and employed at various times for the treatment of stricture, but they are inferior to those described.

**Complications of Stricture.**—*Retention.*—When retention occurs suddenly, it is largely due to an added inflammation or irritation of the urethra, and can usually

be relieved promptly by the use of the hot bath or by the soft catheter in the manner described for the relief of retention in gonorrhœa. If the patient is seen before the bladder is much distended, an opiate every hour may overcome spasm and give relief. A filiform bougie can often be passed when attempts with a catheter fail; if the bougie be left in the stricture for a few hours, the

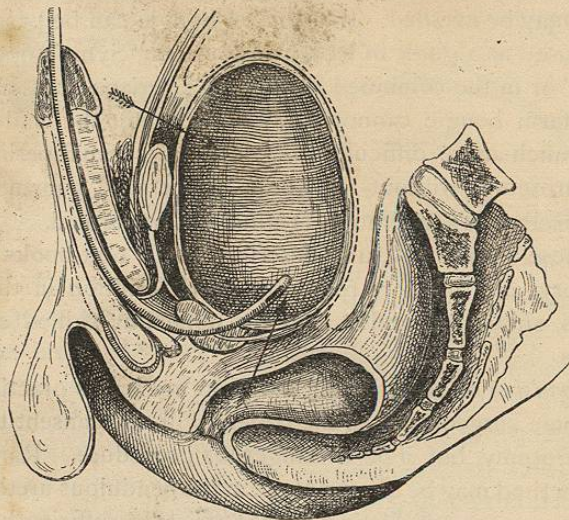


FIG. 44.—Suprapubic and rectal routes for the relief of retention of urine (redrawn from Holden).

stricture will dilate and allow the urine to escape. When other measures fail, an aspirator may be used. Puncture of the bladder with a trocar through the rectum is permissible in case an aspirator cannot be obtained (Fig. 44).

In old cases of tight stricture with a history of repeated attacks of retention or of gradually increasing

difficulty in emptying the bladder, and when the stream of urine is very small at best, retention is a more serious matter. In these cases the hot bath, an opiate, and even an anæsthetic, may be tried, but these measures are frequently ineffective. If possible, a filiform bougie should be passed through the stricture, which may then be treated by continuous dilatation or by external urethrotomy. If a bougie cannot be passed, it is proper to relieve the bladder by aspiration for several days, if by so doing the instrument can eventually be made to enter the bladder. In case all such attempts fail, external urethrotomy without a guide becomes necessary. To determine the best method of proceeding the surgeon should consider carefully the character of the stricture, the experiences of the patient during previous attacks of retention, and all other conditions peculiar to the case.

*False Passages.*—When false passages exist in connection with stricture, they should be recognized, located, and avoided during treatment. Such passages are usually small and serve to entrap the ends of fine instruments. If the directions already given for instrumentation of the urethra, and especially those for the use of filiform bougies, be followed carefully, danger of dilating a false passage will be avoided. The walls of old false passages that have been kept open sometimes undergo changes similar to those of stricture, and therefore will grip an instrument after the manner of a stricture. The diagnosis in these cases is difficult, and must be made with great care.

False passages are produced most frequently by the use of small steel instruments, usually during an attempt to pass the instrument from the bulbous to the mem-

branous urethra. The urethral walls in front of a simple stricture and in the course of a tortuous stricture are often so thinned and softened that they may easily be penetrated by a small steel sound, especially if force be used. When a surgeon has been unfortunate enough to make a false passage, he should recognize the fact, or he may continue and dilate the opening instead of the stricture. The perforation of the urethral wall by the point of an instrument gives the hand of the operator a sensation very different from that produced when the instrument passes through a strictured point in the urethra. The instrument is obstructed in its movements, but is not gripped as when it has entered a stricture. The direction of the handle shows that the point is not in the median line, and if the handle be depressed, it cannot be rotated as when the point is in the bladder. The finger on the perineum or in the rectum will probably distinguish the point of the instrument. On withdrawing the latter there is usually considerable hemorrhage.

The treatment of a recent false passage consists of rest, boric acid internally, hygiene, and the avoidance, if possible, of all instrumentation of the urethra for two or three weeks. The damaged tissue usually becomes inflamed, causing a discharge of blood and pus for a few days, but under favorable circumstances the wound heals in two or three weeks. Urethral fever, abscess, fistula, or even extravasation, may result.

*Urethral Fever (Urinary Fever).*—This much-dreaded complication of stricture usually finds its exciting cause in instrumentation of the urethra. In some instances the urethral fever may be due chiefly to shock or to reflex influences, but in most cases it is undoubtedly the

result of septic infection. The urethra back of a stricture usually contains micro-organisms and their toxins capable of rapid absorption if the mucous membrane be even slightly cut, torn, or abraded, though there are evidences of such absorption in but a small minority of operations on stricture. Those cases in which nausea, syncope, or a chill occurs immediately after the insertion of an instrument into the urethra are undoubtedly due to nervous influence, and may result from the painful passage of a smooth sound which has produced no damage to the mucous membrane.

Some patients are peculiarly susceptible to chills and fever, which in a few individuals follow every attempt at urethral instrumentation. This susceptibility may suddenly develop during the treatment of a stricture, or it may as suddenly disappear. Occasionally this complication is one of the symptoms of a stricture, and disappears when the latter is properly treated. It occurs rarely after operations on the meatus, but it increases in frequency with the depth of the injury in the urethra, being most frequent after division or internal urethrotomy of the deep urethra. In cases of old stricture, especially if complicated by bladder or kidney disease, the danger of a fatal termination is greatly increased.

The symptoms usually appear within twenty-four hours after instrumentation, frequently following the first urination. In typical cases there is a sharp chill, lasting from a few seconds to several hours, followed by fever of irregular duration, ranging from 100° to 106° F., and terminating in more or less profuse perspiration. The patient may be well in twenty-four hours, or a feeling of lassitude and malaise may remain for a few days. In very mild cases slight chills may be the only symp-

toms noticed by the patient. In severe cases the chill is sudden and violent and is attended by great prostration. The skin is cold and livid, and there may be vomiting and profuse diarrhœa. Suppression of urine, uræmia, and death may occur within twenty-four or forty-eight hours. In yet other cases slight chills and mild fever may be followed by all the symptoms of septicæmia or of pyæmia, with a fatal termination.

The first chill may be followed by others without further exciting cause, and the fever may continue in an intermittent or remittent form. In these cases the symptoms do not conform in type and character to the first attack, but vary greatly. Finally, the fever may become chronic, and may simulate malaria except that the symptoms are more irregular and the disturbance of digestion and the impairment of nutrition are more marked. The persistent forms usually occur in connection with disease of the bladder and the kidneys.

The treatment is chiefly prophylactic. The directions already given for urethral instrumentation, including antiseptic precautions and urethral hygiene, should be followed carefully. Of special value in this respect is the use of boric acid in doses of from 10 to 20 grains four times a day, its administration being begun forty-eight hours before operating and being continued for several days. With some patients a chill may be prevented by a prolonged milk diet or by the use of morphine and pilocarpine just before operating. There is no specific treatment for urethral fever after its development. The patient should be put to bed, and free perspiration should be encouraged by the use of blankets, hot-water bottles, hot drinks, and in some cases by the administration of jaborandi. Further treatment is purely symptomatic.

Quinine and other allied preparations are of little, if any, benefit.

*Fistula.*—If fistulæ are small, they frequently close when the stricture is dilated. If they are larger and remain open, they should be treated on surgical principles.

*Abscess* has been considered in connection with *Periurethritis*. When complicating stricture of the deep urethra, external perineal urethrotomy is usually the best treatment.

*Extravasation of urine*, if at all extensive, calls for prompt surgical treatment to secure free drainage and to prevent abscess, gangrene, and extensive sloughing of tissue. When the quantity of extravasated urine is slight, involving a small circumscribed region, is not enlarging, and is not interfering with micturition, incisions are not necessary. In such cases the treatment is directed mainly to the patient and to the stricture. Absorption of the extravasated fluid may be encouraged by rest and by the application of hot fomentations.