

instrument, by partial withdrawal and reintroduction, or by slight depression of the beak, then lifting it over the obstacle with a finger in the perineum, at the same time pulling up the point of the instrument to make it sweep the roof of the canal. This will generally render the introduction of a finger into the rectum unnecessary. The dangerous *tour de maître*¹ should never be tried, nor any force used in the manipulations at this point, as a false passage is easily made here and under these very circumstances. The depression of the handle of the instrument alone is capable of exerting enormous power. The sound represents a lever of the first order, and the surgeon has the long arm.

With a little patience a suitable instrument will always pass into the bladder unless there is stricture. When the point has

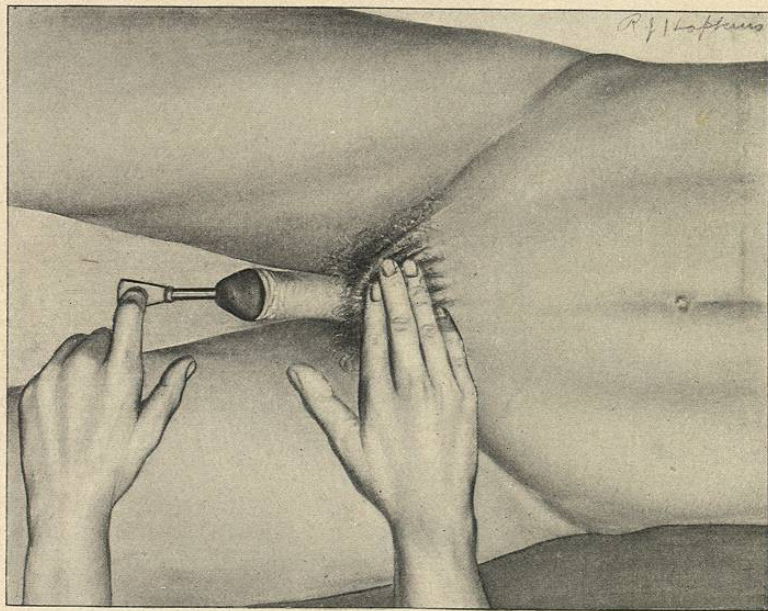


FIG. 18.

traversed the membranous urethra it must continue on freely if the prostate is normal. The so-called spasm of the neck of the bladder does not exist as an obstruction to the passage of instruments.

Instruments small enough to engage in the sinuses of Morgagni

¹ The *tour de maître* consists in introducing a sound with the shaft between the patient's legs until the point is arrested at the bulb; then the handle is rapidly made to describe a semicircle until it reaches a vertical position, when it is at once depressed between the thighs. This is brilliant but dangerous.

are not used in the healthy canal. Instrumentation in morbid conditions will be detailed in connection with the different diseases requiring it.

A *silver catheter* is introduced in the same manner as the sound. In using *soft instruments* without a stylet the penis is slightly pulled upon, so as to efface any circular wrinkles, and the instrument is pushed straight onward into the bladder. If it is arrested, partial withdrawal and rotation during the next forward movement will cause it to pass. One occasionally encounters a spasm of the cut-off muscle that resists prolonged firm pressure by a rubber instrument.

The sensation experienced by a healthy urethra is that of hot points pricking the canal along the part being traversed by the foreign body. As the instrument enters the membranous urethra, a desire to urinate begins to be felt, which increases as the prostate and the neck of the bladder become distended by the instrument, so that the patient sometimes believes the urine is flowing away, in spite of the surgeon's assertions and his own observation to the contrary. Nausea, and even syncope, may occur as the instrument distends the prostate, especially on the first introduction in sensitive young people. Occasionally distention of the prostatic sinus produces a partial erection.

If the patient faints, the instrument should be withdrawn at once and the legs elevated, while the head is hung over the edge of the lounge upon which he lies. The facility with which this may be done, if necessary, is one of the reasons for placing the patient on his back for his first catheterization.

The more serious *complications* of catheterization, such as false passages, urethral fever, etc., will be considered in the succeeding chapters. Ordinarily speaking, none of these complications need be expected to follow the gentle passage of a clean instrument into a urethra which is neither inflamed nor lacerated; but in order to avert the possibility of cystitis or chill it is safe to *terminate every catheterization or sounding by an instillation along the whole urethra of a few drops of silver-nitrate solution (1:1,500)*, unless some other solution is used as a part of the treatment, or the temper of the urethra is well known (p. 218).

CHAPTER IV

URETHRAL WOUNDS AND FOREIGN BODIES

THE urethra may be wounded by traumatism from within or from without. External wounds only concern us here. Internal wounds, whether produced by foreign bodies or by instrumentation, such as false passages, internal urethrotomy, etc., find more appropriate exposition under their respective titles.

WOUNDS FROM WITHOUT

Punctured Wounds.—The prognosis of a punctured wound of the urethra is generally good. For simple punctured wounds a single irrigation of the wound and the urethra with an antiseptic solution, e. g., permanganate of potash, 1:4,000, followed by careful catheterization for each urinary act during the first one to three days, should result in a cure. If the puncture is merely the central point of a laceration or a contusion of the canal, the treatment must be carried out as laid down for these conditions. Complicating suppuration, infiltration, or fistula requires appropriate treatment, as indicated below.

Incised Wounds.—Clean-cut wounds are very rare in the perineum; they usually implicate the penile urethra, the corpus spongiosum, and often some portion of the corpora cavernosa. The complications to be feared are periurethritis (infiltration of urine) with prolonged suppuration and secondary gangrene, traumatic stricture, and fistula. Wounds in the scrotal region are most likely to be followed by severe inflammation, while obstinate fistula is the usual complication of wounds of the penile urethra. The prognosis of stricture, on the other hand, depends on the extent rather than on the situation of the lesion. Stricture does not follow longitudinal wounds of the urethra, but results rapidly from any transverse or oblique wound. When the urethra is completely severed, the cut ends—especially the proximal one—retract within the corpus spon-

giosum to such an extent that it may be difficult to bring them together again.

Treatment.—Immediate suture is the first indication. It may usually be performed under local anesthesia. If the gaping is slight, satisfactory approximation may be obtained by silk sutures inserted into the skin, the corpus cavernosum, and the deeper part of the mucous membrane without touching the epithelial surface, the wound having been cleansed by copious irrigation. If the wound gaps widely, or the urethra is completely divided, buried catgut sutures or skin-grafting may be employed with intermittent catheterization, or the retained catheter, as in rupture of the urethra (see below).

RUPTURE OF THE URETHRA

This includes all contused and lacerated wounds of the canal inflicted from without, and is by far the most common urethral injury, the lesion usually involving the bulb, rarely the pendulous, and still more rarely the posterior urethra.

Etiology.—1. *The pendulous urethra* is practically safe from injury except during erection; but in that condition it is liable not only to extensive injury, as in fracture of the penis and breaking a chordee, but also, as Guyon insists, to slight tears by bruising during coitus—injuries which, though scarcely noted at the time, may have dire consequences.

2. *Rupture of the bulb* is usually the result of direct violence—falling astride of a beam or some such hard object (in 82%—Kaufmann), a kick upon the perineum, or the jolting of a rider onto the pommel of his saddle.

3. *The posterior urethra* is torn only with fracture, dislocation or severe strain of the pelvis, or, exceptionally, by excessive direct violence. The membranous urethra is commonly involved, being torn with the triangular ligament, while the prostatic urethra is spared in all but the most extensive fractures.

The mechanism of rupture of the bulb has provoked much dispute. When the force is applied obliquely, the canal is crushed against the ischio-pubic rami; when from in front, as, for instance, in a fall with the body bent forward, the impact is against the front of the pubes (Oberst, Terrillon); while in certain cases, where the force is applied directly from below, the urethra is probably torn at the sharp edge of the subpubic ligament (Ollier and Poncet). It is upon the truth of this last fact that differences of opinion persist.

Morbid Anatomy.—The trauma which ruptures the urethra generally spares the surrounding soft parts. As the injury is usually

the work of a blunt implement, the skin and the muscles are not torn, and the superficial aspect is, frequently enough, that of a mere bruise or abrasion.

The canal itself may be merely bruised, or more or less completely torn asunder. In the posterior urethra complete laceration is the rule, the canal being broken, as it were, in the grip of the triangular ligament. In the bulb complete laceration through part of the circumference of the canal is the rule; but the roof is usually spared—a point of considerable importance in subsequent catheterization. In the anterior urethra the milder injuries consist in mere interstitial hemorrhage¹—contusion, as it were—of the corpus spongiosum, with perhaps slight lacerations of the mucous membrane or of the sheath of the spongy body.

Symptoms.—The cardinal symptoms of injury to the urethra are pain, tenderness, bleeding, interference with urination, and tumefaction.

The *pain* is sharp and occurs at the moment of rupture. It may be the only symptom of interstitial rupture due to a jar to the erect penis. As it abates rapidly the patient may pay but little attention to it, though even a slight injury may lay the foundation for traumatic stricture. The pain recurs with each act of urination for a longer or shorter time, according to the gravity of the injury and the temperament of the person. *Tenderness* exists primarily at the point of injury and later in the course of inflammation.

Bleeding from the meatus is a constant symptom. It is lacking only in the rare cases in which the mucous membrane is uninjured (see above). It occurs quite independent of urination (urethrorrhagia), its quantity not indicating the severity of the lesion. The unbroken skin usually prevents external (perineal) hemorrhage, though a hematoma of some size is not unusual. Hematuria combined with urethrorrhagia indicates an injury to the posterior urethra.

The *disturbance of urination* varies from the hesitancy excited by the pain of the milder cases to complete retention. This latter, indeed, is the usual condition, and is due to contraction of the lacerated urethra and to spasm of the cut-off muscle, rarely to hema-

¹ The possibility of this condition, as well as its clinical importance, has been warmly debated. In a recent article (*Presse méd.*, 1898, i. 250) Baron sums up the evidence at hand, and shows that a simple contusion, without any break in the mucous membrane, may perfectly well be the starting-point for traumatic stricture. I believe that this occurs when there is enough mucous membranous abrasion to allow a slight contact of urine with the bruised tissue. I think a trauma to produce stricture yields at least a trace of blood (it may be minute) in the urine at first.

toma of the corpus spongiosum or to clots in the urethra. If the retention is not speedily relieved it is increased by the congestion and inflammation about the wound.

Tumefaction, primarily the effect of hemorrhage, secondarily of urinary infiltration and suppuration, follows the fascial spaces. The tumour after injury to the pendulous urethra is usually a circumscribed one within the corpus spongiosum, but may follow the course of a perineal infiltration and extend throughout the scrotum and penis. Effusions within the triangular ligament are retained there to form a tense perineal tumour, which may burst either forward or backward, while injury to the prostatic urethra leads to infiltration of the recto-vesical space. (See Urinary Infiltration.)

Diagnosis.—The diagnosis of the extent of injury is not easy. Immediate interference with urination, which always follows complete rupture, may be caused by spasm or by retained clots. Catheterization, impossible if there is complete rupture, may fail even in milder cases. (See Treatment.) It is sufficient, however, for practical purposes, to diagnose the severity of the case according to the symptoms, as indicated below. Diagnosis of the position of the injury may be made with a fair amount of accuracy from its etiology, the location of the tenderness and tumour, and the presence or absence of hematuria. The presence of urethrorrhagia, while establishing the existence of rupture of the urethra, does not exclude rupture of the bladder; but a positive diagnosis of the latter condition is usually practicable. (See Rupture of the Bladder.)

Course and Prognosis.—Guyon's classification is convenient as offering the most precise indications for treatment. It is as follows:

1. *Mild injuries to the pendulous urethra*, in which the trauma is succeeded by a sharp pain, slight bleeding, and a few painful urinary acts, are not likely to be followed by any serious consequences, except traumatic stricture, which is almost inevitable.

2. *Moderately severe injuries to the pendulous urethra* are characterized by free bleeding, painful and impeded urination, and a hematoma of some size. The chief danger here lies in infiltration and periurethral suppuration.

3. In the *severe injuries* and in most *perineal cases* complete retention is the prominent symptom. It can rarely be relieved otherwise than by external urethrotomy.

In any case traumatic stricture may be predicted—a condition formidable both in its rapidity of onset and its rebelliousness to treatment. (See Stricture.)

The mortality from rupture of the urethra is low. Terrillon

records 12 deaths in 170 cases, chiefly from uremia, septicemia, and hemorrhage.

Treatment.—1. For *mild injuries to the pendulous urethra* expectant treatment should be employed. Rest in bed, free purgation, and the internal administration of urotropin should be supplemented by a gentle injection twice a day of 3 to 5 c. c. of silver-nitrate solution (1:2,000) or protargol (1:1,000) into the anterior urethra. Catheterization is unnecessary and absolutely contraindicated. Extravasation or suppuration must be met by prompt incision (p. 234). Three days after the symptoms have subsided the patient may be pronounced free from all dangers except stricture, against which he must be warned, and for which treatment is to be instituted on its appearance. The contraction usually begins within six weeks of the time of injury.

Perineal rupture, however mild, demands immediate external section to avert deep resilient stricture.

2. *Moderately severe anterior injuries* represent, in a general way, slight lacerations, in which one may hope to avoid infiltration by keeping the urethra cleansed, as above, and preventing any contact of the urine with the wound. A small (Nos. 7 to 15 French) rubber or elbowed catheter should be used. The latter is the better instrument, as it can be made to force the cut-off muscle and to hug with its tip the uninjured roof of the canal. The catheter should be introduced every six hours and each catheterization followed by a nitrate-of-silver or protargol wash.

3. *Perineal ruptures* and all *severe injuries to the pendulous urethra* call for immediate external urethrotomy and suture. Palliative measures, such as suprapubic aspiration (p. 209), catheterization, or the retained catheter (p. 210) cannot save the day. Aspiration may be useful to relieve the distention of the bladder and thus to gain time, but the retained catheter is worse than useless. It serves only to invite infiltration, while repeated catheterization is impossible as soon as congestion sets in. On the other hand, perineal section relieves the retention at once and for all time, while suture of the divided ends of the urethra affords the surest means of preventing resilient traumatic stricture. While opinions may vary as to whether stricture can be absolutely prevented by this operation—and I believe that in some cases it can—there can be no doubt but that the scar after operation is far less retractile, and either will cause no trouble or will prove amenable to treatment by sounds.

The operation varies only in its details from the ordinary external urethrotomy (p. 201). With the patient in the lithotomy

position, but without a staff in the urethra, the median perineal incision is carried down to the hematoma, which may be plainly felt. This is freely opened up and the clots evacuated by irrigation with warm saline solution through the wound itself and the anterior urethra. A medium-sized sound is introduced gently into the anterior urethra until its tip appears in the wound. Then a systematic search is made for the proximal segment, which may be identified in recent cases by profuse oozing from the bulb (Cabot). If this cannot be found it may be necessary to resort to retrograde catheterization (p. 206), though, if the operation is done under local anesthesia (a valuable precaution for just such an emergency), I have found it easy to induce the patient to urinate; in fact, it is sometimes impossible to restrain him, and thus the proximal end of the urethra is located. The torn ends of the urethra are trimmed away and all crushed tissue removed. This trimming need not be very radical, for the urethral wall, surrounded by the vascular corpus spongiosum, possesses great vitality. With three or four sutures of the finest catgut the severed ends are then approximated, the sutures being passed through the corpus spongiosum—thereby checking the oozing from the erectile tissue—close to, but without including, the mucous membrane. (If from loss of tissue the ends cannot be approximated, a graft may be inserted, as after excision of stricture.) A soft-rubber catheter is then fastened into the urethra and the perineal wound lightly packed, since suture of the perineum would but invite infiltration.

FOREIGN BODIES, INCLUDING STONE

Foreign bodies may enter the urethra at either extremity or may develop in and about the canal.

From without :	{	Fragments of surgical instruments.	Substances introduced by the
		intoxicated, insane, or sexually perverted.	
From within :	{	Renal or vesical calculi, or any substance which might form a	
		nucleus for such calculi (p. 429).	
Originating in or	{	Stone :	{
about the canal.			Formed about a foreign body, or in an ulcerated spot,
			pocket, or fistula.

Foreign Bodies.—The most varied substances are found in the urethra,¹ introduced by the patient under the influence of that perverted and depraved sexual instinct which affects the male of all ages who gives up his mind to impure thoughts and whose sexual necessities are not gratified.

¹ Cf. Poulet. Foreign Bodies (translation). New York, 1880, p. 110.

Seeds, stones, beads, beans, peas, nails, pins, needles, hair-pins, slate-pencils, portions of glass, wax, cork, and a host of other substances, are thus introduced into the meatus, and, slipping beyond the reach of the fingers, are not infrequently swallowed by the urethra. Broken catheters and bougies, especially in cases of stricture, and instruments left *à demeure*, if not well fastened may slip past the meatus and travel towards the bladder. Their constant tendency is to slip persistently onward, not because of any urethral suction or peristalsis, but merely because they are introduced blunt end first, and consequently, unless quite round, the outer end is likely to be the sharper. Therefore every erection or effort at extraction, if it move the foreign body at all, pushes it inward. Rounded bodies, such as beans or pebbles, lie in the natural pouches of the canal (fossa navicularis, bulbous urethra) or become arrested by stricture.

If foreign bodies are not removed, one of three consequences follows: 1. They travel on into the bladder and form a nucleus for stone there; or, 2. Stone forms around them in the urethra; or, 3. They cause the urethra to inflame, bring on retention of urine, and finally either become encysted or ulcerate their way out, leaving behind fistula and ultimately stricture.

Treatment.—If the body be long and soft (catheter, piece of wood), it may be transfixed with a stout needle through the floor of the urethra and the canal pushed back over it, like a glove over a finger, as far as possible, when it may be transfixed again, and so urged forward until it reaches the meatus; otherwise the long urethral forceps, the ingenious scoop of Leroy d'Etiolle for small round bodies, or the urethral lithotrite, may be used. For this purpose I have successfully employed¹ the Thompson stricture divulsor, opening it after passing the foreign body, and finding the latter between the blades on closing the instrument. In manipulating with any ordinary forceps, if the finger on the outside can detect and get behind the foreign body, nothing should divert the surgeon from keeping up pressure at that point in order to prevent his instrument from pushing the offending substance still deeper into the canal.

If the foreign body lies behind a stricture, the latter must be cut or rapidly dilated (continuous dilatation), to allow the passage of an instrument suitable for extraction.

Pins and needles may be extracted through the floor of the canal if their blunt ends can be steadied. To remove a hat-pin its point is pushed through the urethral floor and its shaft drawn out until the head can be turned so as to extrude through the meatus. I have

¹ N. Y. Med. Record, March 6 and May 1, 1875.

extracted a pin with Thompson's divulsor, and Dieffenbach removed one from the membranous urethra by pushing it with his finger in the rectum until the point protruded through the perineum, and then forcibly extracting it.

All other manipulations failing, perineal section will reveal the position of the object and permit extraction. The penile or the scrotal urethra should never be excised for fear of fistula in the one case, infiltration in the other.

Urethral Calculi.—A stone descending from the kidney or the bladder may be caught in the prostatic, the bulbous, or the navicular urethra, or behind a stricture; or it may form about an impacted foreign body, or on any ulcerated spot or fistula. It assumes the shape of that part of the canal or cavity in which it lies. Voillemier describes a set of six calculi filling the anterior urethra, and Blasius mentions a periurethral pocket containing eighty stones. As a rule, however, but one is found.

Symptoms.—If the calculus comes from the bladder the onset of symptoms is sudden. As it enters the urethra during urination the flow stops suddenly, while a sharp pain is felt. A second effort may extrude it from the canal or only impact it more firmly, or it may fall back into the bladder and remain a vesical calculus. Once impacted it may cause complete retention, or, more commonly, dysuria.

If, on the other hand, the stone forms *in situ* the onset of symptoms is insidious. First, there is slight gleet and some difficulty in urination. The gleet becomes slowly worse, and finally periurethritis occurs, which goes on to extensive suppuration and fistulization. The obstruction to urination is not complete.

Periurethral calculi may remain latent for a long time, until they obtrude upon the lumen of the urethra or excite suppuration in the pocket within which they lie.

Diagnosis.—A sharp attack of urethral colic is unmistakable, but the less acute conditions just described simulate stricture of the urethra; indeed, stricture and stone often coexist. The mistake is not a vital one, however, for any attempt at dilatation will produce a grating sound characteristic of stone, and the calculus may be felt between the instrument and the finger externally.

Treatment.—In acute cases an attempt may be made to push the stone back into the bladder if it has not passed the membranous urethra; or, if it has passed, the anterior urethra may be distended with olive-oil and the stone worked forward to the meatus, whence it may be extracted by crushing or by meatotomy. These failing, the meatus may be pinched and the patient encouraged to urinate; when the canal is fully distended the meatus is released and the

stone expelled by the gush of urine. The urethral lithotrite is a dangerous instrument and of doubtful utility. The scoops and forceps of Collin and Leroy d'Etiolle, though ingenious, are never at hand at the right moment. I have extracted a stone with Thompson's divulsor. When all these methods fail external urethrotomy succeeds.

Chronic cases of urethral calculus call for external urethrotomy to remove the stone, to excise the pocket in which it lies, and to divide or excise the stricture which is usually present.

Infiltration, abscess, and fistula are considered in another section.

CHAPTER V

URETHRAL CHILL

THE term *urinary fever* is commonly bestowed upon any continuous febrile condition occurring in the course of an inflammation in the urinary organs or resulting from an operation upon them, while the term *urethral chill* or *fever* is restricted to the more acute cases usually attributable to urethral instrumentation. Both terms are misleading from a scientific point of view, since they give no clew to the real nature of the disturbance, and, indeed, group under one title several conditions of widely different natures; and yet, clinically speaking, they represent a set of well-defined phenomena, and they will doubtless always find a place in the clinician's vocabulary. Urinary fever will interest us later; our present concern is urethral chill. This term includes three conditions, any one of which may prove fatal. They are:

1. Shock to the whole nervous system;
2. Shock to the kidneys, inducing uremia; and
3. Toxemia, septicemia, or pyemia.

The first two conditions deserve the title *urethral shock* or chill, while the last is urinary fever or chill, properly speaking, since the toxic elements are derived from the urine.

Etiology.—That urethral chill does not occur more constantly under similar conditions is the mystery. The majority of patients escape, whether the urine is infected or not, whether the wound or the trauma be great or small. The same patient may have a chill one day, and escape it after an exactly similar operation on the next. The simple gentle passage of a small, soft bougie may give rise to it, while violent divulsion or urethrotomy, performed a day or two afterward, may evoke no reaction; and again, after divulsion, which has been negative, the passage of a steel sound may produce a chill. Nor is it instrumentation only which is the exciting cause, since patients suffering from stricture, upon whom no instruments have ever been used, have well-marked exacerbations of chill and fever in connection with renal and bladder disease, and