

CHAPTER III

CATHETERS AND CATHETERIZATION

Catheterization, broadly speaking, is the introduction of an instrument through the urethra into the bladder; strictly speaking, however, catheterization is the introduction of a *catheter*—viz., that particular kind of a hollow instrument which, having an opening at each end, is used to introduce fluids into, or evacuate them from, the bladder or upper urinary organs.

A *sound*, on the contrary, is an imperforate urethral instrument, and has no connection with the introduction or evacuation of fluids.¹ A *bougie* is a flexible sound.

Scales.—The scale for grading the calibre of urethral instruments was first accurately fixed in France, where two scales are at present in use—the Charrière (commonly known as the French scale) and the Béniqué. Other scales are the English and the American.

Of late years the tendency in this country, as well as in England, has been to adopt the French scale as the most convenient, while in France itself there is a tendency to replace the old French (Charrière) by the new Béniqué scale. Although Dr. Van Buren, senior author of the first edition of this work, was very tenacious of the American scale—which indeed was born in his office—the almost universal adoption of the French scale since his time has led me, in subsequent editions, to drop the American in favour of the French scale.

The French (Charrière) scale indicates diameters in $\frac{1}{3}$ mm. No. 1 has a diameter of $\frac{1}{3}$ mm., No. 2 a diameter of $\frac{2}{3}$ mm., and so on. From this scale, therefore, the diameter of an instrument may be determined by dividing its number by 3. A No. 30 sound has a diameter of 30 mm. $\div 3 = 10$ mm.

The Béniqué scale indicates diameters in $\frac{1}{6}$ mm. It numbers in-

¹ To the French all urethral instruments are *sondes*, and the verb *sonder* means to catheterize in the broadest sense.

struments twice as high, therefore, as the Charrière. A No. 30 French sound is a No. 60 Béniqué. $B. + F. \times 2.$

The American scale indicates diameters in $\frac{1}{2}$ mm. Thus its numbers are $\frac{2}{3}$ as high as the French. $30 F. = 60 B. = 20 A.$ $A. = F. (1 - \frac{1}{3}) = \frac{2}{3} F.$

The English scale follows no rule, but its numbers are generally about 2 less than the American. Thus, $30 F. = 60 B. = 20 A. = 18 E.$ $E. = A. - 2 = \frac{2}{3} F. - 2.$

The best scale-plate I know of is the one furnished with a triangular slot so marked as to give the sizes in the English, American, and French numbers for any instrument, and also marked off in inches and millimetres upon one edge (Fig. 14). It is essential to the surgeon's armamentarium in the state of confusion in numbering urethral instruments which still prevails in this country.

The Instrument.—Rigid urethral instruments are made of silver or of nicked steel. Flexible ones are of rubber or of woven silk coated with wax or varnish: these woven instruments are less flexible than the rubber ones. There are also small whalebone instruments, which on account of their tenuity are called filiform.

The *qualities* essential to a good urethral instrument are:

1. Smoothness,
2. Sterilizability, and
3. Durability.

For sounds external smoothness suffices. For catheters the eye should be depressed so as not to scrape the mucous membrane, and the interior must be smooth and free from pockets so as to submit readily to mechanical cleansing. Not only, therefore, should it be as smooth inside as outside, but also its lumen should terminate in the eye and not in a pocket beyond the eye, wherefore the ordinary catheter, with its eye a little distance from the tip, should have a solid end.

The sterilization of catheters is most effectively and conveniently accomplished by boiling. Metal, rubber, and whalebone instruments all may be boiled satisfactorily. The only instrument that rebels is the woven one. This is the one point of inferiority in that excel-

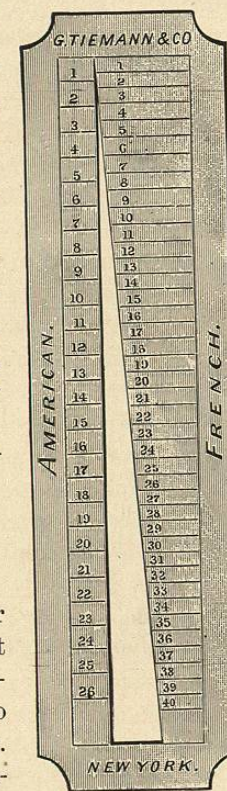


FIG. 14.

lent class of instruments, and it bids fair to be soon overcome. Several French makers have already attained the ideal. Their woven instruments may be boiled with impunity. No doubt others will soon follow the example set.

The durability of catheters is essential from an economic point of view, and in order to minimize their liability to become rough or to break off in the bladder. Woven catheters are the least durable, and are likely to stick together in warm weather, unless kept segregated and in a cool place, or covered with French chalk.

Detailed descriptions of the various urethral instruments are deferred to those chapters which explain their uses.

Preparation of the Instrument.—To be ready for use in the urethra an instrument must be smooth, clean, and slippery. Metal instruments are, moreover, usually better borne when warmed.

Smoothness.—This most essential quality has already been noted. It is a quality of the instrument itself, not of its preparation. When an instrument has lost its smoothness it must be discarded. Neither the most careful asepsis nor the most generous lubrication will atone for such a fault.

Cleansing.—The tendency of surgical cleanliness at the present day is to lay less and less stress upon destruction of microbes *in situ* by fire and poison and more and more upon their elimination, together with their toxins, as ordinary dirt, by generous washings and scrubbing; and it is tacitly conceded that sterilizers and drugs shall be used only where scrubbing and washing cannot reach. The genito-urinary surgeon cannot afford to fall behind in this esthetic and scientific advance. Now more than ever before must he be scrupulously clean in his person, his appointments, and his instruments no less. Every instrument should be made to shine both inside and outside immediately after as well as before using. A rubbing down with hot soap and water and drying with a clean towel in some cases will actually fulfil all the requirements of asepsis for a smooth sound; and for a catheter this need only be supplemented by a thorough irrigation, best accomplished by one who has running water at his command by slipping the end of the catheter on to the faucet and allowing the water to run through it for three minutes. For some cases, I repeat, this will suffice; but such asepsis is not adequate for all cases. We have no right to run an avoidable risk. *To insure the absolute sterility of a catheter it should be boiled for fifteen minutes.*¹ This is an ideal method of sterilizing rubber, whalebone, and the best woven instruments. For the woven instru-

¹ Albarran has shown that this suffices to sterilize an instrument already clean, but that half an hour is required to sterilize a dirty instrument.

ments that cannot be boiled, Elsberg's method of catgut sterilization may be employed—i. e., the instrument is boiled in a supersaturated solution of ammonium sulphate, and rinsed clean in sterile water. For metal instruments, however, neither method is ideal. There are two more convenient ways of cleansing them:

1. Pass the instrument slowly through the flame of a Bunsen burner or an alcohol lamp, allowing each part of it to remain long enough in the flame for the evaporation of the water of condensation that appears as it grows warm. Then cool it rapidly by plunging into cold sterile water,¹ or—

2. Pour a few drops of alcohol over the instrument. Be sure that it is entirely covered with the fluid and that there is no drip. Then light the alcohol and let it burn out. This method has its dangers for the carpet.

Many compound instruments—e. g., certain cystoscopes—may not be boiled and must, therefore, be submitted to some chemical cleansing process, of which Janet's formaldehyd method² is the best. All of the newer instruments may be boiled.

Lubrication.—The object of lubricating a urethral instrument is *not to make the instrument slippery, but to let it slip through the meatus.* A small dab on each lip of the meatus is all that is needed, and this is best applied, not by greasing the whole shaft of the instrument, but by transferring a bit of lubricant to its tip and with it smearing the lips of the meatus.

There is a great variety of lubricants. Vaseline is practically aseptic, though theoretically susceptible of contamination. It is greasy and unirritating. It has the disadvantage of being insoluble in water, sticking to the instrument, and in cystoscopy of obscuring the field. Olive-oil is not so good as vaselin. Glycerin is not sufficiently greasy. Preferable to any of these is Bangs's solution of Iceland moss sold under the name of lubricochondrin. Guyon uses a mixture of equal parts of water, glycerin, and soap powder. White uses a 33% solution of boro-glycerid.

Preparation of the Patient.—The anterior urethra swarms with germs, and while these are not necessarily pathogenic to the more sensitive mucous membranes beyond, they are likely to be so, and it is by no means impossible in practice to introduce these germs into the bladder on an instrument previously aseptic. Even so, no

¹ It is not essential, in the ordinary office manipulations, that the handle of a sound should be aseptic; the handle as well as the surgeon's hands need only be clean in the ordinary sense. Hence the instrument may be manipulated in the flame by holding its handle.

² Guyon's Annales, 1896, xiv, 122.

harm may come of it; the microbes may be expelled by the bladder quite as the bacilli of tuberculosis and of typhoid fever may be passed off from a healthy kidney through a healthy bladder without determining any local infection. But let the instrumentation be forced, bruising the delicate mucous membrane, or let there be other predisposing causes of cystitis (which see) at work, and the chances are that the surgeon will rue the day he trusted to the cleanliness of his catheter and took no account of where he used it, or how. Not only does the anterior urethra contain pyogenic bacteria, but these cannot be dislodged from it. The preliminary irrigations in which so many surgeons indulge are futile in principle, though they may succeed in some degree. The experience of years makes me absolutely certain that a preliminary cleansing of the urethra is a useless refinement, unless it is acutely or specifically inflamed, in which case catheterization is practically prohibited (p. 119). *The success of catheterization depends first and above all upon the gentleness and dexterity of the manipulation, and secondarily upon subsequent anti-sepsis* in order to atone for the necessary defects in preliminary asepsis. The details of this operation are given below.

Technic of Catheterization.—The introduction of a sound, staff, or catheter into the bladder is generally spoken of as catheterization. The use of the staff or sound is sometimes denominated sounding. The manoeuvre in either case is the same. Given a canal of certain dimensions and curvature, and an instrument to fit, the problem is to introduce the latter into the former. Nothing is easier, although to perform the operation perfectly is less simple than would at first appear. No amount of instruction, no volumes of directions, can teach the student how to pass the sound. He must learn by doing it first upon the dead then upon the living body. Some suggestions may, however, be given.

Always make the patient lie on his back, with his head on a pillow, his legs slightly separated, his body relaxed, his fears quieted, and himself as comfortable as possible. Both hands should be practised in introducing the sound, and the surgeon should keep his elbow supported during most of the operation, in order that his hand may be more steady. If the right hand is used, the surgeon places himself at the patient's left, and *vice versa*.

To explore the canal, a simple, blunt, steel instrument of medium size (20 French) is selected, and properly warmed. The penis, with foreskin drawn back, is gently encircled by the fingers and thumb of one hand, the instrument held lightly with the tips of three fingers and the thumb of the other. The shaft of the instrument is held over the fold of the groin, its handle nearly in contact with the

skin, from which latter (the integument, first of the groin and then of the abdomen) it is not to be removed until the point of the instrument is about to enter the fixed portion of the urethra (membranous). The instrument, at first held along the groin, with point

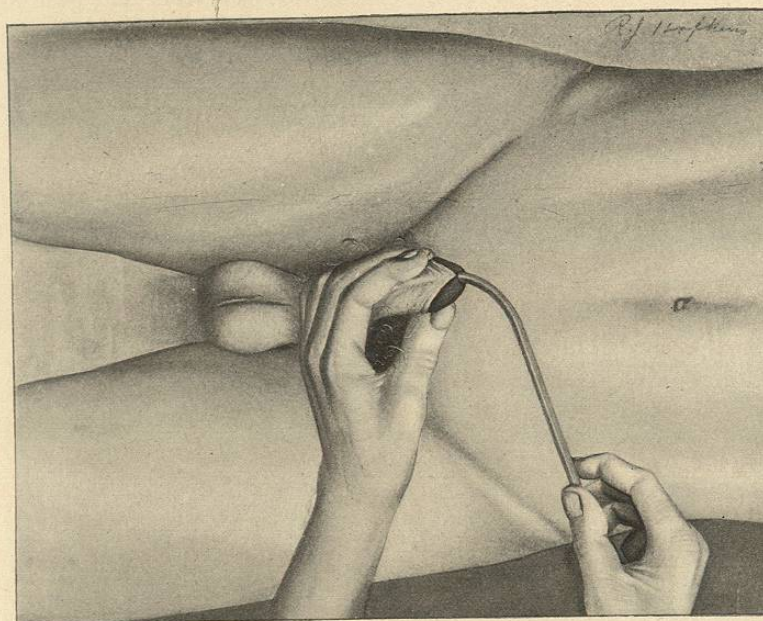


FIG. 15.

high and handle low (Fig. 15), is introduced at the meatus previously lubricated, and the penis moulded up over it. It is not pushed into the urethra, but the urethra is made to swallow the instrument, as it were. When the curve—and perhaps an inch of the shaft—has disappeared within the meatus, the handle of the instrument is swept around over the surface of the belly, so as to lie exactly over the linea alba, parallel with it, and still close to the integument (Fig. 16). The whole shaft of the instrument is now to be gently pressed towards the feet, being still kept close to and parallel with the surface of the belly (the penis, meanwhile, being lightly grasped behind the corona glandis and held steady). The point of the instrument should be followed with the little finger of the hand which manages the penis, and, when it gets fairly past the peno-scrotal angle, the whole scrotum, with the testicles and penis, should be largely seized with the hand and pressed against the pubis, with slight upward traction. The point may now be felt to settle down and adapt itself to the subpubic curve, after which the weight

of the instrument, properly directed, should carry it into the bladder.

As soon as the curve lies well against the symphysis, the scrotum, testicles, and penis should be dropped; the hand which held them takes the instrument, steadies it in the median line, and gradually carries the shaft away from the abdomen (Fig. 17), making the handle describe the arc of a circle, and depressing the shaft between the thighs until it lies nearly in the same plane with them. No pushing movement should be imparted to the instrument during this time. The handle is made to describe the arc of a circle, and in a healthy urethra the point cannot go astray. While the instrument is being depressed between the thighs, the free hand is employed in pressing down upon the mons veneris and the root of the penis (Fig. 18), to stretch the suspensory ligament—a point of importance to the easy introduction of an instrument, and one which

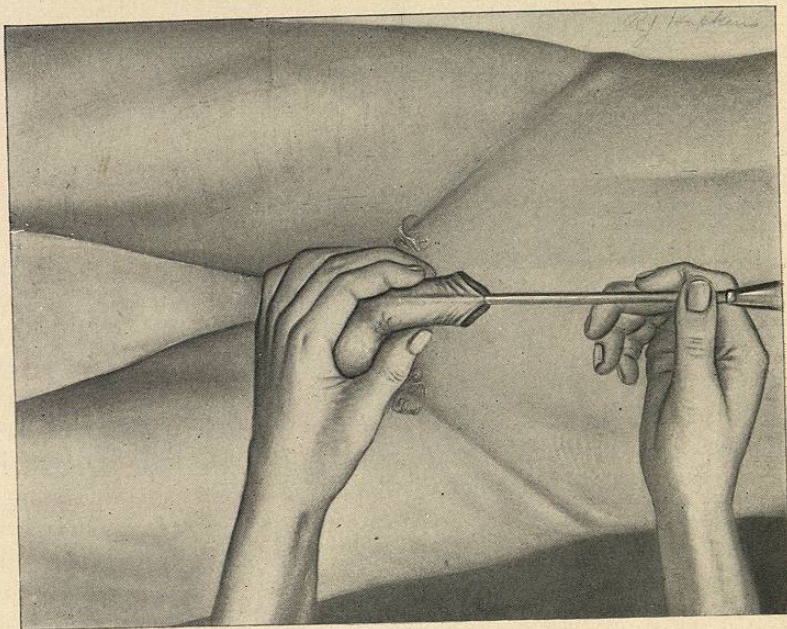


FIG. 16.

supplies to the short curve all the advantages claimed for the longer Bénéiqué curve. When the instrument is in the bladder, its point may be moved freely from side to side by rotating the handle.

The instrument should be withdrawn with the same deliberation and care with which it is introduced. No traction is needed. The motions used in introduction are simply reversed. The handle of the

instrument is lightly caught, and without traction made to describe the arc of a circle until it touches the abdomen over the linea alba. It is then carried around to the groin, and, by a tilting motion, unhooked from the urethra, ending exactly where it commenced along the groin, the handle low, the point high.

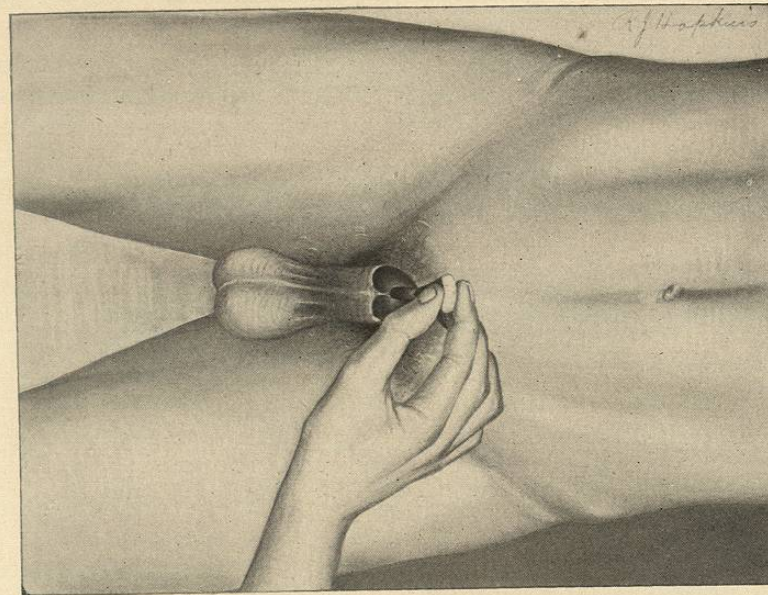


FIG. 17.

The first principle of instrumentation in the urethra is to avoid the use of force. Even in a healthy subject, sometimes, the beak of the instrument will become arrested by pocketing in the floor of the urethra. It is to avoid this that upward traction on the scrotum and penis is made, whereby the beak of the instrument is held in contact with the roof of the urethra, the surgical wall, until it gently slides of its own weight into the bulb and impinges against the triangular ligament. Here the beak of the instrument naturally sinks into the sinus of the bulb, and ceases to advance. Now it is that the operator, by pressing downward the mons veneris, tilts the instrument so that its beak touches the roof of the canal, and slides gently into the membranous urethra, the cut-off muscle relaxing before it. But often the beak is not so readily liberated. That it is still caught in the bulb may be known by the bulging out of its curve in the perineum as the shaft is being depressed between the thighs, and by the rebound of the handle when liberated. The obstacle is overcome by gently maneuvering the point of the

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

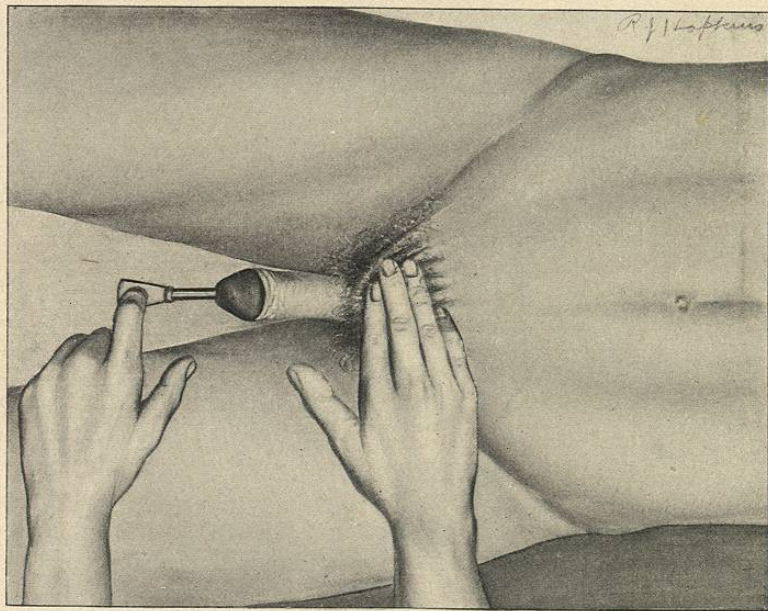


FIG. 18.

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).