CLINICAL LECTURES ON STRICTURE OF THE URETHRA.

Delivered in University College Hospital.

By **BERKELEY HILL, M.B., F.R.C.S. Eng.,**
Professor of Clinical Surgery in University College.

I.—MEASUREMENTS OF THE URETHRA?

IN the remarks I am about to offer you concerning stricture of the urethra, I shall mainly direct your attention to the conditions which relate to close or narrow stricture; but, before doing so, I shall advert to the natural width or natural variations in width of the urethra—for two reasons: one, because I believe a knowledge of that width is necessary to appropriate treatment of the stricture; and the other, because I think the urethra is commonly supposed by surgeons to have a narrower calibre than it really possesses. On the other hand, it must be borne in mind that the urethra, when not in use as a tract for the urine or semen, is not an open tube at all, but a chink of which the sides are in close apposition. This condition is well seen in a transverse section of the penis. Moreover, each successive portion of the canal, when not distended by fluid passing through it, spontaneously closes by its inherent contractility. Thus, when urine begins to flow from the bladder, it dilates the chink to an open tube as it passes towards the meatus; when the supply from the bladder ceases, the urethra, except perhaps the prostatico-membranous portion, closes directly behind the flow. This mode of closure of the urethra can easily be watched through the endoscope as that tube is withdrawn. The prostatico-membranous part, as you well know, is cleared by voluntary effort of the perineal muscles after the flow from the bladder has ceased. Undoubtedly, therefore, the size of the urethra, for purposes of micturition, means the width to which the closed chink must be opened to allow an unimpeded escape to the urine. We have no reason to suppose that the stream of urine ever expands the healthy urethra to its utmost limit. Indeed, the contrary is much more probably true. The elastic urethra may be likened to an artery. The elastic and contractile fibres may be considered to keep a tonic pressure upon the stream flowing through its interior, to maintain the force with which the urine is ejected from the bladder and eventually from the body of the patient. In other words, a bougie or urethrometer can be made to expand the urethra without injury, to a wider calibre than the bladder requires while expelling the urine; and our researches must be directed to discovering how much expansion is customary or necessary when devising means for giving free flow to the urinary stream. For of this be assured, that, if the balance between the expelling force of the bladder and the friction of the urethra be disturbed in favour of friction, the bladder grows tired and irritated, the kidneys are not properly disencumbered of their secretions, and thus begins that series of events which ends not unfrequently in death.

Nor must we delay treatment until difficulty in voiding urine is apparent, because the urethra may have lost much of its customary natural distensibility, and thereby injuriously affect the bladder before the size of the urinary stream is sensibly diminished. Such losses of elasticity can be detected only by instruments which measure the natural distensibility of the urethra; but, as the exact extent to which the urethra should yield before the stream is unknown to us, and as even slight losses of expansibility do seriously impede the flow and harass the bladder in some cases, our aim in treating stricture should be to restore the urethra nearly, if not quite, to its extreme capacity, in order to remove all hindrance to an easy yielding of the passage before the flow of urine, and thereby to ensure that the strictured parts shall open during micturition as much as do the healthy parts. Keep this steadily in mind.

The urethra, I need hardly remind you, is divided into prostatic and membranous parts behind the anterior layer of the deep perineal fascia, and into a spongy portion in front of that limit. With the prostatic portion, stricture has nothing to do; and with the membranous part only in severe cases, by extension of the stricture from the bulb. These two portions are in all persons, moreover, decidedly wider than the

spongy portion. Therefore, in speaking of the urethral measurements, I limit my remarks to the spongy portion. This spongy part may, for convenience, be divided again into bulbous and antescrotal segments.

The anatomists tell us that the bulbous portion is somewhat wider than the rest, having an internal circumference of seven-tenths of an inch; and that the remaining part is smaller by one or two tenths. The meatus does not exceed one-quarter of an inch in width. These measurements are laid down in the books as being liable to little variation, notwithstanding the great variations of the size of the penis. Most writers on stricture have not attempted to ascertain the full distensile capacity of the urethra, but have assumed, possibly from the measures of the anatomists, that the living urethra when dilated measures in circumference between eight-tenths of an inch and twelve-tenths of an inch, or between No. 12 and No. 15 or 16 of the English catheter scale. Long ago it was observed by some surgeons that, at least occasionally, urethrae are met with which easily admit sounds of much greater calibre. In Sir Everard Home's works are drawings of wax casts of an urethra, of which the expansile capacity went much beyond the limits just mentioned (*On Stricture*, 1805, vol. i, p. 566). Mr. Guthrie also drew attention to the great variation of the urethra in different persons, stating it to be between three-twelfths and six-twelfths of an inch in diameter; that is, from three-quarters of an inch to an inch and a half in circumference (*Lancet*, May 24th, 1851). He remarks, moreover, that the meatus must frequently be cut before the stricture can be properly treated. Though Mr. Guthrie pointed out this varying expansibility of the urethra, his remarks have been generally overlooked by anatomists and surgeons. Of late, there has been a tendency to grant a larger capacity to the urethra, especially by American surgeons. Messrs. Van Buren and Keyes, in their recent excellent work on *Genito-urinary Diseases*, estimate the diameter of a "fair average well-formed urethra at three-eighths of an inch", thus giving to it a circumference of over one inch and a quarter. Dr. H. B. Sands, in the *New York Medical Journal*, March 1876, has delineated casts of four urethrae obtained by wax injections, which varied in size according to the amount of pressure used in injecting. The result of his experiments showed that the expansile capacity must be set at a considerably higher value than the anatomists' measures indicate. During the last four or five years, Dr. Fessenden N. Otis of New York, following in the path which Reybard took in 1852, has set himself to ascertain, by a large number of measurements of the urethra in the living subject, its average distensile capacity. The measurements thus obtained match those claimed as exceptional many years ago by Guthrie.

Fig. 1.
The Urethrometer.

For carrying out his observations, Dr. Otis has invented the urethrometer. Here it is. (Fig. 1.) It consists of a slender cannula marked in inches and half inches, within which a stylet can be pushed backwards and forwards by turning a screw at the handle. The moving to and fro of the stylet causes some watch-spring segments of a bulb to draw together or to spread apart, thus forming a bullet-sound, of which the circumference may be varied between two-thirds of an inch and one inch and three-fourths or more. While altering the size of the bulb, the screw also turns an index round a scale, and thus shows the amount of dilation at each turn of the screw. When in use, a thin India-rubber stall covers the expanding part. The scale of this instrument is graduated according to the French scale. In this scale, each size increases in diameter by one-third of a millimetre, so that the number of the size denotes pretty closely in millimetres its circumference—so nearly that, for practical purposes, it may be assumed that such is the case, when estimating the capacity of a given urethra. I may here also observe that a millimetre is almost the one-twenty-fifth of an English inch. This methodical scale is gradually gaining general adoption in England, and it is the one I shall employ in speaking of the capacity of the urethra.

Dr. Otis has published measurements of the distensile capacity of the urethra, taken in one hundred individuals who had no history of previous gonorrhoea or symptom of contraction (*Stricture of the Male Urethra*, New York 1878, p. 200). His measurements were in all cases verified by witnesses. In these hundred cases, measured by the urethrometer, the average distensile capacity was thirty-three millimetres (about one inch and one-third) in the antebulbous part, and thirty-six millimetres in the bulbous part; the minimum being twenty millimetres, or four-fifths of an inch; and the maximum being forty millimetres, one inch and three-fifths. An urethra thus gauged by the urethrometer shows that the most

expansile portion is the bulb, from which point outwards the urethra slowly narrows for about two inches; thence it retains the same capacity to the end, unless the meatus be itself contracted. In such cases of narrow outlet, the urethra, Dr. Otis says, is dilated into the boat-shaped hollow in the roof. This fossa navicularis, described as a normal feature by anatomists, Dr. Otis believes to be the result of pressure of the stream when the outlet has been narrowed, as he could find no such fossa in infants, nor in the foetal urethra. But this suggestion requires further examination. It is one to which I hold little; for I have seen the fossa navicularis well developed in cases of hypospadias, where the urine has always escaped before reaching the glans penis. Besides measuring these hundred cases of normal urethra, Dr. Otis states that he has measured five hundred others, in which disease might or might not have previously existed. The results of his measurements in this large number of cases showed that the urethra could be distended, without pain to the patient; by instruments of a much larger calibre than has been hitherto supposed possible. But, as no relation exists between the meatus urinarius and the calibre of the urethra, the size of the meatus is no gauge for that of the interior parts; and, until an instrument was devised which could pass through a narrow orifice and then be made smaller or larger at will, the calibre of the meatus controlled the size of the instrument to be passed. Hence no contraction of the interior of the urethra that was not also smaller than the meatus could be detected by the sound; unless, indeed, Mr. Guthrie's advice was put in practice, and the meatus was cut before the dilatation of the stricture was commenced. The expanding bulb at once reveals the fact that a narrow meatus often terminates a canal along which a widely dilated bulb will pass freely.

As to the normal width of the meatus, Dr. Otis believes that naturally it may be slightly smaller than the urethra; but that, in its most perfect form, it has the same calibre as the last two inches of that passage. He explains the fact of its being very frequently much narrower than the rest, by supposing balanitis in infancy to have developed a ring of cicatricial tissue at the orifice. This solution I cannot accept, especially as traces of balanitis are often impossible to find in cases of small meatus; and I believe that the meatus may be naturally considerably smaller than the rest of the urethra. But, however this narrowness of the outlet be produced, the most common size of the meatus is twenty-four to twenty-five *millimètres*, or as nearly as possible one inch in circumference; and it may vary from a mere pin-hole to an inch and three-quarters.

By the measurements which I have made with the urethrometer, not so numerous as those of Dr. Otis, but exceeding two hundred, I have satisfied myself that the dimensions claimed by that gentleman for the urethra and meatus really exist in many cases, though I should set the usual maximum of distensibility somewhat lower than he does—placing the average at thirty *millimètres*, or slightly less, instead of at thirty-three *millimètres*. But I am convinced that the only exact mode of learning the size of a given urethra consists in measuring it with the urethrometer. By this means alone can we ascertain the distensible power of the urethra, or the precise situations of the unyielding parts which may have formed along that duct. As an useful aid in this investigation, Dr. Otis points out that the external circumference of the flaccid penis is a tolerably accurate indicator of the distensible capacity of the urethra. Thus, a small penis of three inches in circumference has an urethra of thirty *millimètres*; one of three and a quarter inches, thirty-two *millimètres*; and so on. He thus sets the maximum outside and inside measurements at four and a half inches and forty *millimètres* respectively.

In examining the spongy portion of the urethra, three points are to be ascertained: first, the natural distensibility of the healthy portions; next, the position of unyielding parts; lastly, their calibre. The size and shape of the instruments employed in this examination are of great importance; indeed, unless you provide yourself with suitable instruments, you will not gain any precise knowledge of the condition of the urethra you are asked to treat, and will probably bungle in your treatment. Bullet-sounds with slender stems (*sondes à boule*), some flexible, some rigid, are requisite in addition to the urethrometer. For searching for stricture, I discard instruments with tapering points or of equal calibre throughout—the ordinary so-called French and English bougies or sounds; they are deceptive in several ways. For example, an instrument of which the stem and point are of equal thickness is gripped the whole time it is passing through the stricture, and the presence of other non-expanding points behind the first notified by the sound is not perceptible; unless, indeed, they be narrower than the first, when they stop the further progress of the instrument. The shape of the bullet of an exploring sound best suited for its purpose is that of a turkey's egg, which is a little more pointed than that of the common hen. The circumference of the big end corresponds to the number of the sound.

The bullet is attached to a slender stem no thicker than No. 5 French. When made of flexible material, the stem should be marked in inches and half-inches by white rings, the fifth inch from the point having a wider ring than the rest, to serve as a landmark. The position of any obstruction can at once be noted by observing how many rings have passed the meatus. Again, the bulb at the end of a slender stem transmits impressions from only that part of the canal against which it is pressed; and, as it passes along the canal, it is checked by an unyielding point, or gives slight pain to the patient while it traverses an inflamed area. Directly the wide bulb has passed these situations of disease and reached a healthy part of the urethra, no sense of resistance is felt, and no discomfort experienced by the patient until the bulb arrives at the next diseased locality, because the slender stem does not distend the urethra. Thus the bulb and graduated stem enable the surgeon to ascertain the number, length, and exact position of the indurated or inflamed patches of the urethra. When no stricture is present, no difficulty checks the passage of the bulb to and fro in the urethra, if the triangular ligament be not passed. At that point, the change of direction, and often a slight diminution of calibre of the urethra through the orifice in the anterior layer of the perineal fascia to twenty-seven or twenty-six *millimètres*, usually check and sometimes stop the passage of a bullet-bougie, and pain is felt by the patient. But it is seldom, if ever, necessary to pass the triangular ligament to discover unyielding parts of the urethra. Old well-marked strictures do invade the membranous portion, it is true; but such have so greatly altered the form of the urethra in front as well as behind the perineal fascia, that their detection is easy, and the bullet-sound is not needed to discover such indurations.

With these prefatory remarks, I shall now demonstrate the method of ascertaining the expansibility of the urethra, and the possible existence of stricture, in patients introduced into the lecture theatre for that purpose. All of them complain of discomfort or pain associated with a gleet that has lasted, even in the cases of shortest duration, more than twelve months. I shall first introduce the urethrometer in its contracted state along the urethra as far as the bulbous portion, and then slowly expand the instrument until the patient acknowledges a sense of fullness at that part. The instrument is then gently withdrawn. If any sensation of clinging be felt by the operator, the bulb will be slightly diminished, until it slides along the passage without giving pain to the patient. Let us examine first this case, which is instructive and interesting from the fact that the patient has been for some time under treatment at different hospitals for gleet and for stricture of the bulbous portion of the urethra. In curing the latter, what is called a full-sized instrument by many surgeons has been gradually reached; namely, a No. 11 English steel sound was passed about four weeks ago, before the man came under my care. You see a bullet-sound, No. 25, just passes through the meatus, and is stopped at half an inch along the canal; but that a No. 23 bullet-sound can be coaxed through this constriction, and then runs freely down the passage. You will notice, in passing, that No. 23 bullet-sound has much the size of No. 11 English steel sound. We cannot, therefore, measure the calibre of the urethra behind the constriction at half an inch, unless we use an expanding bulb. To do this, I will introduce the urethrometer. This, when passed for five inches—that is, to the bulbous part—expands easily to No. 32, and can be withdrawn at that size as far as two inches from the meatus, where it must be diminished to 30; and so travels outwards to half an inch from the meatus, where we know the calibre is only 23, and the meter must be screwed down to that size before it can be withdrawn. This unyielding point shall be divided by a touch of the probe-pointed bistoury. Now this has been done, you see that a tapering bougie, No. 27, passes easily into the bladder, and thus demonstrates the absence of stricture at the bulb, to cure which he has been submitted to much assiduous instrumentation. The patient shall now lie down for an hour or two by the ward-fire before he goes home, and be told to come here again in three days' time for the passage of No. 30 sound through the incised part of the urethra only, not down to the bulb, where there is no stricture. This division of the stricture near the meatus will probably suffice to cure the gleet and the irritability of the urethra, for which he seeks relief. In order to test Dr. Otis's dictum, let us measure the circumference of this patient's flaccid penis. It measures three and a quarter inches, and thus tallies with the observation of our American *confrère*; three and a quarter inches (eighty-one *millimètres*) outside, and thirty-two *millimètres* inside.

[Other patients were examined by the urethrometer; and urethra that permitted dilatation at the bulbous portion to thirty-five *millimètres*, and even more, without pain, were found to contract at three or two and a half inches from the meatus to thirty-two or thirty-one, and henceforth maintained this lesser calibre until the meatus was approached. In most of the patients examined on this occasion—sufferers from long-

lasting gleet—the urethra suddenly narrowed at some point in the last inch of the urethra, sometimes at the meatus itself; and the meter had to be diminished to twenty-one or twenty to permit its exit from the canal. The external circumference of the flaccid penis in these patients corresponded also with the dilatibility of the urethra as stated by Dr. Otis. One patient was found to have a meatus of twenty-seven, a calibre at four and a half inches of thirty-three, contracting at one inch to twenty-four. Behind four and a half inches, the urethra for about three-fourths of an inch was only seventeen. This was an example of stricture of the bulbous portion.]

ABSTRACT OF LECTURES

ON METALLOSCOPY.*

Delivered at La Pitié Hospital, Paris.

By DR. DUMONT-PALLIER,

Physician to the Hospital; General Secretary of the Society of Biology, Paris.

M. DUMONT-PALLIER commenced by pointing out that Dr. Burq's system of metallo-therapeutics is a new method founded on two laws. The first law is, that the patients have a certain aptitude for metals; that is to say, every patient seems to be influenced in a certain way by the external application of a metal, which, however, is not in all cases the same metal. The second law consists in the fact that, when a metal has acted by its application to the surface of the skin, and has brought back sensibility, muscular force, and temperature, this same metal must be given internally to obtain similar and continued results. Thirty years ago, M. Burq studied all the facts relating to metalloscopy, especially at the Salpêtrière Hospital, and noted all the phenomena peculiar to nervous, hysterical, and hysterio-epileptic patients. M. Dumont-pallier then pointed out the different symptoms of hysteria which may be promptly changed in certain determinate cases by external applications of a given metal, or by the same metal administered by the mouth. Hysteria is now, he said, divided into two principal forms: common hysteria, which is met with in every hospital; and hysteria major or hysterio-epilepsy with all its varieties.

After describing the special mental characteristics of hysteria, which are well known, M. Dumontpallier passed to the modification of the general sensibility, which is frequently found in cases of hysteria. In these cases are found all varieties of hyperæsthesia, every kind of neuralgia, and especially the intercostal, ilio-lumbar, and occipito-frontal forms, more particularly neuralgia of the fifth pair; and finally neuralgia of the ovary, on which M. Charcot has laid much stress, and to which he has given the name of *ovaric*; a neuralgia which perhaps is not always seated in the ovary itself, and has a great influence over the determination and cessation of the attacks. Finally, instead of an increase of sensibility, there may be anæsthesia; and it is of great importance to attend to this anæsthesia and the muscular weakness, so as to recognise the phenomena which are amenable to metalloscopy. At other times, there are dysæsthetic phenomena, that is to say, perversions of sensibility, so that patients feel a sensation of heat when cold is applied, and *vice versa*. Special sensibility is no less affected in hysteria: hysterical patients suffer from amblyopia, dyschromatopsia, or achromatopsia; modifications of the smell and taste; and finally perversions of the touch, which interfere with their sensibility to the variations of temperature and to their power of distinguishing the forms of objects. There are also other symptoms, connected with motor power. Muscular contractility is deeply involved in hysterical disorders, and here also exaltations, diminutions, and perversions will be found present; for instance, paresis simulating muscular weakness, true paralysis, paraplegia, and hemiplegia. At other times, we find an excess of action—convulsions, contractions, and spasms. The muscles of organic life are sometimes the seat of spasms and contractions. The mucous membrane of the pharynx is often affected with general and special anæsthesia; patients no longer perceive the difference between sweet or bitter substances placed in contact with the mucous membrane of the pharynx. At other times, dysphagia is present, and the patients swallow with difficulty. The stomach is the seat of very important modifications. Nearly all hysterical patients are dyspeptic, and frequently suffer from constant vomiting. MM. Charcot and Fernet have published some remarkable cases in which the vomitings coincided with hysterical anuria. In these cases, chemical analysis has shown that the vomited

matters contained considerable quantities of urea. Flatulent distension of the stomach and intestines is common in hysteria; and the excessive swelling of the abdomen, which is due to a secretion of gas and to paralysis of the muscle of the intestine, may have very distressing consequences, from the difficulty it may cause in respiration and circulation. The enumeration of symptoms of hysteria which are amenable to metalloscopy would be incomplete without speaking of the cough and hysterical aphonia, which are owing either to spasm or to paralysis of the muscles of the larynx. But frequently the muscles of the larynx are not alone affected; the diaphragm and the intercostal muscles are modified in their functions; and then the hiccup and hysterical cry (*aboiement*) will be met with, which, according to M. Dumontpallier, may be cured by metalloscopy.

Cutaneous perspiration is considerably modified in hysteria, and the hand of an hysterical patient feels like the skin of a batrachian, that is to say, damp and cold; this being a defect in secretion due to a modification of the circulation of the palmar region. Another important function which is often disturbed in hysteria is the secretion of the ovaries and ovulation; and in some hysterical patients a copious leucorrhœa seems for some time to replace, at least during a certain time, the menstrual flow, which is often suppressed for some months. The vaso-motor nerves are seriously involved, and this modification shows itself sometimes by a remarkable rise and sometimes by a fall in the temperature. In reference to the appearances produced on the skin of hysterical patients by the derangement of the vaso-motor nerves, M. Dumontpallier called attention to the emotional or vaso-motor appearances frequently observed on the anterior portion of the chest. M. Du-jardin-Beaumetz has, it appears, lately shown, at the Société Médicale des Hôpitaux, a patient on whose skin all kinds of signs could be traced, because, owing to the vaso-motor modifications of the peripheral circulation, the impressions produced by a projecting body were shown by pimples. These are peripheral vaso-motor disturbances which are controlled by the nervous system.

When this condition of the nerves is suspected in a patient, when it is likely to be hysterical, sensibility, muscular power, and temperature should be interrogated if it be required to know what can be effected by metalloscopy and metalloscopy; the sensibility especially should be carefully examined. So long ago as 1848, M. Beau compiled an interesting work on this subject, which M. Burq completed in 1849 by his metalloscopic studies. Muscular sensibility, sensibility to pain, and tactile sensibility must be noted; and subsequently the order in which these different sensibilities disappear. Generally, analgesia is the first demonstration; then tactile anæsthesia ensues; and finally loss of muscular sensibility. M. Charles Richet, in his inaugural thesis, has carefully drawn attention to this order of progression in the loss of the different sensibilities. Analgesia may be present over the whole surface of the body; but, as a rule, it is in hysterical patients limited to half the body (hemianæsthesia). When there is general anæsthesia, some remnant of sensibility is sometimes found in the upper and inner part of the thigh or in the epigastric region, as M. Beau has already remarked. In order to discover hemianæsthesia, the use of a pin will suffice; or, better, the instrument to which M. Burq has given the name of *æsthesiometer*. This, which is the analogue of Weber's compass, has at its ends two blunt ivory points, intended to study tactile sensibility; and, without the patient's knowledge, a needle may be made to project from either, by which sensibility to pain may be explored. Dr. Burq's *æsthesiometer* is in the form of a compass; it is furnished with a graduated scale, by which the distance at which the two points can be felt distinctly is accurately measured. Generally, sensibility is so much weakened, that a more extensive separation of the ends is needed in order that the two points may be simultaneously felt. However, a long needle will enable any one to study cutaneous sensibility by superficial punctures, and the sensibility of the subcutaneous parts by deeper ones. The skin, in hysterical patients, may frequently be pierced, or even the muscles may be penetrated, without producing pain. In these cases of anæsthesia, there is no flow of blood in the situation of the punctures. It has been asserted that hysterical patients can, by an effort of will, conceal pain. M. Dumontpallier would rather think that they suffer from intellectual disturbances of such a character, that they are able to struggle against pain, and almost to say, "Pain, thou art but an expression". But there are conditions, which will be pointed out further on, in which the patients cannot be accused of deception, and in which they cannot easily lead the medical observer into error.

The general sensibility of the skin and of the mucous membranes in relation to pain, tactile sensibility, and temperature, is modified in hysteria, and special sensibility may also be affected in a very remarkable manner; recently, attention has principally been called to the modifications of the sight in hysteria. This is an almost novel fact; formerly, amblyopia and weak sight were only noted. At present, all

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