

## THE HISTORY OF URETHRAL STRICTURE\*

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HOMERIC descriptions of the Trojan wars, written about the ninth century B.C., and others of later date would naturally be influenced both by traditional legend and by contemporary customs. It is related that Heracles, or Hercules, amid other adventures, slew the Hydra, a pleasant monster with nine snake-like heads of which one was immortal and, if cut off, grew two in its place. Heracles, however, managed to slay the brute and dipped some arrows, presented to him by the god Apollo, into the blood of the beast, thereby making them poisonous. Heracles also seems to have conducted a school for archers, to which two worthy Grecian parents, Poeas and Demonassa, sent their son Philoctetes to be instructed. The lad was so diligent that, when he graduated, Heracles gave him a bow and the poisoned arrows as a mark of esteem; and later Philoctetes became the general officer in charge of the archers in the Grecian expedition to Troy. On the way there, having landed to indulge in a little archery practice, Philoctetes, being either stung by a viper or wounding himself with one of the lethal arrows, developed a suppurating stinking wound. The stench therefrom all but caused a mutiny on the troopship, and as the Grecian expeditionary force carried no medical officers, the wily Odysseus, the second in command of the whole army, decreed that Philoctetes should be marooned on the island of Lemnos, or perhaps it was Tenedos, where he remained in an unenviable state for ten years. The Grecian arms did not prosper and a popular cry was raised for the recall of Philoctetes to remedy the lamentable state of the Grecian archery. As the army would not have Philoctetes with his noisome wound the Treasury of Greece was induced to put up the necessary drachmæ and Aesculapius was persuaded, probably at enormous expense, to visit the patient. This he did, excised the wound, washed it with wine, and all was well.

The inference to be drawn from this story in connection with our present inquiry is that mankind tends to push disgusting diseases and other unpleasant things as far as possible into obscurity, and this may account for the fact that, whilst there are early references to urethral stricture, its later and more unpleasant effects received but little attention for centuries.

On the other hand, the tendency to pass something through any blocked passage in order to clear it is primitive, and the earliest recorded attempts to deal with strictured urethræ occur in Hindoo medicine, which had reached a fair degree of proficiency about the sixth century B.C.

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In the Hindoo writings there are descriptions of lithotomy, and Suśruta describes some 200 surgical instruments of various types, including some forms of catheter. He also describes in the Ayurveda the treatment of stricture by means of graduated dilators of metal or wood.

Hippocrates, who lived during the fifth and fourth centuries, B.C., described certain *genito-urinary* affections, including urethral abscess; and orthodox lithotomy was practised in Greece at this time, though elsewhere in 300 B.C. another use for lithotomists was reported from Alexandria: Diodotus, the regent for Alexander, King of Syria, a boy of ten, not seeing any chance of getting the throne for himself, called in a couple of lithotomists to remove a hypothetical calculus from the young king. This was done and Diodotus reigned in his stead.

In 200 B.C., Erasistratus used an elongated S-shaped catheter in the treatment of stricture, and this shape remained a standard one for a long period.

In 146 B.C., Corinth, an old centre of learning, was destroyed and Grecian medicine was transferred to Rome. The attitude of the Roman patrician was haughty towards the conquered races, and men of equestrian rank saw little reason to patronise any of the Grecian arts, so that for a time the practice of medicine remained in the hands of underlings, often slaves. Specimens of urethral dilators, however, made of lead and belonging to the last century B.C. have been found; and discoveries of Roman culture in France suggest that urethrotomies of some kind were attempted. A bronze catheter of elongated S shape, some 12 inches in length and about 9-10 E in size is, or was, to be seen in the museum at Naples and probably belongs to this period.

Celsus also, who lived in the first century of the Christian era during the reign of Tiberius, gives a description of an S-shaped catheter and seems to have been familiar with urethral stricture, having described some of the conditions arising therefrom. In the next century Galen also mentions the subject, but nothing further seems to have been achieved and the position for many centuries was that a few isolated individuals might be prepared to pass something along a stenosed urethra, if it was possible, but if not, the patient was abandoned to die rapidly of retention or to develop fistulæ and to linger in obscurity.

So matters persisted throughout the days of the late Roman Empire, the Byzantine period, and little seems to have been achieved in the subsequent Jewish Mohammedan period which extended from the eighth to the eleventh centuries A.D. In the tenth century, Rhazes of Baghdad and some of his contemporaries performed some sort of external urethrotomy or perineal puncture; and about the time of the Norman conquest of Britain, Albucasis wrote a text-book which described many medical subjects, including lithotomy. He recommended the use of silver instruments and also the use of flexible bougies or sounds of lead for dilation of the urethra.

In mediæval times from the eleventh to the fifteenth centuries medicine and surgery became utterly debased and a prey to the most grotesque superstitions, as the result of which the sale of amulets, runes and charms became popular. This period was not, however, completely sterile, and in this country during the fourteenth century, Magister Johannes d'Arderne reveals some practical acquaintance with urethral surgery. It is recorded that in a case of calculus of the anterior urethra he tied a ligature of linen round the shaft of the penis to immobilise the stone, cut down upon it, removed it, sutured the wound, dressed it with finely ground flour and egg-white, wrapt the whole in linen, and cured the patient. Also somewhere about A.D. 1500 two continental surgeons, de Vega and Diaz seem to have attempted some form of internal urethrotomy. These efforts were, however, isolated and internal urethrotomy disappeared, to reappear again in France, later again in Germany, but, only became finally established in the nineteenth century, when Civiale in France re-established the procedure.

Although during the period of the Renaissance for about 150 years, up to A.D. 1600, practically the only operation beneath the surface of the body was that of lithotomy, and this too had fallen into the hands of itinerant quacks and humbugs, there were, however, some exceptions and a few sporadic outbursts of enlightenment. In A.D. 1520 occurred the first recorded serious epidemic of gonorrhœa, and gradually from that time the subject of stricture began to receive more attention. At this period urethral obstruction was regarded as due to the formation of obstructive growths and not to a constriction of the urethral lumen though various dilators of wax, flexible ivory, etc., were in use. This idea persisted until the eighteenth century. Ambrose Paré, who lived from 1510 to 1590, used the following method to deal with the supposed obstructing growths, and here is a contemporary translation of some of his remarks on the subject: "A silver weir, sharp at the upper end, is to be passed in as far as the obstruction, then by oft thrusting it in and out, it may wear and make plain the resisting caruncles."

In 1588, John Reade noted that stricture occurred as the result of gonorrhœa and wrote at some length about it. In one article entitled "A Treatise of the Caruncle or Carnosities Growing in the Yarde or Necke of the Bladder," he gives a description of the difficulties of micturition and of coitus and of the formation of fistulæ in stricture cases. He outlined two methods of treating it: in the first, which he describes as violent and not without danger, "an instrument of tin or the like is to be put into the urethra and the caruncle is to be pulled out by the roots!" He adds that in such cases "not only urine but blood also itself, yea, and gobbets also, and fragments of flesh" may be brought forth. The second method advocated by Reade as preferable to the above, being "more gentle and easie," was to take "a fine stalk of mallow or parsley," which was to be oiled and passed through the urethra. Failing this a

“wax candle” of threads soaked in wax and turpentine and of “such bigness as the urine conduit will easily receive,” was to be pushed in until the operator felt a “rubbe or a little Jumpe.” The bougie was then to be withdrawn and its surface searched for any signs of moulding. Should the stricture still continue obstinate “probes or searchers of lead” were to be used, “lead being an easier and mitigator of pain and also a drier of ulcers, causing them to stoop and shrink in.” Whatever form of bougie was eventually passed, it was to be retained *in situ* for the whole day. Reade also advocated medicating the surface of the bougies with various substances to cause shrinking of the obstructing tissues and noted that, if any of these procedures caused “great pain or an intolerable shivering,” the urethra was to be washed out with goat’s milk or rosewater with a little camphor dissolved in it.

In the seventeenth century, with but few sporadic exceptions, surgery had reached an abysmal level and was largely in the hands of barbers, executioners and mountebanks. The method of whittling the stricture with a sharp point or a small blade at the end of a long stem, which was passed to the face of the stricture with or without some form of tubular guide, was still advocated by some but not by all, for in 1603 we hear that an operator named Mayerne performed this operation on Henry IV. of France, with results which earned him severe censure for his failure to relieve the monarch. However, Jean Baptiste Loyseau, a fellow practitioner, then applied escharotics with apparent success, as he was created “Royal Surgeon.” In this country Richard Wiseman, who lived from 1622–1676, is the only name of importance. He used medicated bougies to deal with the “Caruncles and Carnosities,” and considered that the condition was the result of gonorrhœa. In 1652 he gives a description of the treatment of a stricture by a friend and colleague whom he called “that celebrated chirurgion, Mr. Edward Molin.” He states that this gentleman made an incision into the urethra near the neck of the bladder and Wiseman records that the stricture was of such consistency “that the knife did not readily divide it for it was as hard as a gristle.” He also noted that the urine gushed out and that the wound remained fistulous. He then goes on to tell that later “with probes and candles” the surgeon attempted to find a passage but in vain.” Still later the patient appears to have become querulous about the leaky condition of his perineum and the whole urethra was laid open by a mid-line incision, which divided the scrotum, but, sad to relate, the urine continued to escape through the perineal opening. This story is the first account of any systematic attempt at external urethrotomy in the treatment of urethral stricture. Wiseman appears to have used the method on other occasions, but usually favoured the application of escharotics. Bougies covered with verdigris, quicklime, alum, or vitriol were amongst the means employed to open up a constricted passage, and if bougies, made of wax or lead, failed to pass, then efforts were made by

the scratching type of incision, already referred to, to bore a way through the "Carunculæ."

At the end of the century the French operation of La Boutonnière, which, as the name implies, was a buttonhole puncture of the dilated urethra behind a stricture and was performed with or without a staff in the canal, was beginning to be used, but the main surgical features of the century were the stone cutting performances of Frere Jacques, who lived from 1651-1719.

In the eighteenth century surgery was still practically confined to the body surface, the only deep penetration being that used for the removal of vesical calculi, and with few exceptions surgical teaching was in the hands of the French, where it remained until the revolution. The active work of John Hunter took place in the latter part of the century, but the absence of anæsthetics and the handicap caused by violent sepsis, to which all wounds were liable, necessarily made progress slow. In 1719, John Douglas tried the suprapubic operation for stone, but soon gave it up owing to a 30 per cent. mortality. In 1730 a successful external urethrotomy was recorded in France by Lédran, who made a long deep incision into a perineal mass riddled with fistulæ, but at first failed to find the urethra. He then made five or six attempts on successive days to reach the urethra with a fine bougie, passed along one of the fistulous tracks, and finally succeeded in introducing a fine grooved staff and laying the track open. It is recorded that the wounds healed and that the stricture was subsequently dilated. Thus the principle of urinary diversion to rest an inflamed stenosis was recognised at this time.

In 1727, William Cheselden, 1686-1752, appears to have concentrated on the lateral operation of lithotomy to such purpose that he could remove a stone in fifty-four seconds with a mortality of 7 per cent. He also explored the suprapubic approach to the bladder, but abandoned it, and all attempts at improving lithotomy at this period appear to have been directed towards lowering this time record; thus in 1753, Cæsare Hawkins introduced his cutting gorget which was described by a contemporary as a "terrific implement." It was supposed to reduce the operative time and to decrease the liability to wounding the rectum and pudic artery. None of this, however, helped towards the problem of establishing a passage through a badly stenosed urethra.

In the latter half of the century the French operation of la Boutonnière became established for cases of retention and impassable stricture and was used by Chopart in 1786. For the simpler types, however, methods of dilatation remained much the same as heretofore, but Baron Dupuytren introduced the method, called by him "Vital Dilatation," or the use of an indwelling catheter or bougie.

John Hunter was born in 1728 and died in 1793. He paid some attention to stricture of the urethra, as he did to so many other subjects, but had curious ideas about its causation. He classified strictures as

permanent, truly spasmodic, which were rare, or mixed. He noted spasmodic contraction of the urethral muscles in stricture and regarded it as being a cause of retention. He doubted "very much if stricture commonly or ever arose from the effects of the venereal disease or from the method of cure," and pointed out that stenoses were common to all body passages such as the œsophagus, intestines, rectum, etc. He regarded the contractions as due to "a wrong action of the muscular fibres" and he was supported in this contention by his pupil Everard Home. In 1787, Abernethy and others were, however, quite convinced of the gonorrhœal origin.

In 1765 we get a glimpse of Hunter's method of dealing with impassable stricture. He opened the urethra behind the constriction and passed a staff forwards as far as the stenosis. He then passed a cannula along the anterior urethra as far as the face of the constriction, pierced the intervening mass of scar with a trocar, and tied in a catheter.

The general run of the passable strictures, however, continued to be dealt with by the same methods as had been used since the fifteenth century and the days of Paré and Wiseman, viz., by means of dilators and caustics. John Hunter continued to recommend the use of the latter and applied crayons of silver nitrate through a cannula. Often the caustic material was embedded in lard, which was smeared over the tip of a bougie or placed in a small cavity near the end of the appliance, and, if the action became too excessive, the urethra was washed out with vinegar to control the effect. A popular method of dealing with retention was to apply caustic as above on a bougie or catheter, either to the whole stenosis, if the stricture was passable, or to its outer face only. The patient was then given castor oil and a dozen or more leeches were applied to the perineum.

The idea of a fine guide to lead in a larger following instrument was suggested by Desault during this century but attracted little attention at the time.

In 1795 the lanced catheter made its appearance. This was a silver catheter from the end of which a cutting blade could be protruded in order to stab its way through the stricture. It achieved much popularity for a long period and was the precursor of later internal urethrotomes.

During the first half of the nineteenth century constricted urethræ received more definite attention and various classifications of types were beginning to be made; but on the whole methods of treatment remained largely stereotyped. Astley Cooper, who was born in 1768 and died in 1841, regarded 99 per cent. of strictures as gonorrhœal and made some study of the subject. In cases of retention in impassable stricture he made a small perineal opening through the skin and integuments, felt for the distended urethra behind the stenosis, and plunged a knife into it, an operation which differed but little from the commonly practised boutonnière.

During this time considerable skill was developed in the passage of urethral sounds and bougies, of which there were a considerable variety. Olivary bougies and bougies of wax, plaster, catgut, and gum-elastic were used at an early stage and Leroy d'Étiolles used fine filiform bougies to which he added various corkscrew bends at their distal extremities to facilitate their passage. This surgeon used la boutonnière, when needed, and also made use of a primitive type of internal urethrotome with a concealed blade which could be passed beyond the stenosis and elevated to cut the stricture from within outwards. External urethrotomy, however, generally resolved itself into groping in the depths of a mid-perineal wound for the urethra behind the stricture, often a difficult matter in the absence of distension.

About this period systematic attempts began to be made, after the urine had been evacuated by the boutonnière to locate and deal with the stricture in front of the external urethrotomy opening, the production of a fistula having heretofore been generally regarded as sufficient. Also to hasten the process of intermittent dilatation a variety of internal urethrotomes and dilators began to appear in the hands of various operators. The idea of perforating the tip of an instrument to allow it to pass over a fine filiform guide, already established in the urethra, made its début at this time but only received tardy attention.

In 1817, Jean Civiale (1792–1867), produced a sound form of internal urethrotome with a terminal bulb which was passed through the stricture, a blade protruded from it, and the whole apparatus was withdrawn, dividing the stricture from within outwards. As a considerable sized bulb had to traverse the stenosis the apparatus was only useful to accelerate the dilatation of fairly large passable stenoses and often failed to produce much benefit. Civiale did not persist far with the idea, being more interested in lithotripsy which was beginning to receive some attention.

In 1829, Fisher of Baltimore attempted anterior urethroscopy with a primitive Desormeaux apparatus, but satisfactory results were not achieved owing to defective illumination.

In 1836, Dugas actually excised a stricture, but apparently as an isolated instance, and in the same year Guthrie made some observations advocating internal urethrotomy, which he performed with the lanced catheter and asserted that the method was best to be applied in the anterior urethra and should not be used further in.

The desire to speed up the results from intermittent dilatation not only led to the increasing use of urethrotomes but also caused the field of forcible dilatation to be explored. The divulseur owed its origin to this, and Peréve introduced one in 1847, the idea being subsequently exploited by Holt and later by Sir Henry Thompson. Peréve's divulseur consisted of two light thin blades united together at their distal extremity like a hairpin and with their opposing surfaces hollowed out to form a

sort of split tube. This was passed through the stricture and a series of larger and larger tapered stylets could then be forcibly thrust down between the blades, wedging them further and further apart until the stricture ruptured. The method was quite blind, produced many alarming results, and was later abandoned, internal urethrotomy, with its controlled division of the stricture, being preferable even though the imperfect appliances of the day often produced wounds of the urethra apart from the stricture. Hæmorrhage, clot retention, and urethral fever are amongst the ill effects recorded as following these early attempts at urethrotomy and a variety of appliances to deal with them are described in the contemporary literature.

The idea of a guide to facilitate the passing of a urethrotome had been used fairly early and usually took the form either of a short narrow beak,  $\frac{1}{2}$  to  $\frac{3}{4}$  inch in length on the distal extremity of the appliance, or an oblique eye was bored through the distal end of the instrument, which could be threaded over a guide and run along it. In 1848, Maison-neuve conceived the idea of a filiform guide which could be first established in the urethra and to which the following urethrotome could be screwed and made to cut the stricture from without inwards. A great advance was thus obtained in dealing with many types of small difficult stricture, and the appliance, with some modifications, including those of the late Sir John Thomson-Walker, continues in essentials the same to-day.

In this country in 1849 Robert Wade regarded most ordinary cases of stricture as sequelæ of gonorrhœa but thought that there was an hereditary predisposition to their formation, though he considered that the true congenital type was extremely rare. He discussed various means of causation and the evils of extravasation, surgical fever, and its deleterious effects upon the bladder, kidneys and testicles. In common with the prevailing opinion he regarded the occurrence of a urethral fistula as beneficial because it relieved retention of urine and might provide a period of rest to the constriction permitting subsequent dilatation. He habitually treated cases of retention with catheters, hot baths, and enemata, but, if a catheter could not be introduced, he advocated puncturing the funnel-shaped urethra behind the stricture. On the whole, however, he regarded external urethrotomy as only a palliative measure and one not devoid of danger.

He was a firm believer in the application of caustics and strongly advocated the merits of caustic potash. For its application he used a catheter like that used by Leroy d'Étiolles with a slightly bulbous tip with a lateral opening just behind it. This was passed, until the bulb was felt to slip through the stricture, when a stylet with a small quantity of potash at its end was introduced so as to protrude through the eye of the catheter and so smear the caustic over the inner surface of the constriction. In suitable cases he employed indwelling catheters and,



when forced to open the urethra for retention, he usually adopted the method of Astley Cooper.

About this time methods of vesical puncture with trocars and cannulæ became somewhat popular. Punctures were sometimes made *via* the perineum, but these, owing to the depth and to the liability of going astray, were found to be difficult and dangerous. Suprapubic puncture had been used by Abernethy, but was regarded with considerable suspicion and punctures were even occasionally made direct through the symphysis pubes. On the other hand, rectal puncture with a curved trocar, which had already been used by Everard Home, a pupil of John Hunter, was often used. The instrument was passed under the guidance of a finger *via* the anus and rectum and pierced the bladder at the upper border of the prostate.

The introduction of chloroform anaesthesia in 1857 by Sir James Young Simpson (1811-70), and rather more than ten years later the work of Lord Joseph Lister opened the door to deep surgical exploration. There was at least no need for desperate speed to achieve one's results within the limits of time set by the endurance of the patient and gradually the appalling effects of sepsis became controlled.

The railway catheter idea, already used earlier, by which sounds and catheters could be slid along a pilot to guide them, was fully exploited by Gouley in the United States of America, and in 1870-71 he produced his tunnelled staffs and railway catheters. This use of filiform pilots, however, often led to difficulties and the alternative means already seen with the urethrotome of Maisonneuve, with the filiform screwed to the beak and the whole appliance being slid inwards as a single unit, was followed up and led to the idea of the Harrison whip bougie, and the detachable guides and followers of de Lant, le Fort, and to those in common use to-day.

Edward Cock, 1805-92, in his earlier surgical career often used vesical puncture by the rectal route in cases of impassable stricture and at this time the accepted procedure in external urethrotomy differed but little from the old French boutonnière, which sufficed if the urethra was distended, but was otherwise difficult and provided little surgical drainage to a highly septic perineum. Cock's operation was essentially the same, but was designed as a forlorn hope in those cases of retention in impassable stricture in which all perineal landmarks were lost.

The forefinger of the left hand was placed in the rectum on the dilated urethra at the apex of the prostate behind the stricture and Cock's double-edged knife was plunged in the mid-perineal line and aimed at the finger tip. At the same time, by swinging the handle of the knife up and down, the skin and integuments were divided in both directions. Thus in one incision the bladder was evacuated and the perineum was surgically drained. The indications for this procedure were given by Jacobson as follows: "The following are the cases to which this

operation is well suited : when the stricture has existed for a number of years ; when the urethra has become permanently obstructed or destroyed by the constant pressure of the urine from behind, and by reiterated attempts, generally fruitless, to introduce an instrument ; when extravasation into the perineum has again and again taken place, causing repeated abscesses and their consequences, the formation of urinary sinuses and fistulæ, until the normal textures of the perineum become obliterated, and are replaced by an indurated gristly structure ; when the bladder has become thickened and contracted by the constant action of its muscular coat until little or no cavity is left ; and when the urine is constantly distilling by drops either through the urethra or through one or several fistulous openings, which dot the surface of the perineum, penetrate through the indurated scrotum, and even find their way to the nates below and the region of the pubes above." This gives briefly a description of a condition which was comparatively common at the time.

About 1876, Wheelhouse introduced his method of external urethrotomy by opening the urethra on a special staff anterior to the stricture, and then with a probe-pointed gorget, or director, searching for the passage through the constriction. It was a practical measure and achieved a long period of popularity, as it avoided the necessity of passing any form of staff through the canal as a guide to incising the urethra. Attempts to facilitate the passage of such a staff had been made by Syme, who introduced his special staff or sound of about 10-12 E, grooved on its curved portion along the convexity, but with the latter portion reduced to 3-4 E in size. When this narrow part had been successfully negotiated through the stricture the instrument was pushed on until the thickened part of the shaft was felt to be against the face of the constriction. An incision was then made in the perineum, and the slender grooved part of the staff was felt for behind the stenosis, which was divided on the groove from behind forwards.

By this period the use of metal sounds for intermittent dilatation was popular, though Cock and others tried to advocate flexible bougies. Most surgeons, however, felt the need of a more rigid control of the point of their sounds when seeking to penetrate a difficult stricture and to avoid making false passages, the production of which was all too common. When using rigid instruments much attention was paid to the exact anatomical position of the appliance which led to the elaborate flourishes and sweeping movements so loved by the authors of the various contemporary text-books. Much energy was also spent in producing the correct curvature on the terminations of metal sounds, and geometrical diagrams were produced which were supposed to give the right shapes from theoretical considerations. As a rule, however, the curves were wrong, being too pronounced, and many used sounds of lead which could be bent to meet individual preferences.

In actual practice the method of introducing small sounds appears to

have been one of careful probing, the sense of touch being used to detect progress of the instrument, and extreme gentleness was always insisted upon by all the responsible authorities.

We next come to the work of Fessenden N. Otis in the United States. He observed that in the healthy urethra any instrument, which would pass the external meatus, would traverse the rest of the canal and that constrictions of the meatus might mask the presence of considerable degrees of stenosis behind it. This led him to the frequent performance of meatotomy, to make a research into the urethral calibre, and to endeavour to standardise the size of its lumen. The general opinion at that time was that the size was about 16 E or 27 Ch., but Otis quickly proved that the actual size was nearer 30 E. From 1861 onwards he had been working with a series of graduated bulbs, or bougies-à-boule, but later introduced his urethra meter or urethrometer, a sort of calibrated probang, expanding from 10-40 C. with the degrees of dilatation being indicated on an external scale. His observations led him to formulate a relationship between the penile circumference and the urethral calibre which, although since proved erroneous, at any rate demonstrated that there was no fixed standard calibre for every individual and that there might be strictures of larger lumen than would be detected by means of sounds or bougies passed through the external meatus. In this opinion Otis received support from Van Buren and Keyes in the States, and in 1875 from Berkeley Hill in this country.

The natural constrictions at the external meatus and in the fossa navicularis were not appreciated at this period and this unfortunate region became a field of much misplaced, though enthusiastic cutting. Multiple internal urethrotomies by means of bulb urethrotomes of the Civiale type became common and any sort of narrowing was promptly divided. Confusion consequently began to appear as to the exact localisation of stenoses and as to which were real and which were anatomical in nature. Otis considered that most strictures occurred in the spongy urethra, but in this country Sir Henry Thompson believed the majority to be situated in the bulbo-membranous region.

Otis also produced various mechanical dilators, and in 1870 his two-bladed dilating urethrotome, often made with a tunnelled beak to facilitate introduction, appeared. He located the constriction by means of his urethrometer, or with graduated bulbs, introduced the dilating urethrotome, expanded it, elevated a concealed blade, and drew this through the constriction from behind forwards, thus dividing it whilst on the stretch. This he did in many hundreds of cases. For early infiltrations he advocated the use of astringents and used silver nitrate applied on probes or cottonwool.

In this country Sir Henry Thompson, who lived from 1820-1904, made a critical and more or less favourable survey of Otis' work and made the following comment about the urethral calibre: "the question

of the diameter of the urethra must be considered as resolving itself into a measure of its capabilities of being distended," a point of view which had hitherto been overlooked but which was also noted by Guyon. Thompson had an extensive knowledge of strictures and his classification of them differed but little from those to be found in modern text-books. At that time also there was some controversy on the question of multiple stricture; John Hunter had found a maximum of six, Colot in France eight, but Sir Henry Thompson had only managed four. Congenital and traumatic strictures were recognised but received but little systematic attention, and female stenoses, though admitted, were thought to be extremely rare and to be confined to the external meatus.

Enthusiasts like Otis regarded urethrotomy as a cure for constrictions of the urethra, but Thompson and others felt that recontraction was always possible, the general opinion being that a No. 12 sound should be passed at intervals for the rest of the patient's life.

At this time also Berkeley Hill, 1834–1892, at the Lock Hospital was working on the same subject. He was much impressed by Otis' work and used bulbous bougies for the exact localisation of constrictions. He laid down the following important principle as regards the physiology and mechanism of the urethra which should still be kept in mind. He said: "if the balance between the natural expulsive force of the bladder and the friction along the urethra is disturbed the bladder is irritated, the kidneys are affected, and the beginning of the long chain of events, which terminates not infrequently in death, is made."

As the result of these ideas a considerable amount of urethrotomistic activity was generated and in some cases in over-enthusiastic hands was pushed too far, so that notes of caution began to appear and in 1889 we find Hurry Fenwick pointing out the dangers of hæmorrhage if internal urethrotomy was carried into the roof of the membranous urethra.

Towards the end of the nineteenth century excision of stricture was beginning to be practised, but failures were too frequent to make it popular. The addition of a preliminary suprapubic, first advocated by Legueu, improved matters somewhat but did not become a common addition to the operation of excision much before 1920. At the end of the last century also the use of caustics was disappearing, violent methods of forcible or too rapid dilatation were generally frowned upon, the use of mechanical dilators such as those of Kollmann and Oberländer, were coming into favour with some surgeons, and in short, the methods of dilatation were much the same as those in use to-day. In 1895 impassable stricture with retention were usually treated by some form of external urethrotomy, the operations of Wheelhouse or Cock being frequently employed according to the circumstances. Internal urethrotomies were common and it was hoped that electrolysis of the stricture would contribute to its more complete absorption and lead to cure.

Since 1900 there has been little change in principle, though strictures

to-day are much more under complete control in competent hands than they were then and practically all the means of dealing with urethral stricture, which had been proved sound in 1900, are still in use. Violent measures of splitting or of too rapid forcible stretching have been, or ought to have been, dropped. Internal urethrotomies for medium and large calibre strictures have practically ceased, but for certain cases of small and difficult stenoses opinion on this subject is still divided. Some surgeons cut such strictures whilst others prefer to persevere with the slower method of intermittent dilatation whenever possible.

Cases of impassable stricture, especially when complicated by retention, are generally treated by a suprapubic diversion of the urine, followed by some form of dilatation, and retrograde methods of passing instruments from the bladder are adopted when necessary. External urethrotomy is still needed in certain cases and strictures are excised from time to time.

So we have passed from those days in 500 B.C. when urethral strictures were dilated with graduated instruments and difficult cases of retention were abandoned or put out of sight to the present time, when the condition is largely under control, though we still meet occasional obstinate and fistulous cases, are still using graduated gum-elastic bougies and sounds, and still seem to be as far off as ever from a definite cure for the condition.

Fortunately modern methods of controlling gonorrhœa would seem likely to bring the incidence of stricture down to one of small dimensions and should reduce the number of such cases to one of comparative rarity in the future.

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