

Simply, as I apprehend, that when the muscular structure of the meatus, and the urethra behind it, is in perfect condition, it is enabled to empty the urethra completely after urination. Let inflammatory action be set up in this locality, as may occur from extension of an infantile or an adult balanitis, or from gonorrhœa, or from any other cause, and a plastic exudation results, which, becoming organized, disables the urethral muscular structure at this point, and it is no longer able to act efficiently in expelling the last drops of urine; they are retained, a dribbling results, and is the unvarying sign that such an accident has occurred. It is from this cause that the discharge from a gonorrhœa is retained, aggravating and prolonging the disease. Now, the only rational remedy, in this class of cases, is to relieve the obstruction; we cannot restore the disabled muscular structure, but we can relieve the obstruction, mechanically, by making the orifice to correspond with the size of the canal behind it, and thus enable the urethra to clear itself of its irritating secretions.

But Prof. Sands says: "The practice of slitting up the meatus is injurious and irrational," that "the normal meatus is narrow, and its size favors the projection of the stream of urine during micturition." It is not the *normal* meatus that requires any slitting, or any other operation; it is the division of the *abnormal* meatus—disabled through antecedent inflammatory action—which a *rational* treatment demands. I venture the assertion that thousands of cases of gleet exist today, which have been treated by copaiba, and constitutional remedies, and injections varied and frequent, and even by full-sized bougies, for years, and vainly, which this comparatively simple operation (of removing the obstacle to the complete emptying of the urethra) would promptly accomplish, besides affording immunity from recurrence, except through a fresh contagion.

But gleet, troublesome as it is, is by no means the only untoward result possible from a contracted meatus. This point is admitted by physiologists to be a sort of telegraphic

depot for the whole genito-urinary system. Nor is it the genito-urinary system alone which may suffer from irritations of this locality. You have but to recall the fact, that a lascivious thought will cause a sensation at this point, and that slight irritation here will induce the sensuous thought. Depression of spirits, especially in youth; incontinence of urine; pain on ejaculation; neuralgias of the testicles, over the pubis, down the thighs, and even to the soles of the feet; spasmodic Stricture, with or without retention of urine; prostatic irritation and enlargement; inflammation of the bladder and testicle—are each capable of being produced by this condition, in certain instances, as proved by the prompt disappearance of these troubles (often ineffectually treated by other and various means) through a free division of a contracted meatus. My paper on "Reflex Irritations throughout the Genito-Urinary Tract," read before the New York Academy of Medicine in February, 1874, adduces no less than nineteen representative cases of this sort, with all the particulars of antecedent and subsequent conditions. In the London *Lancet* of January 29, 1876, Mr. Furneaux Jordan, F. R. C. S., Professor of Surgery, etc., of Birmingham, England, in speaking of the possible influence of a contracted meatus, writes thus: "I not unfrequently meet with the cause and its results. In boys a common result is cystitis, simulating stone in the bladder. Boys, however, often escape notable trouble; as men they are not let off so easily. With the cares, indigestion, gout (disguised or open), and other ailments, which increase the acidity of the urine, there come one or several of the results of Stricture. One such effect is *urethritis*, which, by continuous extension, may lead to *prostatitis*, or *cystitis*, or *epididymitis*. There are some," he says, "who under such circumstances would affirm that the urethral inflammation had been caused by contact with some noxious fluid. . . . I will not," says Prof. Jordan, "here discuss the merits or demerits of a policy of uniform incredulity. My answer is this: often in cases of diminutive meatus, the bladder is affected first, then the prostatic urethra; then per-

haps the inflammation may extend along the vas deferens, setting up consecutive orchitis, and from first to last there is no urethral discharge.* Frequency of *micturition*; *suprapubic pain*; *mucus* or *blood* in the urine; are, singly or combined, the subject of complaint. . . . A *diminutive orifice* aggravates and prolongs a *gonorrhœa* or gleet or *Stricture* and their ordinary *sequelæ*. The treatment," he says, "which I adopt for a small meatus is an incision—the result in all cases—a large number—*successful*. The success is not always rapid, especially in old-standing cases of cystitis; but, sooner or later, relief follows."

Sir Henry Thompson says: † "I have given complete relief to distressing symptoms of very long continuance, the cause of which was not suspected, by dividing an external meatus which, nevertheless, admitted a No. 6 English catheter;" and he cites three cases when the very simple operation necessary had given complete relief to symptoms "which had long been regarded as of very obscure character." Now, if such troubles can be adduced as the possible effect of a contracted meatus, and such results can be shown by its division can it be justly said that slitting a contracted meatus is *irrational*?

Prof. Sands (quoting from one of my papers on "Stricture of the Urethra") says: "If a urethra present, the normal calibre of which is equal to a circumference of 30 millimetres, and only a 29 bulbous sound will pass, without detecting obstruction, then the urethra is not 'about right.' It is strictured to the extent of one millimetre, and can never be a healthy urethra while that Stricture remains." Then he says, "Let us inquire if these statements can be verified; if so, we shall find established an important principle in the treatment of gleet." The question of the measurement of the urethral calibre, which is involved in the statement quoted, is one of so great importance, that I shall not apologize for entering upon it with some degree of minuteness. As a mechanical

* "Stricture of Urethra," second London edition, p. 249.

† Ibid.

proposition, there is no room to doubt but that, if the canal, that is, the ante-bulbous urethra, is 30, and 29 only will pass without detecting obstruction, obstruction certainly exists. This, however, as I apprehend, is not the point in dispute, but it is as to whether this minute obstruction, in the first instance, if present, can be made out, and in the second, if made out, can it prove a cause of trouble. The first point, then, to consider, is, What do we understand by the normal calibre of the urethra? In order to settle this, and to meet the objections which have been urged against my own views on this subject, I will present briefly the method and results of urethral measurements by accepted authorities. From the year 1854 to 1875, Sir Henry Thompson taught that, "when 8 or 9 of the English scale could be passed easily through a given urethra, no Stricture could be said to exist." In one of his recent lectures delivered at the University College of London, November 18, 1875,* he says: "Simply take a flexible English gum-elastic bougie, well curved toward the point, with a blunt end, not larger, as a rule, than 10 or 11 of our scale (that is, nineteen or twenty millimetres in circumference), and pass it very gently and slowly into the bladder. If it goes easily, above all, if it is drawn out without being held, and slides out with perfect facility, take my word for it he has no Stricture, and *quoad* obstruction, wants no use of instruments whatever." It will thus be seen that Sir Henry Thompson fails to recognize the varied capacity of the urethra in different individuals, and practically reduces all urethræ to a common and fixed standard. It will also be observed that, within the last year, he has raised this standard from "8 or 9 English" (17 and 18 F.), to "10 or 11" (19 and 20 F.), that is to say, *about two millimetres*. Why he has done so does not appear.

Now, Sir Henry Thompson distinctly states that "in the living body the walls of the passage are closely applied to each other in a state of inaction, so that the diameter is only calculable when distention occurs from some cause In-

* Reported in the London *Lancet*, December 11, 1875.

deed," he says, "the question of the diameter of the urethra must be considered as resolving itself, to a certain extent, into *the measure of its capacity of being extended*, and this is of greater practical importance than the mere width of the mucous membrane, when slit up after death;"* and yet Sir Henry fixes the urethral limit at 10 or 11 English, without the least reference to these facts.

Prof. Sands says that "we have properly the *normal calibre* of the urethra, *when it is moderately distended by urine during normal micturition*," and, although he remarks, "we cannot estimate this with accuracy, *I believe that it is not very large*." That is to say, it does not, in his estimation, make a calibre of more than twenty-five millimetres. He says, "*Finally, passing sounds exceeding twenty-five millimetres is very rarely necessary, either for the diagnosis or treatment of Strictures of the urethra.*" Prof. Sands thus virtually fixes the urethral calibre at *twenty-five millimetres*. Twenty-five millimetres are equal to 14 of the English scale. We are not informed why Sir Henry Thompson first fixed the urethral limit at "8 or 9," nor why he subsequently granted an extension to "10 or 11;" nor yet why Prof. Sands is willing to allow a calibre of 14. There is no evidence to show that these estimates are based upon any well-ascertained facts bearing upon this point. Profs. Van Buren and Keyes say (page 28 of their excellent work on venereal diseases,† and in italics), "*A fair, average, well-formed urethra measures about three-eighths of an inch in diameter;*" that is to say, thirty millimetres in circumference. The French school (as represented by Dr. T. B. Curtis, of Boston, in his essay which won the Civiale prize in 1873, and has thus the stamp of approval by the French Academy) says, "*The size of the human male adult urethra is seven millimetres in diameter,*" or 21 of the French scale.

The late Mr. Guthrie, so much appreciated as a surgical authority, both in Great Britain and America, says, "The

* "Stricture of the Urethra," Thompson, second London edition, p. 6.

† "Genito-Urinary Diseases," etc., p. 28.

urethra varies so much in different people, that it is scarcely worth inquiring into, particularly as the passage of instruments is always regulated by the size of the orifice;" but, as to its *positive* size, he says: "I have a solid bougie which is rather more than half an inch (twelve and a half millimetres) in diameter. I had it made for one gentleman in particular, and it passed with perfect ease through the whole passage Very few urethras," he further remarks, "will admit a sound of more than 12 to 16."

In view, then, of this apparent want of harmony (not to say definiteness), in arriving at a practical estimate of the normal urethral calibre, we must, I think, come to the conclusion that the authorities quoted must have taken *the size of the meatus, the volume of the stream, the results of post-mortem examinations, and the experiments on the extensibility of mucous membrane*, as a basis, and have struck a general average as to what ought, in their opinion, to constitute a normal urethral calibre. In summing up these independent, individual estimates, we find them as follows:

Sir Henry Thompson (10 to 11 E.) up to 19 or	20 millimetres.
The French School	21 "
Prof. Sands up to	25 "
Profs. Van Buren and Keyes	30 "
Mr. Guthrie up to <i>over 1/2 inch diameter</i>	about 40 "

Now, in a urethra of a calibre of 30, an instrument of 19 or 20 ("10 or 11" English) would pass a Stricture of ten millimetres' value without discovering it; one of twenty-five millimetres would fail to appreciate a Stricture of five millimetres' value or one-sixth of the entire calibre of the urethra; and should the normal calibre reach the size of 40, which it can be proved to do by Mr. Guthrie and myself, in rare cases, even an instrument of *thirty* millimetres in circumference would fail to detect a Stricture involving *one-fourth* of the passage. It would, then, appear to be a matter of some importance, for a person suffering from symptoms of Stricture, to ascertain the probable size of his own urethra before apply-

ing to a surgeon for aid; otherwise, he might apply to a disciple of the English school, who would not allow him a calibre of more than 19 or 20 ("10 or 11" English); or to a French surgeon, who would concede only 21; or to one who believes, with Prof. Sands, that "more than 25 is rarely necessary for the diagnosis or treatment of Stricture;" for all these would certainly fail to detect, much less be able to appreciate, the extent of a Stricture, above their estimates, in a urethra which should reach the fair average of the normal urethra of our more generous American authority, to say nothing of the possibilities of a urethra of the size of about forty millimetres in circumference, cited by that grand old English surgeon, the late Mr. Guthrie.

The conclusion is, then, forced upon us, that some method of arriving at an estimate of the normal urethral calibre must be adopted, which shall eliminate, as completely as possible, the element of individual opinion based upon generalities. The clear and practical view of Sir Henry Thompson, that "*the question of the diameter of the urethra must be considered as resolving itself into the measure of its capability of being distended,*" furnishes us with the only rational basis for a true appreciation of the urethral calibre in different individuals. Through a very great number of experiments, upon subjects living and dead, during a period of more than four years, the possibility of arriving at correct and uniform measurements of the urethral canal, by means of this instrument, the *Urethra-metre* (which has already been described to you by Prof. Sands), has finally been demonstrated. By means of this it has been found possible to determine (and with scarcely more discomfort than would result from the introduction of an ordinary sound or bougie) the *limit* of easy distention, and thus the *normal calibre* of urethra, within one or two millimetres in almost every case. In a great proportion of one hundred cases, recently examined, this limit was defined *exactly*; and this without regard to the contractions of the meatus, or the presence of Strictures above 13 F., which is the size of the closed instrument. My examinations with the

urethra-metre have been, from the first, conducted with an entire knowledge and appreciation of the physiology and histology of the penis and urethra, as taught by authorities. It was fully recognized that the calibre of the urethra varied, anatomically, in different parts. The instrument was introduced, closed, to the bulbo-membranous junction, and then expanded slowly, until a feeling of *slight fullness* was experienced *by the patient*. If, then, it was *easily* and *painlessly* movable, it was drawn gently forward, and, if no positive obstruction was met, the urethra was considered free from Stricture. If, however, it was arrested at any point, the instrument was turned down until it could pass, and the amount of obstruction was noted from the dial. If the holding was slight, and at a point of usual anatomical narrowing, it was not considered important, unless the instrument was distinctly resisted on being pushed back at such point.

After making a great number of examinations, I was led to appreciate an important difference in the calibre of different urethra, and that an average standard was impossible. That while thirty millimetres was the full measure of one man's urethra, that of another would as freely admit a No. 40 solid sound through its entire length, and into the bladder.

Another point, and one which has attracted some, but not sufficient, attention, was that of the proportionate relation, which I came to observe, between the size of the urethra and the penis with which it was associated. After an extended experience on this point, I am prepared to state that this relation is constant, and is about 1 to $3\frac{1}{2}$; in a penis of three inches circumference the urethra would be 30, $3\frac{1}{4}$ 32, $3\frac{1}{2}$ 34, $3\frac{3}{4}$ 36, 4 38, $4\frac{1}{4}$ to $4\frac{1}{2}$ 40; and that an estimate of calibre made on this basis is a valuable guide when the urethra-metre is not available. It must, however, be borne in mind that the circumstances under which examinations are made occasionally (though seldom) vary, and that some experience is necessary in order to recognize and appreciate the conditions which temporarily affect these relations.

Even late authorities state that a large penis may be as-

sociated with a small urethra, and that a small penis may accommodate a large urethra. This important statement will be proved untrue by the results of my examinations.

Out of the one hundred cases presented in the annexed tables, the size of the urethra corresponded with the size of the penis, exactly in accordance with my claim, in thirty-nine cases:

			39 cases.
Deviating from it	1 millimetre,	36	"
"	"	2 millimetres,	17
"	"	3	"
"	"	4	"
"	"	5	"
"	"	6	"
"	"	7	"
			100

On page 21 of his paper, Prof. Sands relates *his* experiments with the urethra-metre. I am not surprised that, from his experience in *twenty* cases, he should arrive at conclusions on some points somewhat at variance with my own. The urethra-metre is an instrument which, like the *stethoscope*, requires a familiarity with its use, for which no anatomical knowledge, or dexterity in the use of other instruments, can fully compensate. The tactile skill which is required to appreciate the least amount of distention which urethral mucous membrane will bear, without damage, and yet shall give the assurance of its full expansion, will bear comparison with the appreciation of the *true respiratory murmur* in a chest-examination. Prof. Sands did find, however, that the instrument showed variations, in different localities of the urethra, corresponding with those which he had previously demonstrated on the dead subject. He says, "If the above facts can be verified, they prove indubitably that the assumption of an unvarying calibre for any urethra is unwarrantable; and it is plain that such an assumption must lead to the gravest errors in practice."

Now, I, for one, am sure that "the above facts" *can be verified*, and I most cordially agree with Prof. Sands in his

statement, as to the error of considering the urethra of unvarying calibre, as well as in regard to probable consequences of such an error. This is *the* error which is practically made by those who estimate the calibre of the urethra by the size of a bougie, and *not* by any one who makes an intelligent use of the urethra-metre. Prof. Sands has misapprehended me when he infers that I am accustomed to take the calibre of the bulbous portion of the urethra as a *measure* of what all parts of the urethra in front of this portion "ought to be."

The passage quoted from my article on gleet, etc., from which this conclusion is drawn, is as follows: "At this point (the bulbo-membranous junction) the bulbous portion of the instrument (the urethra-metre) is to be expanded by means of a screw at the handle, until a *feeling of fullness* is experienced, when, if there is no Stricture at the point of trial, the hand on the dial-plate will indicate, *with sufficient certainty*, the normal calibre of the urethra under examination."* The *feeling of fullness* spoken of, referred, in my mind to the *sensation of the patient*; and this I found was experienced, as a rule, before the true capacity of the canal, at that point, was reached; from the extreme sensitiveness which exists in some cases, the sensation of the patient affords no reliable guide in ascertaining the calibre of the ante-bulbous portion, with the urethra-metre. This abnormal sensitiveness is rarely present at the bulb, and thus the instrument, raised to a point occasioning a feeling of fullness to the patient (and not one of arrest to the operator) indicated, "with sufficient certainty," the calibre of the ante-bulbous urethra, and not the size of the bulbous urethra, which authorities state, and I then fully believed was, as a rule, much larger.

My meaning was perhaps not as clearly expressed as it should have been, but the errors which might arise from the impression that the bulbous and ante-bulbous portions are of the same size are perhaps not so great as Prof. Sands intimates, or as I myself would have premised, before making my

* "On Gleet and its Relations to Urethral Stricture, American Clinical Lectures," p. 253, by F. N. Otis, M. D.

recent urethral measurements of one hundred cases of supposed normal urethræ.

In these, the measured difference between the bulbous urethra and the part anterior to it was—

In	35	cases	1	millimetre.*
"	21	"	2	millimetres.
"	18	"	3	"
"	6	"	4	"
"	2	"	5	"
"	2	"	6	"
"	2	"	7	"
"	1	"	11	"
"	13	"		no difference.

The average difference in the one hundred cases was $2\frac{5}{10}$ millimetres, and the calibre of the ante-bulbous portion averaged 32.95.

In my previous report of one hundred cases, in a paper read before the State Medical Society in February, 1875, and which were examined with the view to detecting Stricture, and not to ascertain the normal calibre, the average calibre was $31\frac{1}{2}$. The difference of about two millimetres in the average of the first and second hundred cases may, I think, be accounted for by the more rigid, thorough, and methodical carrying out of the plan of measurement in the more recent examinations. In this connection, as opposed to the traditional idea, it will be interesting to quote the opinion of that eminent English surgeon, the late Mr. Guthrie, who says:

"This bulbous portion of the urethra is said to be larger than the anterior part, but I do not believe that it is, *although it may appear so.*"

Perfect security against mistaking a normal narrowing for Stricture may always be had, by examining *from before backward*. If the canal anterior to the contraction is of distinctly larger calibre, this localized contraction must be accepted as a Stricture. I recognize the elements of doubt, as to the cause and nature of localized urethral contractions, in some cases, especially as *post-mortem* examinations often do not

* 1 millimetre equals $\frac{1}{25}$ of an inch.

show any lesion of the mucous membrane over a point where Stricture has been recognized during life. Various conditions, resulting from persistent irritation of mucous membrane, may obtain, which are capable of causing changes—possibly atrophy, with contraction of the trabecular structure of the corpus spongiosum, or obliteration of its meshes, and which might escape the observation of those who were looking only for cicatricial deposits. One thing is certain, that the subject has not yet received, from our microscopical experts, the attention its importance demands. The practical fact, however, remains, that whatever permanently constricts a localized portion of any urethra is practically a Stricture, and capable of causing the effects of Stricture, and is also amenable to the same method of treatment.

The value of the examinations of one hundred cases,* repeatedly referred to during the course of this paper, will be better appreciated by a knowledge of the circumstances under which they were made. The subjects of examination were, some in my own wards in Charity Hospital, others, through the courtesy of my colleagues, Drs. Keyes, Howe, Piffard, and Frankel, were selected from their wards. Quite a large proportion, fully one-half, were patients in Bellevue Hospital, kindly placed at my disposal by my friends Profs. Sands, Stephen Smith, and Dr. Erskine Mason.

The examinations were conducted by me, in the presence and with the assistance, on different occasions, of Drs. Stephen Smith, George A. Peters, F. J. Bumstead, H. G. Piffard, L. Bolton Bangs, W. T. Bull, and various members of the house-staff of Charity and Bellevue Hospitals. In the accompanying tables the names of the gentlemen, as far as possible, are associated with the cases examined or reviewed by them. In three of the cases, a reëxamination was made after death; two cases, in the presence and with the assistance of Dr. Stephen Smith, Dr. A. Jacobi, and Dr. L. Bolton Bangs; and the third in the presence and with the assistance of Dr. Freeman J. Bumstead, Dr. George A. Peters, and Dr. Bolton

* Tables at page 200.

Bangs. In the first two the reëxamination was found to accord completely with that made during life; in the third, the distensibility of the bulbous urethra was increased four millimetres; but the measurements in the anterior portion of the canal and size of the meatus remained the same. The measurement of the flaccid penis, in each case, was less by one-quarter of an inch than during life; but as, in the former, the measurement was made after the removal of the integument, it so far shows that the measurement of the flaccid penis during life does not differ greatly from a *post-mortem* measurement.

The results of examination were carefully noted by my friend and associate Dr. L. Bolton Bangs, whose sole office it was to record them. The tabulation, which is appended, was also made by him, solely, and has been subjected to no revision by any other person.

In regard to the case of fourteen Strictures (reported by me to one of our medical societies, and subsequently published in the New York Medical Journal of April, 1874) referred to by Prof. Sands, I desire to protest against this grave accident to my patient being brought forward to discredit the results of my method of examining the urethra, especially so, as this warrants the inference that I am in the habit of discovering and operating upon Strictures that do not exist. I am aware of the claim of Sir Henry Thompson, that rarely more than three or four Strictures occur in a single urethra. Pursuing the same general mode of examination, it is not difficult to appreciate the incredulity of Prof. Sands in regard to the existence of fourteen Strictures in a single urethra. If a man thrust his hand into a fire, there will be no dispute but that he may have, resulting, as many scars as he has received burns. In the same way there can be no limit to the number of urethral scars, which become Strictures, except by limiting the degree and continuance of the gonorrhœal, or other fire, which has inflicted the primary injury.

This drawing, which was presented, in company with the

living subject, before the New York Medical Journal Association early in 1874, is a fairly correct diagram of the number, size, and locality of the fourteen Strictures. They were made out by me, on several occasions, before the operation, and at the time of the operation these measurements were rehearsed and confirmed, under æther, by Dr. George A. Peters and Dr. Deforest Woodruff, who assisted me during the operation. The Strictures were found, in a penis of three inches, to vary from twenty-two millimetres to one-third of a millimetre, and extended to $6\frac{1}{2}$ inches, beyond which the urethra was practically impermeable. The perineal section was performed for the posterior Strictures, and dilating urethrotomy for those anterior. The Strictures were, with the exception of three bands deep in the perineal urethra, made out with the bulbous sounds; the latter were recognized in the passage of the Maisonneuve blade, by me, and distinctly appreciated by Drs. Peters and Woodruff.*

I was more than gratified to learn, from so able a surgeon as Prof. Sands; from one who so thoroughly enjoys the confidence of the medical profession and of this community and country, that he thought so well of the operation of internal urethrotomy. "Some of the most gratifying results in modern surgical practice," says Prof. Sands, "have been achieved by this method. But," he continues, "I believe it applicable chiefly to the treatment of close Strictures, and as an auxiliary to dilatation." I could have wished that he had accorded to this operation of internal urethrotomy, so highly commended, a broader scope. Prof. Sands announces himself as "a firm believer in gradual dilatation." For my own part, I can only consider gradual dilatation of Stricture, (except so far as it may be necessary to prepare the way for urethrotomy,) in the light of a temporary expedient, and would use it, only as I would temporize with a vesical calculus, with demulcents and sedatives, when the condition of the patient was such as to forbid the use of the scalpel or the lithotrite.

See diagram showing locality of the fourteen Strictures in the case of W. C. H., page 63.