

of the others, as it melts at a low temperature, and can be made to solidify quickly by being subjected to the action of cold water. Plaster of Paris does not run very easily when the mixture is thick, and when it is thin it is slow to harden. Fusible metal makes a firm and durable cast, but it becomes solid at so high a temperature, and so quickly, that we can seldom be sure the canal has been fully distended. The casts which I exhibit have been made for me by Dr. Charles McBurney, the able demonstrator of anatomy in the College of Physicians and Surgeons, who has bestowed much time and care in preparing them. The urethræ which they represent were free from any evidences of disease. In all cases the nozzle of the syringe was introduced into a pouch of vesical mucous membrane, obtained by making a circular incision through the membrane, about an inch behind the internal orifice of the urethra, and then dissecting it up from the subjacent parts. By this means the urethra is more certain to be thoroughly distended than when the injection is thrown into the bladder, while at the same time the canal itself is not interfered with. To secure a perfect cast of the external meatus, a similar plan was pursued in all cases but one. Instead of closing the meatus by suture, a portion of the integument of the glans penis was dissected up, thrown forward over the meatus, and then surrounded by a ligature. It thus formed a pouch which received and retained the injection after it had passed through the meatus.

In making such an injection, the amount of force employed may be greater or less; and, accordingly, the distention of the urethra will be much or little; but in all cases the entire surface will be subjected to *equal* pressure; and, consequently, although preparations obtained in this manner may not afford a certain test of the relative calibre of different urethræ, they offer a perfectly reliable indication of the relative calibre of the different portions of any given urethra. I exhibit to you four casts, each one representing the entire length of the urethra. Cast marked No. 1 was made by the employment of a moderately distending force. In obtaining

the remaining three, as much force was used as it was thought the urethral wall would bear without rupture. The accompanying table gives the dimensions of different parts of the urethra as indicated by the different casts. In all instances the figures represent the circumference in millimetres.

	No. 1. Æt. 40 to 50.	No. 2. Æt. 27.	No. 3. Æt. 40.	No. 4. Æt. 29.
Meatus .....	26	25	22	30
Fossa navicularis .....	30	44	40	43
Three inches behind meatus..	32	36	35	36
Bulb .....	40	47	41	61
Membranous portion.....	20	25	26	30
Prostatic portion at its widest part.....	30	40	45	53
Internal meatus.....	18	35	50	40

Now, the comparison of these figures shows some curious results. Cast No. 1 is considerably smaller than the rest, and this fact may perhaps be accounted for by the moderate force that was employed in introducing the injection. The remaining three were all the result of the greatest distention it was thought safe to employ, yet they differ considerably in size, No. 4, especially, being larger than No. 2 or No. 3. I think it fair to assume that the varying size of casts 2, 3, and 4, indicates a corresponding variation in size in the respective urethræ, although it cannot be *proved* that the distending force employed in every instance was the same in amount. But assuming that it was so, or nearly so, we ascertain that the dimensions of the adult male urethra vary in different individuals. Whether these variations bear any definite ratio to the circumference of the penis, is a question that it will be convenient to postpone for the present. I will only add, in this connection, that the facts here demonstrated on the subject confirm the observations that have long ago been made by surgeons and anatomists, who have generally admitted differences in the calibre of healthy urethræ.

The table also shows that the calibre of the urethra, es-



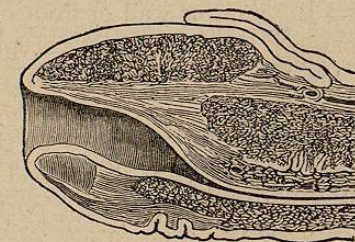
pecially of its bulbous portion, is, in some instances, much greater than it would appear to be from any examinations which have ever been made to ascertain its size during life. This statement agrees with the results already obtained by Reybard, in the experiments I have alluded to.

But the special value of the figures is the unfailing indication which they afford of the want of uniformity in calibre of different parts of the same urethra. This is no new fact, yet the recognition of it is so important in the present discussion, that I may be pardoned for setting it clearly before you.

We notice, then, in examining any one of these casts, that it represents the urethra as displaying a series of alternating contractions and dilatations throughout its entire course. The meatus is generally contracted; then follows a dilatation, somewhere in the glans penis, the fossa navicularis; behind the fossa navicularis the urethra is again narrowed for a distance of several inches, when it expands more or less gradually to form the bulb; behind the bulb is a third contraction, corresponding with the membranous division of the urethra; and finally we reach the last dilatation in the prostatic portion, and the last constriction at the internal meatus. We thus observe three dilatations, namely, in the fossa navicularis, the bulb, and the prostate; and four contractions, these being at the meatus, behind the navicular fossa, throughout the membranous portion, and at the internal orifice of the urethra. These dilatations, as is well known, are all found along the inferior wall or floor of the canal. I note the fact, in passing, that, with one exception, these casts demonstrate the bulb to be the widest or most dilatable portion of the canal. The prostatic portion is said to be the most dilatable, but, owing to the firmness of the tissues which surround it, great force is needed to expand it. In cast No. 3 the bulb is not so wide as the prostatic portion, yet it is wider than any part situated in front of it.

These contractions and dilatations of the different parts of the urethra have long been familiar to anatomists, and have seldom been called in question. Their presence is tacitly

denied, however, when it is affirmed that the calibre of the urethra is indicated by the dimensions of the bulb. The dilatation called the fossa navicularis was known to the older anatomists; it was described by Vesalius and Morgagni, and has been admitted by all authors with whom I am acquainted except Amussat and Dr. Otis. Amussat denied its existence; but the arguments which he employed are by no means convincing, and have been fairly refuted. Dr. Otis also denies the existence of the fossa navicularis, and regards the presence of a narrow meatus as abnormal. He says: "Vertical sections of the penis, from the junction of the glans with the body of the penis, show a uniform calibre throughout the fossa navicularis to its external boundary at the meatus, the opening of which is of corresponding calibre. This may be accepted as the normal condition of these parts, and any variations from such uniformity may be considered aberrations from the normal condition."\* Dr. Otis does not state, however, that he has ever made these sections himself, and he is in error when he quotes the authority of Henle in support of his assertion. The accompanying plate, which is borrowed from that anatomist's work,† is designed by its author to illustrate the arrangement of the erectile and other tissues in the glans penis; and, moreover, Henle ‡ states, distinctly in the text, that the meatus and the membranous portion are the narrowest parts of the urethra. He gives seven millimetres as their average diameter. Now, the correctness of this statement is capable of the easiest demonstration. I am well aware that a very wide meatus is occasionally seen, but the opening is usually narrow when compared with the urethra behind it, and I cannot avoid



VERTICAL SECTION OF ANTERIOR PORTION OF PENIS.

\* Dr. F. N. Otis, *New York Medical Journal*, April, 1874.

† J. Henle, "*Anatomie des Menschen*," vol. ii., p. 424.

‡ *Op. Cit.*, vol. ii., p. 393.



the conclusion that Prof. Otis has mistaken the exception for the rule.

There is a peculiarity respecting the anatomy of the fossa navicularis, which I have not seen mentioned by anatomists, and which is illustrated by the casts now exhibited. I may remark that I have noticed the same peculiarity in the living body—I refer to the situation of this fossa. It is always found in the glans penis; but, while in some instances it is distant three-quarters of an inch or more from the meatus, in others it is placed almost immediately behind this opening. When it is situated at some distance from the meatus, that part of the urethra which lies in front of it is usually narrow, and of uniform diameter. When it is found directly behind the meatus, it appears as an abrupt dilatation, as in cast No. 3, when the meatus measures twenty-two millimetres, and the fossa navicularis forty millimetres, in circumference. In some cases, as in that represented by cast No. 1, the fossa navicularis is only slightly marked, but I have rarely known it to be entirely absent.

Now, it may be objected to the statements I have thus far made, that they relate merely to the dead subject, and that, the preparations which I have shown cannot indicate either the absolute or the relative calibre of the urethra in the living body. Accordingly, I have made some investigations with the view of correcting any errors that might have arisen from the study of the cadaver alone. I have been induced to proceed with great caution, however, in this matter, to avoid the injury to the urethra that might otherwise result.

In practice, we find in the size of the meatus a rough test of the calibre of the urethra. As this is generally as narrow as any other part of the canal, we assume that the largest sound it will admit ought easily to traverse the entire urethra, unless Stricture is present. And this rule I have usually found a good one, although, when the meatus is exceptionally small, it may be desirable to enlarge it, either for the introduction of a full-sized lithotrite, or for the examination of a

Stricture which is not very tight. But, unless the meatus is unusually large, the *greatest* calibre or distensibility of the urethra cannot be tested by the largest sound that will pass through this opening, and I have found the ingenious instrument devised by Dr. Otis of great value in conducting this part of the investigation. I am unable, however, to obtain with the urethra-metre the same results as those recorded by Dr. Otis.

In the first place, I can discover with it no exact ratio between the calibre of the bulb of the urethra and the circumference of the penis. On the one hand, the circumference of this organ, even in its flaccid state, is liable to variation; and, on the other, the "feeling of fullness" that is said to indicate the distention of the urethra is, so far as I am able to appreciate, no reliable sign that the walls of the canal have been fairly stretched. I have carefully examined the urethrae of twenty healthy adults, and, with a single exception, I have succeeded in expanding the urethra-metre to its fullest extent, namely, forty-five millimetres, without causing pain or inconvenience. In many of these instances I have been able to move the instrument, while thus expanded, forward a distance of an inch or more, without encountering resistance. I infer, from these results, that the bulb of the urethra in the living subject is generally capable of greater dilatation than can be effected with the urethra-metre, and that this instrument has failed to prove the existence of a definite ratio between the calibre of the urethra and the circumference of the penis.

In the second place, I have always found, when the instrument was expanded so as to distend only moderately the bulb of the urethra—and yet move freely within it—that, on attempting to withdraw the instrument, it would be arrested about one inch in front of the bulb, and that it became necessary to reduce its size before it could safely be drawn forward. It would then pass on easily until its expanded portion reached the meatus, when generally a further reduction became necessary before it could be finally withdrawn. In



short, while the urethra-metre, in my hands, has failed to indicate the exact calibre of the urethra, as compared with the size of the penis, it has shown variations in the distensibility of its different parts, corresponding with those which have been demonstrated by the employment of injections in the dead subject.

The application of these facts is at once easy and important. If they 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. If the calibre of the bulb of the urethra be taken as an indication of what the calibre of all parts of the canal in front of it *ought* to be, I cannot understand why Stricture will not frequently be diagnosed when none really exists. And, when it is remembered that not less than fourteen Strictures in the same urethra have been supposed to be revealed by this mode of examination, we may reasonably suspect, in the absence of *post-mortem* evidence, that there is something fallacious in the method employed. In fact, I am convinced that, when a healthy urethra, which has not been previously stretched, is explored, either with the urethra-metre, or with very large bulbous sounds, the instrument will often be tightly grasped at certain points, and communicate to the examiner a deceptive sensation, as if a Stricture were present. This may possibly arise from one of several causes, as, for example, a deviation of the sound from the axis of the canal, a spasmodic contraction of the muscular fibres that surround the urethra, or a puckering of its mucous membrane before the instrument. Another explanation is suggested by certain interesting appearances in the urethral casts which I have just exhibited. Instead of presenting a smooth and even surface, they are often marked by slight transverse furrows and alternating ridges, indicating that the urethral mucous membrane, when greatly distended, yields more readily at some points than at others.

I should be sorry to have it inferred, from anything I

have said, that I am opposed to the operation of internal urethrotomy for the cure of Stricture. Some of the most gratifying results in modern surgical practice have been achieved by this method, but I believe it to be applicable chiefly to the treatment of close Strictures, and as an auxiliary to dilatation. The dilating urethrotome, invented by Reybard many years ago, never met with general favor, on account of the accidents which attended its use, and the success of safer and milder methods of treatment. I am a firm believer in what, I fear, is becoming an old-fashioned doctrine among us, namely, that gradual dilatation is far the best treatment yet discovered for the great majority of urethral Strictures. In regard to what are termed Strictures of large calibre, I believe that they rarely exist, and that, when they do, they seldom cause the symptoms which have been ascribed to them. I fully indorse the statement made by Sir James Paget, who says: "Every year teaches me more and more plainly that a very large number of cases of Stricture of the urethra are not really dependent on any fixed condition of the urethra, but upon mere swelling of its mucous membrane, upon just such swelling as, with chronic catarrh, narrows or shuts up one or both nostrils. Manual surgery should find little or nothing to do in cases such as these."\*

I desire also to express my disapproval of the habitual use of *very* large sounds, as I believe that a sound exceeding twenty-five millimetres in circumference is rarely necessary, either for the diagnosis or treatment of a urethral Stricture, and that a canal, even smaller than this would indicate, may permit the ready evacuation of the bladder. The fact that the urethra *can* be distended considerably beyond this limit is no proof that it ought to be, and unquestionably much evil may result from over-distention.

Finally, I cannot help thinking that the practice of slitting up the meatus, now so much in vogue among us, is injurious and irrational. The normal meatus is narrow, and its small

\* "Clinical Lectures and Essays," London: 1875.



size doubtless favors the projection of the stream of urine during micturition. When it is enlarged by a free incision along the floor of the urethra, the penis is thereby deformed, and a condition of artificial hypospadias is established. Except in special cases, therefore, it ought to be left as Nature has made it.

If, upon all these matters, I have stated my convictions somewhat emphatically, it is because I am deeply impressed with their important bearing in practice. My sole object has been to elicit truth; and, if I have ventured to criticise freely, I am willing that my own views shall be criticised in the same candid spirit.

The paper read by Dr. Sands being before the Society for discussion,

DR. OTIS was called upon by the acting President Dr. Emmet and spoke at some length in reply to the paper of Prof. Sands, occupying the time until the hour of adjournment had arrived. When closing, he announced his intention to discuss the matter more fully at the next regular meeting of the Society.

## CHAPTER VIII.

### ON THE RELATIONS OF GLEET TO STRICTURE.

*Discussion continued.—Dr. Otis's Reply.*

AT the next stated meeting of the Medical Society of the County of New York, held February 28th, 1876, Dr. Thos. Addis Emmet, Vice President, in the chair, the discussion of the paper by Prof. H. B. Sands, On Gleet and especially on its Relations to Stricture of the Urethra, was resumed by Dr. F. N. Otis, as follows:

“Prof. HENRY B. SANDS opened his interesting and able paper “On Gleet, and especially in its Relations to Urethral Stricture,” with these words: “*The humiliating confession must be made, that many important surgical problems remain unsolved.*” This was the statement of a fact which, in his opinion, was especially applicable to the subject which he was about to discuss.

In so many words, then, he confessed that gleet, and especially in its relations with urethral Stricture, was a problem for which he had, as yet, found no satisfactory solution. The object of the paper, as stated, was simply to excite discussion, and particularly with reference to views which had been advanced by me, in which I claimed to designate the true nature and cause of gleet, and the only effectual and radical cure for this acknowledged opprobrium of surgery.

Proceeding then to the definition of gleet, Prof. Sands referred to *idiopathic* gleet—gleet depending upon a *strumous diathesis, prostatic gleet, masturbators' gleet*, etc., and remarked, that “we shall avoid much confusion, by giving to the word the restricted meaning ascribed to it by John Hunter and Sir Astley Cooper, and regard it as an *imperfect* or