

Clinical Lecture.

CLINICAL LECTURE ON URETHRAL STRICTURE DELIVERED AT THE BOSTON CITY HOSPITAL TO FOURTH YEAR HARVARD MEDICAL STUDENTS.*

BY F. S. WATSON, M.D., BOSTON.

GENTLEMEN:

In a general sense stricture means a narrowing in the course of the urethral canal irrespective of the nature of the condition which causes it. Thus we speak of several sorts of stricture, *viz.*, spasmodic, inflammatory and organic. The last of these is the only one which is stricture in the true, strict meaning of the term, and it is to that variety that what I have to say will be confined for the most part.

DEFINITION OF ORGANIC STRICTURE.

Organic stricture is a narrowing of the urethral canal at one or more points, due to the formation of connective tissue in or beneath its mucous membrane, or in both places, which results either from injury—in which case the stricture is called “traumatic”—or from a preceding chronic inflammatory process, the latter being almost invariably of gonorrhoeal origin.

The tissue changes incident to the formation of the fibrous tissue which constitutes stricture have been described to you in a former exercise, and we will not therefore go over that ground again, but will assume that stricture has already become organized, and proceed from that point.

The connective tissue forming the stricture varies in amount and in the depth and extent of the structures involved by it, and also in the manner of its distribution, in different cases, and



FIG. 1.

according to the one or the other of these elements there occurs a corresponding variation in the form, extent and quality of the stricture.

* All instruments referred to in the text were shown to the students in the lecture and the manner in which they should be used was demonstrated.

Strictures are divided for the sake of description, into three principal classes, *viz.*, linear, annular and tortuous or innodular. These forms may be illustrated thus:

Picture to yourselves the urethra as a rubber tube. Tie a thread around the outside of it at some point, and you will have produced, of course, a circular, narrow constriction on the inside, of greater or less degree, according to the tightness with which the thread has been drawn. This is linear stricture.

Linear stricture as it progresses, takes the form of a delicate membrane stretched across the canal. The opening through it may be either central or on one side of the membrane. This variety of stricture does not invade the submucous or periurethral tissues.

Now instead of a thread, tie a bit of tape around the outside of the tube, and you have made an annular stricture.



FIG. 2.

This form varies in its width, may extend over a considerable area, may or may not involve the submucous and periurethral tissues.

Next think of the tube as being subjected to varying degrees of pressure from different points of its outer surface, and you will see that there will be a series of irregular projections produced in its interior, occupying more of the canal at one place, less at another, and necessarily giving a twisted or tortuous course to the channel running through the strictured part of the urethra. This represents a tortuous stricture.

Further descriptive names are given to strictures to designate certain special qualities which they present, thus: of recent formation, of long standing, dense or resistant, tough, hard, intractable, irritable, resilient, of large or small caliber, etc.

The resilient stricture is one which after being dilated, rapidly recontracts to its former size.

The dividing line between strictures of wide and small caliber is an arbitrary one; usually

anything larger than twenty-two of the French scale is termed stricture of wide, anything smaller than that number, of narrow caliber.



FIG. 3.

NUMBER — LOCATION.

Theoretically there may be as many strictures in the urethra as there is space in it to accommodate them, practically as many as fourteen have been found in one case.

As has been said there is a preference shown by strictures to choose certain parts of the urethra for residence rather than others. The reasons for this are: (a) The presence of points of natural narrowing of the canal as compared with wider portions immediately behind them, in consequence of which there is a less free exit offered to the products of inflammation which, being in some part retained, perpetuate by their irritating character the chronic process from which they originate. (b) The relatively greater vascularity of some parts of the canal than others, which tends to the establishment of areas of congestion in these localities. (c) The existence of a larger proportion of follicular and glandular structures in some parts of the urethra than in others, in consequence of which, as has been shown in a former lecture, there is a tendency of the chronic inflammatory processes to become localized there.

STRICTURE OF THE DEEP URETHRA.

It has been asserted by some observers that stricture of the membranous urethra does not result from gonorrhoea, but is due to traumatism alone, the reason assigned for this being the absence of glandular structures in that portion of the urethra. On the other hand it is claimed that the membranous urethra is more frequently the seat of gonorrhoeal stricture than any other part of the canal. In a recent article by Bazy and Decloux there is given the description of some cases in which stricture of the membranous urethra, originating in gonorrhoea, was present, and demonstrated by microscopic examination of post-mortem specimens, but in these instances

it was shown that the strictures began in the bulbous urethra and had subsequently extended back to the membranous portion.

Stricture of the prostatic urethra has not been observed. The reasons assigned for this have never appeared to me to be altogether satisfactory, and I shall content myself with simply noting the fact of the failure of the condition to exist in this locality, and pass on directly to the clinical side of the subject, which I am able to illustrate to-day by several cases.

Here is a man of forty-five years of age who at different periods during the past twenty years has had attacks of gonorrhoea of varying duration.

The last of them, which was contracted two years ago, has continued in a chronic form ever since. The principal symptom being a slight gleet discharge from the meatus, usually most noticeable in the mornings, at times seen only then, with occasional exacerbations following excessive sexual indulgence.

There has been no narrowing of the urinary stream or other change in its character until about six months ago, at which time he began to notice a slight diminution in its size, and in the force with which it was expelled. This condition has gradually increased up to the present time, though as yet the degree of narrowing has not been important, and he still passes a fairly good sized stream. A slight frequency of urination, most marked during the day time, has also been present for about the same length of time, and finally there has been a noticeable dribbling of urine after the apparent completion of micturition.

This patient presents, typically, the classic symptoms of the early stages of stricture.

It has been asserted that a chronic gleet is a certain sign of stricture. It is more true to say that it is frequently an evidence of this condition. It should invariably excite suspicion of it, but it may exist without stricture, and conversely stricture may be present without giving rise to gleet; in the former case the gleet discharge is frequently furnished from the seminal vesicles, or from Cowper's glands, or even in a few cases, by long persisting areas of chronic inflammation, more especially in the prostatic urethra where, as we have said, stricture is never found.

When stricture is present without the occurrence of gleet, it is usually in cases in which the contraction is of long standing. The rapidity with which stricture forms subsequent to gonorrhoea varies in different cases, and has been claimed to be as long as twenty years in a few instances. It seldom occurs much under two years and the average is perhaps about three and a half or four years. In traumatic stricture it occurs much more quickly, owing to the greater destruction of tissue which takes place in those cases, and the correspondingly large amount of connective tissue formed. In passing I may note here the fact that the large number of injuries inflicted from without upon the urethra, fall upon the membranous and

bulbo-membranous part of the canal, hence the great majority of traumatic strictures are here.

If left to itself stricture continues to contract more or less rapidly until no urine can be passed through it, and we have the condition known as urinary retention. Before this occurs, or at times coincident with it, there may be a rupture of the urethra, behind the stricture, through which the urine escapes into the peri-urethral tissues and burrows in them to a greater or less extent, producing in many instances violent septic inflammation.

According to the more widely accepted belief at present the rent in the urethra is produced from without inward, by the rupture into it of an extra-urethral abscess, usually originating in the glands of Cowper, or others in the neighborhood of the bulbous or prostatic portions of the canal, the escape of urine taking place secondarily, and being the consequence, and not the cause, of the suppuration in the peri-urethral and other more distant tissues. Others again consider that this condition may arise quite independently of the presence of urine in the tissues at all, and that it is an acute diffuse phlegmonous inflammation.

In whatever way it takes place, it represents the condition ordinarily called urinary extravasation or infiltration. These, the two most important complications of stricture, namely: retention and extravasation, I shall not refer to in this lecture but will confine myself to the treatment of the condition after the actual formation of stricture has occurred, with a word about the methods of examining the urethra for the purpose of establishing the diagnosis and in order to accurately locate the obstruction, estimate their caliber and number. (Four members of the class were then called from the seats and given the opportunity to examine the urethras of two patients with strictures.)

EXAMINATION.

Two instruments are used to detect stricture of the anterior urethra, the acorn tipped sound or *bougie a boule*, and the urethrometer.

The former gives the most characteristic sense to the fingers, the latter measures more accurately the caliber of the stricture. In the first case there are three well-marked strictures of the anterior urethra. You will feel the shoulder of the acorn tip, as it is withdrawn, after being passed into the part of the urethra behind the strictures, give a sharp jump upon going over them. The sensation is much the same as if the butt of the tip were drawn across the stretched web between the thumb and forefinger. Nothing but organic stricture feels like this, and once felt is not to be forgotten.

The distance of the stricture from the meatus is readily measured by placing the thumb nail upon the stem of the instrument as it emerges from the meatus at the moment when the shoulder of the tip has come in contact with the posterior face of the stricture. The distance between these two points measured after withdrawing the

instrument is that of the stricture from the meatus.

Strictures of the membranous urethra are, as has been said, relatively few. That part of the canal is but three quarters of an inch in length, consequently we may estimate stricture of that locality accurately enough for practical purposes by means of the conical steel sound.

There is one frequent source of error in examining this part of the urethra for stricture, *viz.*, spasm of the compressor urethræ muscle, which is often produced by the presence of the sound. It may be distinguished from organic stricture in the following manner: If the sound is warm, well lubricated, and is gently and steadily held against the obstacle opposed to its entrance into the membranous urethra, the latter will presently relax and allow the instrument to pass through easily if it is due to spasm, whereas it will not do so if it be organic stricture. Also in its passage in cases of spasm, the membranous urethra alternately relaxes and contracts upon the sound, and conveys in so doing a series of jerky, twitching sensations to the fingers. The feeling given by an organic stricture to the fingers is as if the instrument were being drawn through a sticky substance which grasps it more or less tightly but steadily.

TREATMENT.

There is no palliative treatment for organic stricture. The object of all treatment is the restoration of the canal to its normal caliber, and that method which accomplishes this most safely, most efficiently and most permanently is the best. There is, however, no one method which fulfils all these conditions for all cases.

The question which meets us at the outset is. What is the normal caliber of the urethra? Personally I am a strong believer in the views held by the late Dr. Fessenden Otis of New York. Briefly put, his conclusions were as follows:

Urethras are not all of one size any more than noses are! There is, however, an average size for them and it is a caliber of 32 of the French scale.

The size of the meatus is not a measure of the urethra behind it. The average meatus is about 22 of the French scale. It is rarely as large as the urethra to which it belongs.

There is a definite relation between the circumference of the flaccid penis and the caliber of the urethra within it.

This ratio Otis found to be as follows:

A penis with a circumference of 3 inches has a urethra with a caliber of 30 of the French scale. With each quarter of an inch increase in the circumference of the former, there is a corresponding increase of 2 mm. in the urethral caliber. There are more urethras showing a variation above the average size, 32 mm., than there are below it.

METHODS OF TREATMENT.

There are five ways in which stricture may be treated, *viz.*, By dilating (or stretching), by splitting, by cutting through, cutting out and by

the application of an electric current. These methods are called, respectively, dilatation, divulsion, urethrotomy, resection and electrolysis.

Dilatation is divided into three kinds: Rapid, continuous and gradual. The last is the only one of them that need be referred to in detail.

Gradual dilatation consists in the dilatation of the stricture by the passage through it of successively increasing sizes of special instruments, called sounds or bougies, at intervals of time of varying lengths, until the canal has been opened to its normal caliber. (Six members of the class were instructed in the passing of sounds during this exercise.)

How often should the sounds be passed? No absolute rule can be laid down as to this, but the following may be taken as a general one:

Let the intervals between the sittings be short; about five days, until the normal caliber has been restored, thereafter make them as long as possible, to be determined by the time elapsing before the stricture begins to recontract. This period varies greatly with different individuals. In the early stages of stricture there will sometimes be no tendency to recontract for six months, the time will vary from this to the other extreme in which the recontraction takes place within a few hours as is the case with some resilient strictures, which it is useless to try to treat by this method.

The following rules you may accept as absolute in connection with the treatment by gradual dilatation.

RULES TO BE OBSERVED IN THE TREATMENT BY GRADUAL DILATATION.

Never undertake this, or any instrumental treatment of stricture if there be an acute urethritis present.

Never continue it if constitutional symptoms, chills, fever, fainting, threatening symptoms of suppression of urine, follow the use of the instruments, or if they excite acute inflammatory reaction in the urethra.

Never use any but gentle manipulation.

Have the sounds warm when they are used.

Do not pass the instruments with the patient standing up.

Lubricate the instruments amply and use a sterile medium for the purpose.

Sterilize the instruments before using them. The steel sounds by heat, an alcohol flame is the most convenient manner of applying heat to these instruments. The webbing bougies may be boiled in a saturated solution of rock salt for twenty minutes.

Irrigate the urethra when possible before passing the instruments, preferably with a $\frac{1}{4}$ to $\frac{1}{2}$ solution of permanganate of potash.

Use the webbing bougies until the stricture has been dilated as far as number 18 or 20 French scale, and the steel sounds from this upward.

Avoid making jerky, sudden movements in using the instruments, urge them steadily and gently forward. Hold the handle lightly, do not grip it.

Do not undertake the treatment if you do not know the road through the urethra well.

Do not try to gain too much at one time, on the other hand do not have your patient come to you twice as often as is necessary.

HOW TO PASS THE STEEL SOUNDS.

Preferably, stand on the patient's left side. Enter the tip of the sound into the meatus, with the shaft of the instrument in the line of Poupart's ligament and not much raised above the surface of the body. Next, push the instrument onward through the urethra directly toward the anal orifice, bringing the shaft at the same time gradually to the middle line of the body, but not lifting it much above the surface, until the tip has reached the further end of the bulbous urethra; this you will know by the fact that it is stopped at that point. The left hand holds the head of the penis between the thumb and forefinger during this movement and follows the right hand across to the middle line of the body. On reaching the bulbous urethra and feeling the tip of the sound arrested there, withdraw it slightly, put the penis on the stretch by traction with the left hand, then bring the shaft of the sound directly forward over the symphysis pubis toward the space between the legs.

In making this movement the tip of the sound rises and follows the course of the membranous and the prostatic urethra into the neck of the bladder.

If, by the first examination it has been determined that there is no stricture beyond the anterior urethra, one should avoid passing the sound into the bladder subsequently, since, though the chance is small of so doing, one may sometimes carry infection into the deeper part of the canal and to the bladder; moreover it is from the deep urethra that the impulses which in some cases produce shock or other nervous symptoms are originated.

DIVULSION.

In this method the stricture is split or ruptured by the quick passage through it of a metal instrument having the size of the normal urethra.

URETHROTOMY.

Internal urethrotomy consists in division of the stricture by a single incision through it, which should be made in the middle line of the roof of the canal. This line is selected because of the relatively small blood supply of this part.

The operation is the best performed by the Maisonneuve instrument upon strictures having a smaller caliber than 16 of the French scale. For strictures of a larger caliber I prefer the dilating urethrotome of Otis, which by the separation of the two blades which form its shaft, puts the stricture upon the stretch whereby its complete division is insured, and enables the operator at the same time to cut it to an exactly determined size; the caliber is registered upon the dial at the

distal end of the shaft which shows the degree of separation of its two blades.

The incision of the stricture is made by drawing a narrow knife through it. The knife is concealed in a slot at the distal end of the upper branch of the shaft so that it does not cut until drawn out of it for that purpose. There is a scale of inches along the whole length of one side of the shaft, whereby the distance of the knife from the meatus may be determined and the cut applied to the strictured portions of the canal and nowhere else, the distance of the stricture having been established previously by the use of the urethrometer or *bougie a boule* as already described.

Internal urethrotomy should be limited to the anterior urethra because of the difficulty of dealing with hemorrhage in or beyond the membranous urethra, and because of the greater liability there to retention of inflammatory products and urine, owing to the action of the compressor urethræ muscle, and to septic absorption from the surface of the wound. The urethra should be irrigated thoroughly with a cleansing solution both before and after the operation. A catheter is not tied into the urethra, because of the liability of its exciting urethritis, which if it occurs threatens the success of the operation. In this as in all other methods of treatment, the meatus should be cut to a size a little larger than the normal caliber of its urethra. The best way of doing this is by means of a meatatome, such as that of Civiale which I will pass around for you to see.

Every second day following the operation a full-sized sound should be passed through the urethra, to keep the wound open while it is healing. The cessation of bleeding after the use of the instrument in this way is the signal for discontinuing it. This bleeding accompanying the use of the sounds usually continues for about a fortnight. After this, ten days, then a month, and then six months are allowed to elapse without the use of the instrument, and if no recontraction has taken place then, the patient is directed to come once a year for examination.

This operation, except in cases of very old, dense strictures, offers in my experience about 60% of chances of *cure*, by which term is meant that the stricture shows no tendency to recontract, the patient not using instruments to keep it open.

EXTERNAL URETHROTOMY.

This term usually is applied to the opening of the urethra by an incision made longitudinally through the median line of the perineum. It is appropriate to cases of stricture of narrow caliber or those too dense or resilient to be amenable to gradual dilatation, and to all strictures situated in the membranous or bulbo-membranous urethra.

In any case in which even a filiform guide can be passed through the stricture into the bladder, external perineal urethrotomy is one of the

simplest operations; when nothing can be passed through it, it becomes a very difficult one.

The case which is now coming in belongs to the former of these two classes, and you will see that there is already a filiform guide in the urethra.

The neatest way, I think, of doing this operation in all cases in which a filiform can be passed, is that proposed by my colleague, Dr. Gavin of the Boston City Hospital, which I will now show you in this case.

The Maisonneuve staff is first screwed into the metal cap on the end of the filiform guide, which already lies in the urethra. The staff is then passed through the stricture, pushing the guide ahead of it. The triangular blade, blunted on its apex, is next passed into the slot of the staff, and with one steady movement is driven to the further end of it, whereby every stricture is divided to the size of the blade which is used. If the instrument is provided with a number of sufficiently large blades this one internal incision can be made of the same size of that of the normal caliber of the urethra, which is being operated upon, but this is not customary nor altogether free from danger.

The patient is now placed in the lithotomy position. A good-sized grooved staff is passed through the urethra into the bladder, and upon this staff, guided by the nail of the left forefinger placed in the groove from the surface of the perineum, as a guide to it, the point of the knife, its cutting edge being upward, is pushed into the groove of the staff alongside the finger nail, and all the tissues, including the urethra, may be divided with one cut about half an inch in length.

The whole operation need not occupy more than two minutes, and is done with exactly two cuts. It is in truth primarily an internal urethrotomy, the external excision being made to supply drainage, which is secured by fastening a catheter in the bladder through the perineal wound, to avert entrance of urine and septic matter into the cut surfaces and to control hemorrhage if need be. The catheter is left in place for forty-eight hours.

The whole urethra should be thoroughly irrigated with a cleansing solution immediately after the perineal cut has been made. The subsequent treatment by the passage of sounds is the same as that already described.

External perineal urethrotomy without a guide is a very different matter.

The problem here is to trace a minute channel which passes in an irregular way through a dense mass of connective tissue. When false passages have been made by the unskillful use of instruments in previous attempts to enter the bladder, the undertaking is rendered infinitely harder. We will begin by assuming that such is not the case. When it is not, the procedure is as follows: If the anterior urethra will admit a Wheelhouse staff (the instrument was here shown and described), the caliber of which is 15 of the French scale, this instrument is passed into it until it is stopped by the front face of the stric-

ture in the perineum. The urethra is then laid open for a distance of half an inch by an incision from the perineal surface as already described.

The Wheelhouse staff insures the lower end of this incision being at least a quarter of an inch in front of the stricture.

When there are strictures of the anterior urethra of too small caliber to admit the staff, they may be dilated sufficiently to allow of its passage, or, if for any reason this cannot be done, any instrument other than the Wheelhouse that will pass through them, and locate the face of the stricture in the perineal region, may be used in its stead, the only thing to be remembered being that the incision which exposes it in the urethra must not be carried at its lower end nearer the face of the stricture than a quarter of an inch. The object of this maneuver is to preserve intact this bit of the urethra in front of the stricture for the sake of making its course close to the latter clearly visible.

When this has been done a suture is passed into each side of the divided urethra, close to its edge, and these threads are then drawn outward and forward in such a way as to open the urethra widely. The Wheelhouse staff is now turned around and the blunt hook which is on the opposite side of the tip is drawn up against the upper angle of the incision in order to still further display the interior of that part of the urethra. In this way there is formed a funnel-shaped canal at the apex of which lies the orifice of the channel running through the stricture. Sometimes this is detected at once, at others a long search for it may be required. When found the endeavor is made to pass a filiform guide through it.

This is generally successful, if so, it only remains to lay open the canal through the strictured portion by following the filiform guide with the knife. (These operations were demonstrated by illustrations first, then done in the case of a patient in which a guide could be passed.)

When false passages exist, they are more apt to be on the floor or lower side of the urethra than elsewhere, and they start usually at or near the anterior face of the stricture; from here they dissect up the peri-urethral tissue for a greater or less distance. In consequence of being on the floor of the canal, they are apt to be laid open by the incision before the urethra is, and are often mistaken for the latter. The difference in the appearance of the inner lining of the urethra and the false passage is the best guide for distinguishing the one from the other. The largest instrument that can be made to pass through the anterior urethra is the one which is most likely to avoid being caught in the false passage.

When the true canal cannot be traced by any means, there remain two things to be done. One is the operation known as Cock's, and the other, supra-pubic cystotomy and tracing the course of the urethra through the constricted portion from behind. This then becomes an easy matter. The posterior and anterior limits of

the strictured area are defined by the tip of a sound resting against each one of them, respectively,— one having been passed from the bladder, and the other through the anterior urethra,— and all that remains to be done is to divide the fibrous tissue between these two points in order to restore the continuity of the urethra.

Cock's operation consists in laying open the urethra behind the stricture by a thrust of the knife from the perineum, guided by the tip of the forefinger of the other hand, which is placed in the rectum against the apex of the prostate. Of the two methods I unhesitatingly prefer the suprapubic in such a case.

The entrance to the stricture when doing the usual perineal operation may sometimes be found by pressing downward upon the bladder from above the symphysis pubis, thereby forcing a few drops of urine through the stricture, which, issuing through orifice of the true channel through the constricted part of the urethra, will serve to locate it.

ELECTROLYSIS.

This method is carried out by applying to the anterior face of the stricture an electric current of measured strength, for stated periods of time, and at certain intervals, by means of an acorn-tipped electrode. Under this influence the passage through the stricture presently enlarges, and allows the instrument to go through it. Of this method I have only to say that I have tried it personally and carefully, and that it has been not only unsuccessful, but has in several instances produced a stricture of greater density and toughness than was originally present.

COMPARISON OF METHODS OF TREATMENT.

Gradual dilatation is more frequently employed than any other form of treatment because of the following reasons: 1. The general practitioner feels competent to do it. 2. The word operation deters many patients from accepting a manner of treatment which involves one. 3. The patient is not confined while it is being carried out.

Its disadvantages and limitations are as follows: It is useless for resilient and very dense strictures. It is unsafe as compared with the operations in those cases in which constitutional symptoms attend the passage of the instruments.

Internal urethrotomy is undesirable in cases of stricture of the deeper part of the urethra, unless it be combined with perineal section and drainage, but when so done it is the best method for those cases. It is the only effective operation for resilient or non-dilatable strictures. It is the only operation which offers the prospect of permanent cure in the proper sense of the word. It is not more dangerous than any other operative procedure when applied to stricture of the anterior urethra. In this class of cases it is, I believe, the operation of choice. If you read, as you will sometimes, that the making of an internal urethrotomy incision in the urethra necessitates the

use of sounds to keep the passage open always in the future, you may take my word for it, this is not true.

External urethrotomy is the safest and most satisfactory one in cases of stricture of the bulbo-membranous or membranous urethra which are not amenable to gradual dilatation or in which the patient has serious constitutional disturbance during the course of dilatation. It allows better control of bleeding, and furnishes drainage of the bladder and for septic products, thereby preventing in greater measure their absorption from the open surfaces of the urethra than internal urethrotomy alone does in the cases of stricture of the character and locality mentioned above. It is a valuable adjunct to an internal urethrotomy in cases in which the stricture can be traversed with a guide beforehand, and which, therefore, admit of the combined operation being done in the manner described already. The risk of urinary fistula resulting from the operation is very slight if the catheter is not retained longer than two days. When chronic cystitis is present it is better to incur the risk of fistula by keeping the catheter longer in place, for the sake of the benefit that results from bladder drainage in those cases.

Divulsion is as safe but not safer than internal urethrotomy. With the exception of a few cases of early stricture it offers no prospect of permanent cure. It opens a free passage through the urethra at once, but does so in an inexact way, for the extent and direction of the splitting of the stricture is not in the control of the operator. It sometimes results in the formation of a mass of connective tissue larger and more dense than the original one, and consequently less amenable to treatment.

The treatment may be summarized briefly thus:

1. The meatus must be cut to a caliber 2 mm. larger than that of its normal urethra previous to properly carrying out any form of treatment.

2. Internal urethrotomy yields the most permanent results of any method, and for strictures of the anterior urethra, irrespective of their character, is the operation of choice.

3. All resilient, intractable, nondilatable and impassable strictures of the bulbo-membranous or membranous urethra are best treated by external perineal urethrotomy.

4. With the exception of these, all strictures so situated are best treated by gradual dilatation, unless, during its course, constitutional disturbances of importance arise, in which case it is safer to divide them at once by an external perineal urethrotomy.

5. Divulsion and electrolysis are not methods to be commended.

(During this exercise six students were given the opportunity to examine the urethra for stricture, and to pass sounds, and two assisted at the operation of combined internal and external perineal urethrotomy referred to in the text of the lecture.)

Original Articles.

SERUM DIAGNOSIS OF TUBERCULOSIS.*

BY DRs. ARLOING AND COURMONT, LYONS, FRANCE.

FOR several years our method of serum diagnosis of tuberculosis as practiced by us has been employed in most of the large scientific centers of Europe, but in America, although commonly employed by some writers, it does not seem to have been put to general practical use. Is this because of ignorance of the work of the Lyons physicians or of the difficulty of obtaining and maintaining the homogeneous cultures necessary for the agglutination reaction? This question we cannot answer.

However, it has seemed to us profitable to indicate here the actual status of this subject, so important for the diagnosis of tuberculosis, and to study briefly the history, the technique and the results of the serum diagnosis by the agglutination of homogeneous cultures.

I. THE HISTORICAL ASPECT OF THE SUBJECT.

In 1898 Arloing published a method of obtaining liquid homogeneous cultures of the bacillus of Koch, and was the first to show that these cultures could be agglutinated by the serum of tuberculous human beings or by animals rendered tuberculous, thus creating the serum diagnosis of tuberculosis.¹

Certain improvements in obtaining and in the choice of homogeneous cultures² and chiefly the clinical application³ and general significance of the serum reaction for tuberculosis have been studied by Arloing and Paul Courmont in numerous publications.

The serum diagnosis of tuberculosis in bovines has been further studied by Arloing.⁴

The variations in the agglutinating power of effusions and tuberculous effusions has been investigated by Paul Courmont and the result published in various articles.⁵

Since 1899 many authors have studied this subject, both in France and in foreign countries, and a certain number of points have for some time been established beyond all question. The following facts are admitted by all writers:

1. The bacillus of Koch can be cultivated in homogeneous fluid cultures. Certain experimenters, such as Buard (of Bordeaux), Bronstein (of Moscow), Carriere (of Lille), etc., have accomplished this result by starting with solid cultures different from ours. All those to whom we have sent our homogeneous cultures have maintained them easily.

2. These homogeneous cultures are very readily agglutinated in variable strengths by the serum of tuberculous human beings or of animals rendered tuberculous. Beck and Rabinowitch, with whom we disagree on other points, have recognized that it is possible to raise the natural agglutinating powers of the blood of an animal by inoculating it with tuberculosis.

* Translation of paper presented at the Section in Medicine of the Congress of Arts and Sciences at St. Louis, September, 1904.