

ORGANIC STRICTURE OF THE URETHRA.

Definition.—Organic stricture of the urethra may be defined as a pathological connective-tissue growth in the submucous and periurethral tissues, interfering with the normal calibre and the normal functions of the urethra. Dr. Bryson¹ calls attention to the fact that this connective-tissue growth constituting stricture results from continued pathological activity in the periurethral tissues and shows a distinct tendency to contract toward the axis of the canal. He proposes the name "chronic contracting periurethritis" by which to designate the "stricture disease."

Stricture is most frequently found in men between the ages of twenty and forty-five. It is uncommon in women.

Varieties of Stricture.—With reference to form, strictures are classed as (1) linear, (2) annular, and (3) tortuous.

(1) *Linear stricture* is usually a cord-like band, such as would be produced by tying a cord about the urethra.

(2) *Annular stricture* is a constriction such as would be formed by tying about the urethra a piece of tape not more than a quarter of an inch wide (Fig. 25).

(3) *Tortuous or irregular stricture* includes every stricture that is wider than an annular stricture. It may be so extensive as to include the greater portion of the pendulous urethra. The calibre of this form of stricture usually varies in different parts, rendering the channel tortuous and irregular, hence the name (Fig. 26).

Aside from the three forms of stricture described above, obstruction in the urethra may exist in the form

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of a thin membrane or diaphragm completely occluding the canal but for an opening situated centrally or eccentrically; or a crescentic or other shaped band or septum may project from a portion of the urethral wall; or there may be a number of fine bands crossing the urethra

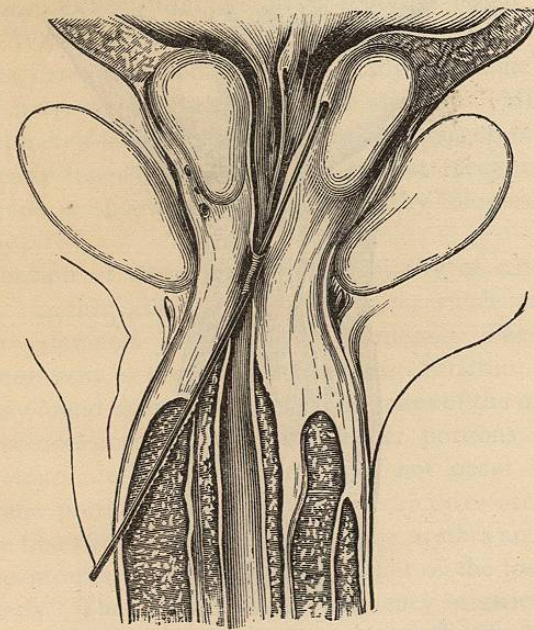


FIG. 25.—Annular stricture (Dittel).

obliquely or transversely, or so situated as to form flaps and valves. These finer bands, flaps, and valves are often the result of faulty instrumentation of the urethra.

According to the amount of contraction present, strictures are usually divided into *strictures of small calibre*, which will only permit the passage of an instrument smaller than No. 15 (French), and *strictures of large cali-*

bre, which will allow the passage of larger instruments. The division is an arbitrary one, but it is of practical value, since, as a rule, soft (flexible) instruments are to be preferred for all sizes below No. 15. The calibre of a stricture may become so narrowed that it will admit a

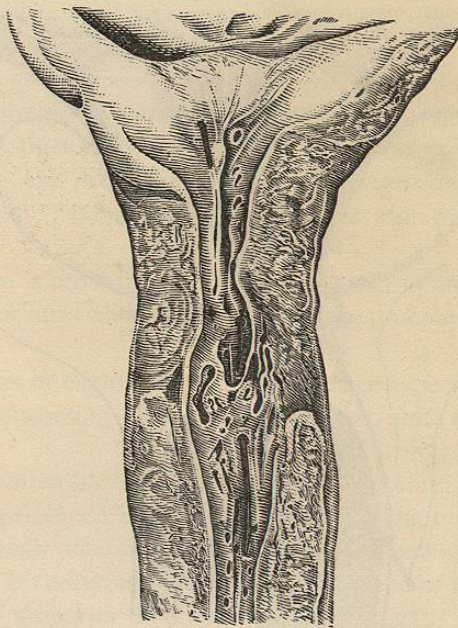


FIG. 26.—Tortuous stricture, showing dilated follicles, lacunæ, and false passages (Dittel).

fine probe with difficulty, but complete occlusion of the canal occurs only after traumatism or after some other outlet for the urine has been provided, as in the formation of fistulæ.

According to their behavior with instruments, strictures are called *irritable*, when they are very sensitive and easily inflamed, or *resilient*, when they are elastic

and after being dilated contract rapidly to their former, or even a smaller, calibre.

Number of Strictures.—Strictures usually occur singly, but a urethra may contain several strictures. Thompson has never seen more than four in a single urethra. Other observers have reported larger numbers. When a number of strictures are found in a single urethra, careful examination will usually determine them to be irregular contractions of one stricture. Multiple "strictures of large calibre" in the pendulous urethra are frequently reported by those who do not recognize the existence in this region of points of physiological narrowing.

Location of Strictures.—The majority of strictures of the urethra are found in the region which includes the membranous and bulbous portions. The most common seat is the bulbous urethra. Stricture is frequently found within two and a half inches of the meatus, and is occasionally located in deeper portions of the pendulous urethra. Stricture does not occur in the prostatic portion. The majority of strictures occurring in the first two and a half inches of the urethra are found at the meatus or at the posterior limit of the fossa navicularis. The reason for the frequency of stricture in this region and in the bulb undoubtedly lies in the tendency of urethritis to become chronic in these parts—the result, probably, of their great vascularity and dependent position. The membranous urethra is more subject to traumatism than are the other portions, and is therefore the most frequent seat of stricture from this cause.

Otis, working on the theory that the pendulous urethra should be a tube of uniform dilatibility, finds the largest

number of strictures in this portion of the urethra, placing the majority within an inch and a half of the meatus.

Etiology.—Stricture of the urethra is probably always preceded by inflammation or traumatism of the mucous membrane, which is thus damaged sufficiently to allow the escape of smaller or larger quantities of urine into the submucous tissues. Any form of urethritis may be followed by stricture, but such records as have been collected indicate that at least 75 per cent. of all cases of stricture owe their origin to gonorrhœa. The more prolonged the inflammation, the greater the probability that stricture will follow; and chronic urethritis which persists for months or years results in stricture in a large proportion of cases. If during a urethritis the inflammation extends to the periurethral tissues, the danger of stricture is greatly increased. The "breaking" of chordee during gonorrhœa is certain to be followed by stricture of the worst type, since its origin is traumatic. Injections in gonorrhœa, when properly used, are not capable of producing stricture, but the careless use of a syringe with a long or rough nozzle can easily damage the mucous membrane near the meatus, and thus be the cause of stricture. This may be one of the reasons for the frequent occurrence of stricture in this region. If an injection (such as those used in attempts to abort gonorrhœa) be strong enough to excite an artificial urethritis or to destroy a portion of the mucous membrane, it will undoubtedly be followed by stricture. The formation of stricture as a result of urethral inflammation requires a number of months at least. Thompson reported, of 164 cases of stricture attributable to gonorrhœa, 10 that appeared soon after the attack, 71 within a year after its occur-

rence, 63 in from three to eight years, and 20 in from eight to twenty-five years. Guyon and other observers have found that stricture appears from one to ten or fifteen years after gonorrhœa. When it occurs very early, it is probably due to traumatism.

Traumatic stricture is most frequently found in the membranous urethra, where it follows blows upon the perineum, such as would be produced by a kick in this region or by a fall astride any hard substance such as a fence, a wheel, the tongue of a wagon, etc. If such an injury be violent and the injury to the urethra be considerable, it will immediately be followed by hemorrhage, and probably by retention due to inflammation and œdema of the urethral tissues. When the acute inflammation subsides, repair of the tissues begins, resulting in a cicatricial formation which ultimately contracts and produces stricture. In such cases the contraction is comparatively rapid and usually produces symptoms of stricture within a few months, though if the injury be limited to a portion of the urethral circumference cicatricial contraction may be slow and for several years may produce no evidence of stricture. If the first injury be slight, it may pass unnoticed and be forgotten until symptoms of stricture appear some years afterward.

In other portions of the urethra traumatic stricture may result from lacerations of the mucous membrane caused by the rough or prolonged use of instruments, or by the presence of other foreign bodies, such as sharp calculi, or from the breaking of chordee, or from other injury to the penis. Stricture may follow urethral chancre or other ulceration, or any process which destroys the mucous membrane of the part. It is

highly improbable that stricture ever results solely from masturbation, excessive coition, or prolonged erections, although, after stricture has begun to form, its further development is encouraged by any source of irritation, of congestion, or of inflammation of the urethra. Stricture also forms more readily in tuberculous or syphilitic individuals and in those of a rheumatic or gouty diathesis.

Pathology.—Formation of Stricture.—According to Harrison's conclusions,¹ which have been largely endorsed by other observers, the urethral epithelium is so damaged at one or more points, as a result of inflammation or injury, that it permits the escape of minute quantities of urine into the submucous tissues. To prevent urine soaking further into the tissues, inflammatory exudation is excited, and barriers of plastic lymph are thrown out opposite the places where leakage takes place. Such lymph ultimately organizes to form splints of connective tissue, evidently for the purpose of strengthening the urethral wall and preventing further leaking of the urine. But this connective tissue is apparently influenced in its growth by the presence of minute quantities of urine, and differs from similar tissue resulting from inflammatory exudates in other parts of the body in that it is denser and shows a more decided tendency to contract. These characteristics are most marked in traumatic stricture, in which the mucous membrane is lacerated and the urine escapes in larger quantities. In these cases the cicatrix is dense and contracted, and produces stricture of the worst type. Such stricture is frequently resilient.

The Lesion in Stricture.—The connective-tissue growth

¹ *Lettsomian Lectures*, 1888.

constituting stricture may be limited to a very narrow line (linear stricture) in the submucous tissues, but it is usually formed in irregular masses in the submucous and periurethral tissues. It may include large portions of the corpus spongiosum and may obliterate its spaces (blood-cavities). The active development of the stricture-formation continues beneath the mucous membrane proper, which is thus pushed into the urethra in front of the new growth, and may show but little change in thickness or character even when the underlying stricture is bulky and nearly obliterates the urethral canal, though it may be thinned, atrophied, inflamed, ulcerated, or included in a cicatricial formation. In recent cases the tissue forming the stricture is small in amount and is comparatively soft and yielding. This tissue, however, usually grows in density and in amount and continues to contract. In old cases, when due to gonorrhœa, the urethra may be surrounded at the site of the stricture by irregular areas of knobbed or corded, firm masses that can readily be felt by the fingers on the outside of the penis as they follow the course of the urethra. The opening of the stricture is rarely situated centrally, but is most frequently found near the roof, as the stricture-formation is usually most abundant on the floor. The opening may be but slightly smaller than the normal calibre of the urethra, or it may become so small as to be almost impermeable. Complete occlusion is, however, rare except after severe injury to the urethra or after fistulæ have formed to provide an escape for the urine.

The rapidity with which stricture contracts and the density and extent of the connective tissue forming a stricture are dependent upon several factors. Strictures

due to mechanical or chemical violence (traumatic stricture) contract earlier and are denser than those due to inflammation. The amount and shape of the new formation in traumatic stricture depends largely upon the nature and site of the injury, and the stricture may be linear, annular, or irregular. Strictures due to gonorrhœa are often irregular in shape and lumpy. Cachexia and individual tendencies influence the development of stricture, which seems to form readily, extensively, and irregularly in the tuberculous or syphilitic or in those of gouty or rheumatic diathesis. The habits of an individual whose urethra contains a forming stricture also play an important part; a faulty sexual hygiene, or anything that causes congestion of the urethra, will undoubtedly hasten the formation of stricture, and tend to make the latter dense and contractile.

Changes in the Urethra.—As the stricture contracts and forms an obstruction to the free outflow of urine, each act of urination is accompanied by a dilatation of the urethra immediately back of the stricture. The frequent stretching of this part of the urethra is slight at first, but it gradually increases until the walls at this point lose their tone, become thinned, and a permanent pouch or sac is formed. This pouch retains constantly a drop or two of urine, which is decomposed by the mucus and acts as an irritant to the mucous membrane. Thus it happens that the urethral membrane immediately back of a stricture is usually inflamed and produces a gleet discharge. The mouths of the ducts and follicles enlarge, and as the stricture contracts it increases during urination the pressure upon the urethral walls back of it. The mucous membrane in this situation becomes more and more thinned and atrophied, and may

be pushed out between the bands of muscular fibres to form sacculi or pockets in which a few drops of urine are retained and decomposed, thus adding to the inflammation of the urethral wall, and therefore to the danger of ulceration. Such sacculi may have their origin in distended ducts or follicles. In severe cases ulcerations follow, allowing of the escape of a few drops of urine into the periurethral tissues. There are thus formed abscesses which open externally and result in urinary fistula. Occasionally some portion of the thinned urethral wall gives way, and urine in considerable quantity escapes into the surrounding tissues, producing the serious accident known as "extravasation of urine."

Resulting Changes in Bladder and Kidneys.—Early in stricture the congestion may extend to the neck of the bladder, causing vesical irritation with frequent micturition; or cystitis may result. Later, as the stricture contracts and produces greater obstruction to the outflow of urine, the detrusor urinæ muscle, as a result of its efforts to empty the bladder, becomes hypertrophied and thickened, and bands of muscular tissue project into the bladder in ridges. The contraction of the hypertrophied muscles in the bladder-walls diminishes the size of the bladder-cavity and may eventually almost obliterate it, the muscles undergoing fibroid changes which render them incapable of distention. During the violent contractions of the bladder the weaker portions of the wall between the muscular ridges are pushed outward and stretched until finally they form sacculi or pouches which may have but a small opening connecting them with the proper bladder-cavity. These sacculi, having no muscular fibres in their walls, cannot empty themselves; they therefore retain the decomposing urine and

furnish a favorite site for the formation of calculi. Rarely, as a result of rapid formation of stricture and over-distention of the bladder, the bladder-walls, instead of becoming hypertrophied, are thinned and atrophied. Cystitis results in most cases in which decomposing urine is allowed to remain in the bladder.

The pressure of the urine, especially during the act of micturition, extends backward through the ureters, which become dilated and hypertrophied, to the pelvis and to the calices of the kidneys, producing hydro-nephrosis. As a result of inflammation extending from the bladder through the ureters to the kidney, or more frequently as the result of microbic infection, there may follow pyelitis, pyelonephritis, or, rarely, abscess of the kidney and perinephritis.

Symptoms and Results of Stricture.—The symptoms produced directly by stricture are not so marked as are those resulting from secondary implication of other parts of the genito-urinary system. As these secondary symptoms or results of stricture may be first both in appearance and in importance, and as they are closely associated with such symptoms as may be due directly to the stricture-growth, it is best to consider them together.

Stricture of large calibre may exist for months or even for years without producing symptoms of importance, though when the contracture of the urethra begins to interfere with the normal function of the canal, its presence is usually manifested by a series of characteristic disturbances.

Increased frequency of micturition is among the earliest symptoms of stricture, though it may be so slight at first as to pass unnoticed, or may be entirely absent. As a

rule, the desire to urinate gradually becomes more frequent, until in old cases the patient may find it necessary to empty the bladder every few minutes. The frequency with which the bladder is evacuated in a day does not, however, necessarily indicate the degree of contraction of the stricture, but is largely dependent upon the temperament of the individual and upon the presence or absence of cystitis and other complications. In the beginning this symptom may be due solely to irritation reflected from the site of the stricture to the bladder, and later to irritation resulting from the increased efforts of the bladder to overcome the urethral obstruction and to empty itself. In many cases congestion of the vesical neck undoubtedly occurs early, and, as the urethral inflammation back of the stricture increases, it extends at least to the deep urethra or to the neck of the bladder, resulting in a greatly increased frequency of micturition due directly to the posterior urethritis or cystitis.

In tight stricture of long standing, as a result of which the bladder-walls have hypertrophied and so reduced the size of the cavity that it will hold but a small quantity of urine, the demands to urinate may be so frequent as to amount almost to incontinence. The same clinical condition is found with an atonic and constantly distended bladder which has lost its power of complete contraction. Very late in the history of these cases the patient may be unable to retain his urine for even a short period, and it constantly dribbles from the urethra. In the first class of cases, in which the bladder-cavity is nearly obliterated, this condition constitutes true (and hopeless) incontinence, and should carefully be distinguished from the mere overflow of a distended and atonic bladder. In the latter case the use of a catheter

will reveal the presence in the bladder of a large quantity of residual urine. A smaller amount of residual urine may be found in the majority of cases of organic stricture. In these two forms of bladder disease resulting from stricture the frequency of micturition and the incontinence are worse during the day, due to the fact that when the patient assumes the upright position the urine in the bladder produces pressure upon the vesical neck, or, in case the latter is relaxed, upon the stricture and the dilated urethra back of it; these same symptoms, when due to prostatic disease, are usually most pronounced at night.

Dribbling after urination is another early symptom of stricture. In a normal urethra the close of urination is followed by a wave of contraction of the muscular fibres surrounding the urethra, expelling the last drops of urine from the canal. This action is probably aided by a corresponding wave of blood sent through the corpus spongiosum by the contraction of the accelerator urinæ muscle. The submucous deposit in stricture prevents, by its mere presence, the accurate closure of the urethra, and later, by invading the muscle-fibres themselves and by obliterating the meshes of the corpus spongiosum, may yet further interfere with the closure of the canal. In consequence, the last drops of urine are retained behind the stricture, and do not escape until later, by force of gravity, when the penis is dependent.

Urethral discharge, which, appearing as gleet or as shreds in the urine, is present in most cases of stricture, is produced by the urethral inflammation back of the constriction. In the forming stage of stricture the discharge may be furnished by the inflamed, granulated, or otherwise damaged urethral membrane beneath which

stricture is forming. Opinions vary as to the constancy and importance of this symptom in its relation to stricture. Dr. White finds about 50 per cent. of strictures accompanied by a gleet discharge from the meatus, while a large majority of all others show shreds in the urine. Some observers maintain that the presence, for any considerable period, of a gleet discharge or of shreds and pus-corpuscles in the urine is sufficient evidence of stricture, and advise, in such cases, operation upon any points of narrowing, however slight, that can be detected in the urethra. That such a view is extreme and erroneous is evident, since many cases of chronic urethritis that have persisted for months or years recover completely under proper hygienic management and without local treatment. The amount of urethral discharge in stricture varies with the general condition of the patient and his habits of living. As in chronic urethritis, congestion or irritation of the urethra from any cause will increase the amount of the discharge. In stricture of large calibre the history and symptoms of the disease may differ in no particular from those of chronic urethritis.

Retention of urine may occur early in stricture if the mucous membrane covering it becomes inflamed and swollen as a result of gonorrhœal infection, alcoholic or sexual excesses, cold, or other causes of urethral irritation and congestion. Such retention, coming on suddenly after a debauch, may be the first evidence of stricture recognized by the patient. This form of retention, due chiefly to urethral spasm and to swelling of the mucous membrane, rarely lasts more than a few hours, and is readily relieved by hot baths, an opiate, or the introduction of a soft catheter. In an unobserving or dis-

sipated patient other symptoms of stricture may pass unnoticed for months or even for a few years, and he may suffer from repeated attacks of sudden retention before applying for treatment. As the stricture contracts and diminishes the calibre of the urethra, less and less swelling of the mucous membrane is required to produce retention, which consequently is more easily provoked, occurs more frequently, is more persistent, and is relieved with greater difficulty. In old cases sudden retention may necessitate the performance of perineal section under unfavorable circumstances.

The stream of urine becomes noticeably smaller only after the calibre of the urethra has been diminished considerably, as in health the size of the stream is much less than the urethral calibre (estimated by the size of the sound it will readily admit). As the stricture contracts, and especially if there be atony of the vesical walls, the patient finds he is unable to throw the stream of urine as far from his body as formerly, and more time is required to empty the bladder. In old and tight strictures the contraction may be so great that the urine passes in drops only. The stream may be so modified in shape that it is twisted, forked, peculiarly curved, or divided into several small streams; but as its form depends chiefly on the shape of the meatus, and as it varies greatly in health and as a result of conditions other than stricture, these modifications are of little importance.

The sexual functions of the urethra may be impaired early in stricture, but usually they are not disturbed until the obstruction is sufficient to prevent the forcible ejaculation through the urethra of the semen, which then dribbles from the meatus after subsidence of the erection, or, in case of very tight stricture, is forced back into the

bladder, to be discharged with the next flow of urine. The patient consequently is sterile. Ejaculation may be followed by pain in the urethra just back of the stricture, or in the bulb or the perineum, and the semen may be mixed with blood. If some of the meshes of the corpus spongiosum, and possibly of the corpora cavernosa, are occluded by the stricture-growth, the free flow of blood through these bodies is prevented, and erections are painful or are so imperfect as to render the patient impotent. In old cases sexual desire is diminished or entirely absent, but in recent cases the slight inflammation back of the stricture may serve to stimulate and irritate the sexual organs.

Local pains varying greatly in character occur at the site of the stricture, in the glans penis, testicles, cord, perineum, rectum, bladder, and even in more remote parts of the body. In stricture of small calibre there is usually some vesical tenesmus during the entire act of urination. While many of the pains are undoubtedly reflex in character, many of them are due to the presence of posterior urethritis, cystitis, or to other complications of stricture.

The urine usually contains some pus, and shreds composed of epithelium and pus-cells, but it is otherwise normal unless cystitis be present, when it has the characteristics of urine in cystitis from other causes. Keyes reports several cases of stricture in which hæmaturia was the only symptom.

Constitutional symptoms are not directly produced by stricture until late in the disease, when the almost constant, painful attempts to force urine through the narrow opening may allow the individual no rest, and may result in complete exhaustion, and, if unrelieved, in death.