CHAPTER XI

ORGANIC STRICTURE OF THE URETHRA—ETIOLOGY, MORBID ANATOMY, SYMPTOMS, RESULTS, DIAGNOSIS

Although two conditions commonly known as stricture have been described in the preceding chapter, the one, spasmodic stricture, is a mere symptom, and the other, congenital stricture, a condition which, except in extreme cases, is absolutely innocuous. True stricture, the stricture that is never innocuous and always active in its work of undermining its possessor's health, except when kept at bay by the surgeon's efforts, has yet to be considered.

True organic stricture of the urethra is a cicatrix of the urethral wall left there by some injury or inflammation, and manifesting a constant tendency to contract, and thus to diminish the lumen of the urethra. This tendency to contraction, which is always manifested in a greater or less degree, is doubtless caused by the irritation incident to micturition, the impact of the stream against the barrier; for the deepest stricture, the one that most obstructs the flow of urine, is always the tightest, and if the stricture is kept dilated so as to afford little or no obstruction, the tendency to recontraction is very slight.

Varieties.—Strictures may be classified from several points of view: thus, for prognostic purposes, strictures are considered as anterior (at or in front of the peno-scrotal angle) and posterior (behind this point); therapeutically considered, strictures are of large calibre (admitting a 15 French bulbous bougie) or of small calibre; while from a pathological and etiological point of view strictures are classified as gonorrheal and traumatic. The old descriptive division into linear, annular, and tortuous or irregular stricture is clinically convenient to describe the nature of the obstruction to the exploring instrument, and the terms soft, fibrous, and inodular (or indurated) are descriptive of important features.

Etiology

All true strictures are either inflammatory or traumatic, and almost all inflammatory strictures are gonorrheal. An excessively

severe or prolonged simple urethritis may cause stricture, and so may urethral chancres, ulcers, neoplasms, and loss of substance following periurethritis. But these causes appear so rarely as to be quite negligible.[1]

By far the greater number of strictures are gonorrheal. Thus out of 220 cases studied by Thompson, 164 (75%) owed their origin to gonorrhea; while Martin found among 219 cases 187 gonorrheal strictures (85%).

The *causes of gonorrheal stricture* are, however, many. The inflammation itself may cause the stricture, and doubtless this is usually the case; but it is difficult to estimate what proportion of strictures is due to breaking a chordee, to a false motion in coitus causing a tear in the inflamed mucous membrane, to the ill-advised use of caustic injections for the purpose of aborting the attack, or to the injudicious use of instruments in the urethra before the attack has subsided. Such strictures are properly traumatic, since trauma of the same kind, but greater in degree, may cause stricture when the mucous membrane is not inflamed and the gonorrhea thus only plays the *rôle* of a predisposing cause.

There is a small class of *intermediate cases* in which the stricture is neither absolutely inflammatory nor traumatic. To this class belong strictures caused by urethral chancres and ulcerations, or loss of substance from periurethritis, etc.

The *causes of traumatic stricture* vary widely. The *penile* portion of the urethra may be divided by knife or bullet, or torn by bending the erect penis, by a false motion in coitus, or by breaking a chordee. The *bulb* is the portion usually affected by trauma from within, by ulceration from stone, foreign body, or retained catheter, or by the sharp point of a blundering instrument. The *prostatic* urethra is said to become strictured when torn by disruption of the pelvis.

But of all traumatic strictures, recognisable as such, stricture of the *membranous urethra* or at the bulbo-membranous junction is the most frequent. The stricture is caused by a crushing force applied to the perineum, which brings the urethra sharply into contact with the subpubic ligament, crushing it beneath the sharp edge of this structure or tearing away from it in front.

The injuries which have caused traumatic stricture in the perineum, with or without a penetrating wound, are innumerable. Among the most classical may be mentioned falls from a height

[1] Ten cases of diffuse urethral syphiloma have been reported. Guyon's Annales, 1898, xvi, 892.

astraddle a beam, a chair, a stump, a manger, the limb of a tree, the corner of any blunt object, such as a trunk, a box, etc.; falls astraddle a fence while walking upon it, of a wheel while mounting an omnibus, of the tongue of a wagon; falls upon a sharp object, as a chisel, the breakage of a chamber-pot upon which the patient is sitting; falls with one leg through a hole in the ice, or down a coal-hole in the sidewalk; being thrown forward upon the pommel of a saddle, while riding; fracture of the pelvis, kicks in the perineum from man or beast, etc., *ad infinitum*. This perhaps unnecessarily minute detail of injuries capable of causing stricture is given because they are all occurring constantly. The authors have seen cases from each cause, and very many from some. They may be overlooked by the patient if they do not give rise to immediate hemorrhage or retention. The injury is then slight, not causing much immediate disturbance, and the patient forgets it; he never has a gonorrhea, perhaps, and yet in after years symptoms of stricture come on, and the canal is found highly contracted at its membranous portion; or, in trying to relieve retention in fever, the physician finds his catheter unexpectedly arrested.

Pathogenesis.—The most notable modern theories upon the formation of stricture are the theory of Finger and the Guyon school, Harrison's theory and the theory of Guiard.

The Finger-Guyon theory [1] makes stricture the result of chronic urethritis. According to these authors, chronic urethritis is essentially a sclerotic process, characterized by deposits of cicatricial tissue in the submucosa and even in the corpus spongiosum. This fact is illustrated by numerous pathological findings that would prove its truth were it not flatly contradicted by two notorious clinical facts. First, that stricture not infrequently occurs when there has been no chronic urethritis. Second, that chronic urethritis is habitually a posterior urethritis confined, that is, to a region where inflammatory stricture does not occur; while a chronic anterior urethritis is usually associated with a stricture, but as a result not as a cause, and chronic urethritis may exist for years without ever causing stricture.

Harrison's theory [2] is that the mucous membrane of the urethra, when inflamed by gonorrhea, becomes slightly permeable to the urine, which thus infiltrates the urethral wall at some place or other. To oppose this infiltration a circumscribed inflammation is set up which results in a local deposit of scar tissue, and ultimately in stricture.

[1] Finger. Internat. klin. Rundschau, Februar 12, 1893. Wassermann and Hallé. Guyon's Annales, 1891, ix, 143 *et passim*. Wassermann and Hallé, *ibid.*, 1894, xii, 244, 321.

[2] Mettsonian Lectures, 1888.

Guiard's theory [1] is that stricture depends upon the virulence of the urethral inflammation; the more severe the initial attack the more intense the chordee; the more frequent and violent the relapses, and the longer the gonococcus can be found in the discharge, the greater is the probability of stricture. He believes that in a mild or a chronic stage the urethral inflammation is simply catarrhal and neither deep-seated nor productive of any permanent lesion; while the acute inflammation, with its involvement of the lacunæ and glands, its circumscribed or diffused areas of periurethritis, is the inflammation calculated to leave behind permanent scars in and beneath the mucous membrane.

Of these three theories the latter two may be accepted. Indeed, a single stricture may owe its origin to a periurethritis, and then, after the first band of exudate has been thrown out, the impact of urine against the congested and ulcerated mucous membrane may be enough to permit a microscopic infiltration, followed by the reaction, which will pile up a new barrier of inflammatory tissue that will in turn cause renewed infiltration, and so on; or the infiltration may result from a trauma, the breaking of a chordee, or some such accident. But in cases of simple inflammatory stricture to assume that the primary accident is an infiltration seems hardly warranted. In short, the essential primary cause of simple inflammatory stricture would seem to be a periurethritis occurring during the acute stage of gonorrhea. The secondary cause, the factor that encourages the development of stricture and its constant contraction, is doubtless the impact of the stream of urine, whether this impact causes an excessive deposit of cicatricial tissue by setting up a minute infiltration or simply by a surface irritation. Long-continued chronic inflammation in the anterior urethra may, however, cause stricture. Thus in prostatic cases a slight linear stricture is often met with in the bulb. Its presence is denoted by the spasm it evokes in the cut-off muscle. This stricture is due, I believe, to a simple urethritis secondary to the prostatic catarrh.

In the etiology of traumatic stricture urinary infiltration must always play some part. It is true a severe contusion and laceration of the urethral wall are ample causes for stricture; but it is incredible that the muscular disturbance of urination and the distention of the wound with a fluid containing urinary salts and urethral bacteria should cause no increase in the inflammatory reaction. (See Infiltration of Urine.) Indeed, the admirable results obtained by simple perineal section and diversion of the stream of urine from

[1] Les uréthrites chroniques chez l'homme. Paris, 1898, p. 90 *et seq.*

the wound, confirm the belief that here again urinary infiltration is important as a secondary cause of stricture.

In this connection *the time of occurrence of stricture after gonorrhea and injury* is of interest. Of the 164 cases of stricture following gonorrhea, tabulated by Thompson, in 10 symptoms appeared immediately after or during the attack; 71 within one year; 41 between three and four years; 22 between seven and eight years; 20 between eight and twenty-five years. J. D. Hill,[1] from a discussion of 140 cases of stricture from all causes, makes the length of the period between the cause and the first symptoms of stricture noticed: after gonorrhea, shortest period two years, longest thirteen years; after urethral chancre, shortest period ten months, longest three years; after injury, shortest period four months, longest eighteen months. Guyon, among 142 cases of gonorrheal stricture, found only 4 cases within the first year, 10 during the second year, 79 distributed between the second and tenth years, and 49 after the tenth year. On the other hand, I have seen an impassable stricture in the perineum six weeks after a severe injury, and Guyon [2] has met a stricture which only admitted a 16 French sound two weeks after injury, and another which would not admit a 12 French after six weeks.

The deductions from the above statistics, confirmed by daily observation, are that the symptoms of stricture appear earlier after traumatism than after gonorrhea, the date of their appearance being measurably proportionate to the extent of the injury, and that the greatest divergence is noticeable after gonorrhea. It is totally exceptional, however, for symptoms of organic stricture to come on immediately after or during the attack of gonorrhea—as Thompson states occurred in 10 of his cases—unless stricture existed previous to the attack, unnoticed by the patient.

Morbid Anatomy

Number of Strictures.—While Thompson,[3] in examining 270 pathological specimens, found only 44 cases of multiple stricture, Guyon [4] lays down the clinical rule that gonorrheal strictures are multiple, while traumatic strictures are single. These statements, properly interpreted, conform perfectly with each other and with the facts. Concerning traumatic strictures there is no doubt; they are almost always single. But gonorrheal strictures, while frequently single from the pathologist's point of view, do present with equal frequency a number of ridges to the examining sound. Clinically, therefore, gonorrheal strictures are multiple, pathologically they are single.

[1] An Analysis of 140 Cases of Stricture of the Urethra. London, 1871.
[2] Leçons cliniques, 1894, vol. i, p. 239.
[3] Stricture of the Urethra. 2d Ed., 1858, p. 76.
[4] *Op. cit.*, i, 139.

Seat of Stricture.—Upon this subject the laborious investigations of Thompson, upon the 270 specimens above referred to, must be considered final, especially as daily experience with patients bears out the truth of his conclusions. He divides the urethra into three regions:

1. The bulbo-membranous, including 1 inch in front of and ¾ inch behind the junction of the spongy with the membranous urethra.
2. From the anterior limit of region 1, to within 2½ inches of the meatus, embracing from 2½ to 3 inches of the spongy urethra.
3. The first 2½ inches of the canal from the meatus.

The 270 preparations showed 320 strictures.

Region 1 contained	215	strictures—	67	per cent.			
"	2	"	51	"	16	"	
"	3	"	54	"	17	"	

There were 185 cases of one stricture only, situated in region 1.

"	"	17	"	"	"	"	"	2.
"	"	24	"	"	"	"	"	3.

Otis places a majority of all strictures within the first 1¼ inches from the meatus—the next most common position being somewhere in the middle portion of the pendulous urethra. He believes deep urethral stricture to be far less common; but these views, which Dr. Otis has for years laboured earnestly to advance, are largely influenced by his theory that the urethra is a tube evenly calibrated throughout, and therefore what most other authors believe to be points of physiological narrowing (perhaps exaggerated in many individual instances) of the normal healthy urethra, he denominates stricture.

It is convenient to associate the region in which the stricture occurs with its cause. Thus, strictures at or near the meatus, if not congenital, are usually caused by chancrous or chancroidal ulceration, less frequently by caustic injections and by gonorrhea. Strictures of the pendulous urethra are commonly gonorrheal. Strictures in the bulb and at the bulbo-membranous urethra are also commonly gonorrheal. Strictures of the membranous urethra are never gonorrheal, always traumatic. Stricture in the prostatic urethra is very rare, to say the least. Thompson has not seen it, and French authors believe it only occurs as a complication of fracture of the

pelvis. On the other hand, Walsh[1] describes a stricture in the museum of the Royal College of Surgeons, Dublin, as commencing in the posterior part of the membranous and extending into the prostatic urethra. Leroy d'Etiolle[2] says that he has in his collection one specimen showing prostatic stricture. Ricord[3] and Civiale[4] have encountered it, and Mastin[5] makes the same assertion.

Form of Stricture.—As has been said above, the descriptive distinction of strictures into linear, annular, and irregular or tortuous is merely a matter of clinical convenience, indicating that the amount of scar tissue in a stricture varies from a slight band or membrane to a broad and irregular mass, extending, perhaps, over the greater part of the anterior urethra. There are two points of much greater importance in this connection.

In the first place, the stricture is usually chiefly built up from the floor of the canal. This is most notable in the bulb, and commonly results in an eccentric position of the orifice of the stricture, close to the upper wall of the canal. The cause is not far to seek. It is in the loose floor of the canal, especially in the pocket of the bulb, that the gonococci commit their greatest ravages. It is the floor of the canal that is most often torn or crushed. It is the floor of the canal that is damaged by overdistention, when urination is obstructed (Bazy[6]).

In the second place, it is a matter of clinical experience that in broad, irregular strictures, strictures that are clinically multiple, the constrictions become progressively narrower as they approach the bladder. Beginning, perhaps, at the penoscrotal angle, there is a constriction which admits a 20 French sound. A short distance farther on this, too, is obstructed, and only a 15 French will pass, and finally the stricture in the bulb admits only a filiform instrument. In other words, the deeper extremity of the stricture, which receives the strongest impact of urine, is more irritated than the rest and contracts more rapidly.

Gross Pathological Changes (Figs. 36, 37, 38).—When the strictured urethra is slit longitudinally, the mucous membrane may be found only slightly thickened and congested. The surface may be quite normal in recent cases, though it has usually lost its polish, and may be cicatricial in character or covered with granulations. If

[1] Dublin Medical Press, January 26, 1856.
[2] Des rétrécissements de l'urèthre. Paris, 1845, p. 83.
[3] Notes to Hunter on the Venereal. 2d Ed. Philadelphia, 1859, p. 168.
[4] Maladies des organes génito-urinaires. 2de éd. Paris, 1850, i, 158.
[5] Boston Med. and Surg. J., 1879, p. 878.
[6] La semaine méd., 1891, xi.

the stricture is more advanced, a band or a mass of cicatrix may be found to replace the mucous membrane throughout its thickness, and it may even penetrate the corpus spongiosum, the meshes of which will be found obliterated. This tissue may be slight in extent, cicatricial in character, tightly contracted; or it may be exuberant, knobbed, and excessive in amount, so as to be readily felt from the outside of the canal, having a cartilaginous or even woody hardness. In this callous, fibrous mass there may be irregular areas of recent inflammation, soft congested patches, minute abscesses, and small cavities with ulcerated walls. Behind the stricture the canal is distended and more or less extensively ulcerated, and immediately in

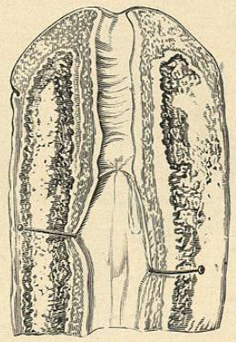

Fig. 36.—Voillemier.

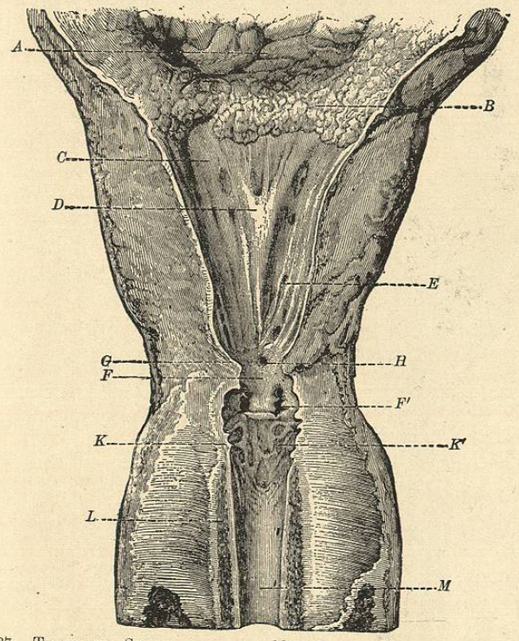

Fig. 37.—Traumatic Stricture of the Membranous Urethra (Voillemier).

A, bladder; *B*, bladder neck (ecchymotic); *C*, dilated prostatic urethra; *D*, verumontanum; *E*, one of the prostatic ducts; *F*, *G*, *K*, the stricture; *F'*, dilatations in front of the tightest part of the stricture; *H*, orifice of small abscess cavity; *K'*, mucous membrane in front of the stricture, thin and ulcerated; *L*, corpus spongiosum; *M*, anterior urethra.

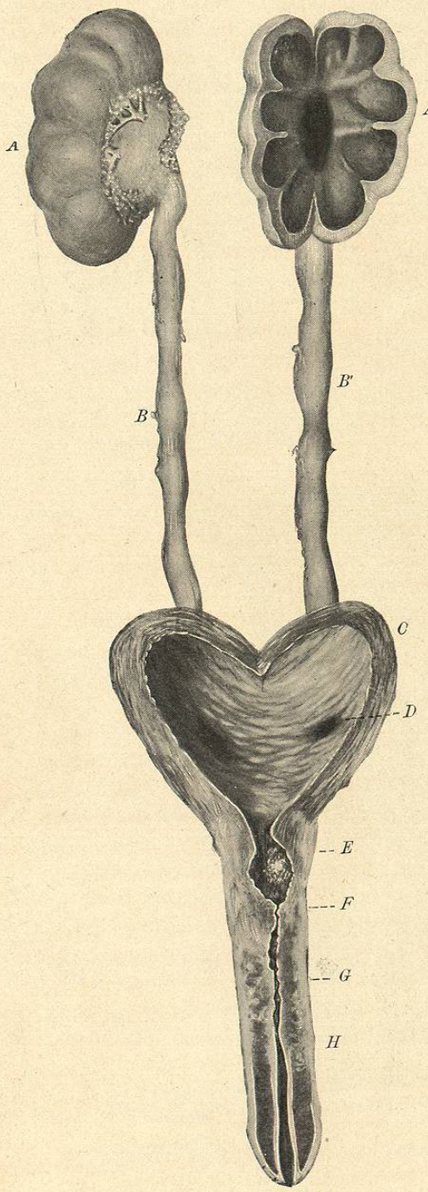

Fig. 38.

front of the stricture, or between two constricting bands, there are other lesser dilatations and ulcerations.

Microscopical Appearance.—The mucous membrane over the stricture is at first congested, and its epithelium thickened. When the congestion has become chronic the deeper layers of epithelium are increased in number and made up of cuboidal cells, while the more superficial layers are pavimentous or mere scales. In the dilated regions behind, and to a less degree in front of the stricture, the epithelium is thinned and flattened. Ulceration may destroy a part or the whole of the epithelium on and about the stricture, and if the ulceration heals the epithelium is in great part permanently replaced by scar tissue.

Beneath the epithelium appear the essential lesions of the stricture. Irregular areas of inflammatory tissue surround the canal and invade the corpus spongiosum.

Fig. 38.—Results of Stricture.

A, *A'*, Kidneys dilated, sclerosed, pyonephrotic; *B*, *B'*, ureters irregularly dilated; *C*, bladder contracted and thickened (concentric hypertrophy); *D*, dilated ureteral orifice; *E*, prostatic urethra dilated (prostatic abscess); *F*–*H*, the stricture; *F*, its tightest point; *G*, corpora cavernosa involved in the scar.

The glands are chronically inflamed, cystic, or obliterated, and they are seen to be the centres from which the inflammation spreads (Finger, Oberländer, Hallé, and Wassermann). When minute abscesses are present they, too, may often be found to originate in some inflamed gland, the duct of which has been obliterated. Areas of normal tissue are interspersed among the masses of pathological tissue.

Associated Lesions.—The chronic urethritis, cystitis, vesical hypertrophy, pyelitis, nephritis, etc., so often resulting from stricture will be considered under the title Results of Stricture, while abscess, fistula, extravasation, etc., will meet detailed treatment elsewhere. (See Index.)

Subjective Symptoms

Organic stricture may exist in a man for years, producing no symptoms and unsuspected. On the other hand, the usual symptoms of stricture, gleet, the irregular stream of urine, and the final dribble, are of daily occurrence among men who have not, and never had, stricture.

Gleet.—The initial symptom is the presence of shreds (*Tripperfäden*) and more or less free pus in the urine. If the stricture follows immediately after a gonorrhea the urethral discharge is perpetuated, but more often there is a lull while the shreds, and perhaps the general cloudiness of urine, persist, but, in the absence of a notable gleet, do not attract the patient's attention. These shreds and pus are evidence of the local inflammation on and about the stricture, which is adding fuel to the flame, and encouraging extension and contraction of the fibrous tissue.

As the stricture contracts the urethral catarrh grows worse and, sooner or later, produces a moderate chronic discharge, perhaps only visible in the morning when the urethra has not been scoured by the urinary stream for eight hours, perhaps persisting throughout the day. This is *gleet*. It is usually the first symptom noted by the patient. The gleet of stricture gets better or worse according to the general condition of the patient, the degree of acidity of the urine, and the amount of sexual indulgence or of venereal excitement. Exacerbations of gleet from slight causes, or repeated attacks of gonorrhea, as the patient usually considers them, often constitute the most marked feature of the case. In fact, it is the rule in mild cases for the patient to be wholly unconscious that his urethra is at all narrowed. He applies for treatment, on account of his gleet, for an attack of gonorrhea, as he calls it (bastard gonorrhea), and often refuses to believe that he has stricture, or that, if stricture does exist, it is of sufficient importance to occasion his symptoms; and he re-