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.

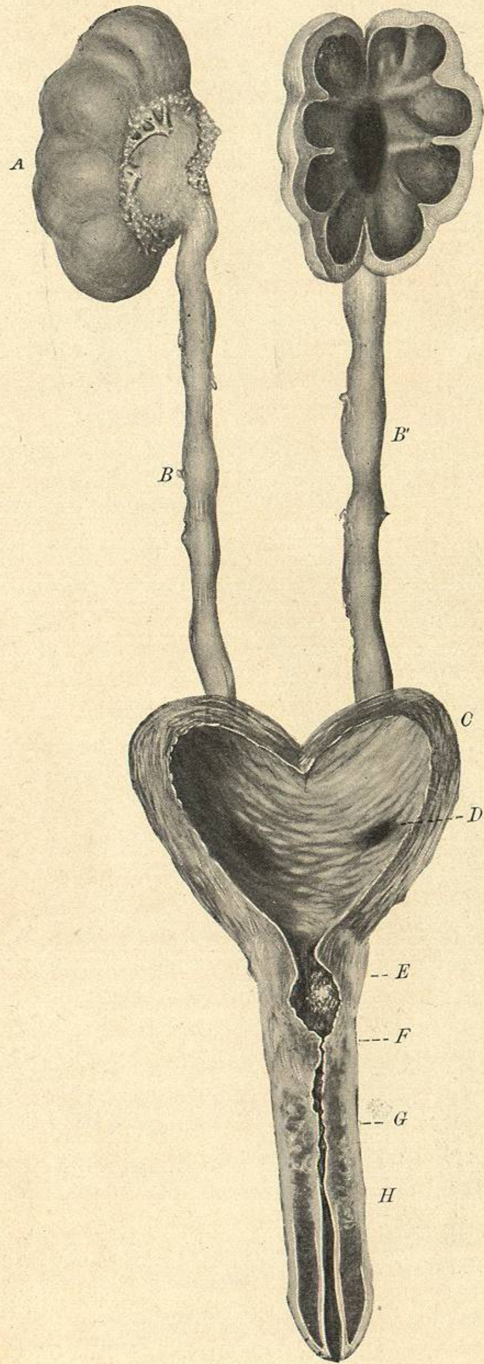

Fig. 38.

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-

peatedly asserts that he makes as large a stream of urine as ever. Nothing so well as the bulbous bougie will convince such a patient of his condition. The evidence of this instrument he must admit. The gleety discharge, once commenced behind the stricture, rarely ceases entirely until the constriction is relieved.

Changes in the Stream.—As the stricture tightens, fresh symptoms are added. A cartilaginous hardness may often be felt from the outside of the urethra at the constricted point. The meatus urinarius looks blue and congested, as does sometimes the whole glans penis, from obstructed circulation. The gleet continues, *the stream of urine is small and irregular*, often forked or curving up in a curious manner just after leaving the meatus, or there may be several streams running in different directions, or often one stream is projected for a certain distance, while another drops down perpendicularly from the end of the penis.[1] *The last few drops of urine are retained in the canal*, both mechanically by the obstruction of the stricture, and because the wave of blood, impelled by the contraction of the accelerator urinæ upon the bulb in the final effort at clearing the canal, cannot pass along the corpus spongiosum, on account of the obliteration of its meshes at the point of stricture, and thus fails in its function of expelling the last few drops of urine from the canal. By this same obliteration of spongy tissue, erection is sometimes rendered imperfect and painful.

Frequent Micturition.—In time the surface congestion of the stretched urethra behind the stricture extends backward to the bladder, and brings on irritability (so called) of that organ. The intervals between the acts of micturition grow shorter and shorter, and somewhat painful. Next to gleety discharge this frequency of micturition is the symptom of stricture which is least often absent. A slight narrowing of the canal may occasion it. It is undoubtedly attended by congestion about the neck of the bladder, but not necessarily by any true cystitis.

Retention.—The congestion of the urethra behind a stricture easily becomes greater, is kindled into acute inflammation by a heavy dinner, a little excess in drink, or a chilling of the legs; the mucous membrane swells up, the stricture closes, and the patient has retention of urine. If this retention is unrelieved, the bladder becomes overstretched; after many hours a few drops of urine will escape

[1] It is to be noted that while an impediment anywhere in a water-pipe (such as the urethra) modifies the *force* of the stream, the *shape* of the stream depends chiefly upon the shape of the nozzle (the meatus). Thus the shape of the stream, upon which so much stress is commonly laid, has no bearing on the diagnosis of stricture. It is modified by the meatus itself more often than by any other cause.

from the meatus (overflow), and the patient thinks he is getting better. If this condition of overdistention is allowed to continue unrelieved, the contractile power of the bladder may be permanently injured (atony).

Retention may be the only disagreeably prominent symptom connected with a case of stricture. The gleet may not have been noticed, the gradual decrease in the size of the stream may have been ignored, when, after exposure, excess, or a carouse of beer, retention suddenly comes on. Some patients will have had several attacks of retention before they apply for relief. The spasm and inflammation which cause the narrow canal to become obliterated in these cases cease after a few hours, and then the patient goes on perhaps for a year or more without another retention, not suffering noticeably in the meantime.

If retention does not come on, the inflammation, once aroused behind a stricture, gradually, sometimes rapidly, travels back to the prostatic urethra, and there is posterior urethritis. Now commences what before was absent, or present only to a mild degree, a *frequent desire to urinate*, at first every three or four hours, once at night, and gradually at shorter and shorter intervals, until, when the patient seeks relief, he may be passing water in a fine stream every half hour or fifteen minutes, with great pain and straining.

Hematuria.—Blood sometimes flows with the urine at the beginning or end of the act. Exceptionally *hematuria* may be the most prominent symptom of stricture, indeed the only one noticed by the patient for a long time. I have had several such cases, and have seen the hematuria cease upon relief of the stricture.

Pain.—Along with symptoms of vesical irritation, often before any actual inflammation of the bladder has occurred, are found pains various in character and situation: pain in the urethra, aching of the glans penis, in the testicle, along the cord, or running up into the back or hip; pains across the lumbar region, in the perineum, around the anus, in the rectum, over the pubis, etc., and other obscure pains of a neuralgic sort, in the thighs, the legs, or the sole of the foot[1] (Brodie), all of which pains are cured by dilating the stricture. Urination is often painful (sometimes excessively so), the pain being at the neck of the bladder, in the perineum, at the point of stricture, or near the glans penis.

Sexual Symptoms.—Erections may be painful, the venereal orgasm attended by pain, the semen not being discharged during the

[1] Or in the great toe. The pain is sometimes compared to intense heat, sometimes to icy cold, sometimes it is actual pain over a small area.

sexual act, but often dribbling away afterward, perhaps stained with blood, or running back into the bladder, to be discharged at the next flow of urine. Impotence sometimes accompanies this condition. The sexual appetite is often impaired, sometimes nearly obliterated, in old severe cases. But, in mild cases, the congestion kept up behind the stricture may be just enough to excite and irritate the patient, causing frequent erections, erotic fancies, and nocturnal emissions.

Results of Stricture

Hemorrhoids and Hernia.—The constant straining in urination keeps the hemorrhoidal vessels congested. This not infrequently results in an attack of piles or of rectal prolapse; occasionally, hernia occurs from the same cause. The straining may be so violent that the bowel protrudes at every effort to empty the bladder, making it unsafe for the patient to attempt to urinate except upon a close-stool, for fear of the passage of feces at the same time as the flow of urine.

Cystitis.—The inflammation of the bladder caused by stricture is usually superficial, but it may become parenchymatous, perhaps accompanied by abscess in the walls of the bladder, or in the connective tissue around it. In cases of stricture the bladder-walls, as a rule, thicken, while their dilatability diminishes. The muscle, constantly called upon to force the urine through a narrow orifice, becomes thickened and hypertrophied. Trabeculæ of muscular tissue project upon the mucous surface of the bladder, and between these trabeculæ the mucous membrane may protrude, forming pouches or sacculi. The bladder may contract to such an extent as to be almost totally obliterated, its muscular walls having undergone fibrous degeneration, which has rendered them non-distensible. In this condition (concentric hypertrophy) there may be a constant flow of urine from the urethra, which the patient cannot control (incontinence), to be carefully distinguished from atony, with overflow (in the one case the bladder is constantly empty, in the other constantly full).

Stone.—Instead of incontinence the patient may be obliged to empty his bladder every few minutes, after a few drams of urine have accumulated, which seem to be bursting the organ. The urinary salts sometimes deposit in vesical sacculi, or a small renal calculus lodges there, forming a nucleus for stone. The greater the urethral obstruction the more pressure is brought to bear upon the sacculi, and the larger they become, so that sometimes they equal or exceed the size of the cavity of the bladder. As the sacculus enlarges, its neck remains unchanged, and, if stone form in it, the

stagnant urine (for there is no surrounding muscular tissue to empty it) constantly furnishes fresh supplies of urinary salts to increase the size of the stone, so that finally the latter may fill up the sacculus, constituting what is known as encysted calculus.

Atony.—Instead of contracting, the bladder may (rarely) dilate. In these cases there has not been so much irritability, and the bladder has not been called into such constant use; or overstretching may have been followed by atony, in which case overflow occurs, not to be mistaken for incontinence. Inflammation of the mucous membrane is also found in these cases of eccentric hypertrophy, together with the trabeculæ of hypertrophied muscular tissue and the sacculi.

Reflex Urinary Paralysis.—These conditions of vesical and urethral irritation, or others, such as stone, are sometimes, but very rarely, attended by partial paralysis of some groups of muscles of the lower extremities, or indeed by paraplegia. These various conditions, commonly known as reflex urinary paralysis, seem to depend upon the morbid condition of the urinary organs, and to be relievable, sometimes even curable, by treatment of the urinary difficulty.[1] Not very infrequently locomotor ataxia is mistaken for urinary reflex paralysis, especially if the urethra or the bladder happens to show any trifling lesion.

The Urine.—The urine in cases of stricture always contains shreds or free pus. As long as there is little or no posterior urethritis the second flow (p. 83) is clear. But as the inflammation extends backward the urine becomes clouded throughout. When cystitis supervenes the urine may become foul and ammoniacal.

Pyelo-nephritis.—Ultimately the back pressure makes itself felt upon the ureters and kidneys. The ureters sometimes enlarge to the size of the thumb. Their walls are thinned and contain areas of thickening from chronic inflammation. The pelves of the kidneys undergo the same distention, the kidney tissue being forced outward and compressed by the retained urine. Simultaneously, the inflammation extends up the ureter to produce *surgical kidney* (p. 361).

Indirect Results.—The less direct results of stricture, such as infiltration, extravasation, abscess, gangrene, fistula, prostatitis, vesiculitis, epididymitis, and cowperitis, are discussed elsewhere. (See Index.)

Constitutional Disturbance.—The constitutional disturbance in stricture is very variable. The stricture itself produces no general

[1] Brown-Séquard. Lectures on the Diagnosis and Treatment of the Principal Forms of Paralysis of the Lower Extremities. Philadelphia, 1861. Lecture on Reflexed Paraplegia. Lancet, 1863.

reaction whatever. It is the retention and inflammation that affect the patient's health, and the consequent *urinary toxemia and septicemia* have no special features to distinguish them from similar conditions due to other causes. The toxemic symptoms usually come on insidiously (unless there is complete retention), while septicemia usually affects the type of urethral fever and is evolved by instrumentation. In the more severe or acute varieties of cystitis and pyelitis septic intoxication is always found.

Recapitulation of Subjective Symptoms and Results of Stricture.—The *symptoms of stricture* are, briefly, narrowing of the canal, with dilatation of the urethra behind, blueness of the meatus, irregularities in the stream of urine, shreds and pus in the urine, pain, neuralgia of the urethra, retention of urine, overflow, dribbling, imperfect erection, irritability of the bladder, hematuria, and impotence—from urethral obstruction to escape of semen. The *remoter results of stricture* are the various inflammatory, functional, and structural changes in the bladder, ureters, kidneys, and rectum, also stone, infiltration, abscess, fistula, rupture of bladder, epididymitis, and sterility—from obliteration of the canal of the epididymis, and the various forms of urinary toxemia and septicemia.

A word must be said here concerning the effect of the sexual element in aggravating the symptoms of stricture. This concerns especially the painful, neuralgic, and functional disturbances. An unmarried man frequently tortures himself with fancied ailments, which he ascribes to stricture; or declares himself strictured when the canal is sound, imploring sympathy and demanding energetic treatment. Fancied stricture, next to fancied spermatorrhea, is the most common hypochondriacal expression of perverted sexuality, such as is found among those who heedlessly allow the brain to stimulate their erotic fancies and sexual needs, without being able to set Nature at rest by satisfying her demands, or who, on the other hand, abuse themselves sexually by physical as well as by intellectual excess.

These patients require kind and gentle management. They must be instructed about the cause of their troubles, and their sexual hygiene must be regulated. This can be accomplished by marriage, or by purity of thought and absolute continence.

Objective Symptoms and Diagnosis

Few diseases are more easy of diagnosis than organic stricture of the urethra. Few, perhaps, are more often wrongly diagnosed. The glaring fault is not overlooking an existing stricture, but attributing to stricture all the ills to which the urinary or the genital tract

is heir. Some are born with stricture (at the meatus); let us respect the design of their Creator. Some acquire stricture; we can help them much. Alas! many have stricture thrust upon them; their road to neurasthenia is hewn with the urethrotome.

Before entering upon the positive points of diagnosis, let the surgeon disabuse himself of three prevalent errors. Let him recognise that—

1. Every case of gleet is *not* due to stricture, even if it is improved or cured by the use of the sound.
2. Every irregularity in the calibre of the anterior urethra, every contracture of the meatus is *not* stricture, nor a cause of stricture.
3. Every spasm of the urethra, every acute retention, every obstruction to introducing an instrument, however absolute, is *not* organic stricture, nor caused by organic stricture.

Given these negative data, three facts must be positively determined before the diagnosis of stricture can be made:

1. Shreds or free pus in the urine.
2. An obstruction, slight or marked, to urethral instrumentation.
3. Evidence that this obstruction is caused by organic stricture.

These facts are elicited by exploration of the urethra.

Exploration of the Urethra.[1]—In exploring a given urethra for stricture for the first time, I prefer to use a blunt steel sound which will just pass the meatus—that is, when the latter is not itself abnormally small (p. 170). The blunt sound causes less pain than either the bulbous bougie or the urethrometer. It should be cleansed, warmed, lubricated, and introduced with the utmost gentleness. If obstructed anywhere, there is stricture, for normally the meatus is the smallest part of the canal. When an obstruction is encountered, a smaller blunt sound is tried, and then another, until some sound will enter the bladder. It is always well in searching for stricture to commence with a large size and work down. To begin with a small instrument leads to confusion. I have more than once in hospital and in my office had a case referred to me as one in which a filiform instrument could not be made to enter the bladder, and have at once easily passed a full-sized blunt steel sound into the bladder. The explanation of this is that spasm of the deep urethra frequently fails to permit a fine instrument, especially a pointed one, to pass, while spasm in that region, in my experience, at least, always yields to gentle pressure slowly and accurately applied with a blunt steel sound. Moreover, a false passage, or a pouched sinus of the bulb,

[1] The instruments and maneuvres are described in detail in the next chapter.

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or a dilated follicle, will frequently catch the point of a fine instrument, while a blunt sound will escape the obstacle, and, presenting fairly at the bulbo-membranous junction, will presently pass, perhaps smoothly, perhaps with a little jump, as it rides out of the sinus of the bulb into the membranous urethra.

The stricture, once detected, may be located, calibrated, and measured with the blunt steel sound, with the bulbous bougie, or with the urethrometer. Obstructions beyond $6\frac{1}{2}$ inches may be set down as due to prostatic enlargement, particularly in patients more than fifty-five years old. If the bulbous bougie or the urethrometer be used alone, there is danger of assuming that the point of physiological narrowing, at about the middle of the pendulous urethra, is a stricture requiring treatment by cutting when there is no real occasion for the operation. If this point is covered by granulations, however, and bleeds as the bulb passes it, it is in a diseased condition, and may require sounding, although no true stricture exists—only a granular condition due to prolonged chronic inflammation. These are among the so-called strictures of large calibre so popular at the present day, so common in occurrence, so rich a field for the young surgeon, and sometimes the occasion of unnecessary cutting, as it appears to me, since the gleet they occasion may be permanently removed by a few passages of a large sound without recourse to the knife, and in most instances, when the gleet has been cured by the sound, although the physiological narrowing continues, the patient becomes and remains well without the necessity for further use of instruments in his urethra.

Just within the meatus—at $\frac{1}{8}$ to $\frac{1}{4}$ inch—there is very often a point of congenital narrowing (meatus secundus) which may be cut if there is any occasion for using an instrument larger than it will admit—otherwise it may be disregarded. It is always wise to divide it if stricture exists beyond, because a free meatus greatly facilitates the use of large sounds (p. 170).

Differential Diagnosis.—So much for the method of examination. The presence of an obstruction having been determined, the differential diagnosis lies between organic stricture, spasm, and chronic inflammation. The position of the obstruction and the various points dwelt upon in the preceding paragraphs, and in the chapter on Spasm, are elements in the diagnosis. But the most distinguishing characteristic of all is resiliency. Organic stricture is always elastic and resilient, the others are not. To test this resiliency a sound—the largest that will pass—is gently introduced through the supposed stricture. It is allowed to rest in place for a moment, and then an attempt is made to withdraw it. *If there be organic stricture the withdrawal of the instrument will be opposed by a firm grasping* as long as the instrument remains engaged in the stricture. If there be no grasping there is no organic stricture.

To tabulate these features briefly—

	Organic Stricture.	Spasm.	Urethritis.
Shreds or pus..	Always present.	Not present unless there is an inflammation.	Always present.
Obstruction....	" "	Only in membranous urethra.	Sometimes.
Grasping......	" "	No.	No.

On the other hand, when the stricture is impassable and situated at the bulbo-membranous junction it may be impossible to distinguish it from spasm without the aid of general anesthesia. Yet in most cases the two may be differentiated by patient pressure with a blunt sound.