

In the former case we have abscess, or perhaps blind internal fistula, which may continue as such for many months. Its presence is indicated by a hard lump around the urethra, varying from the size of a large pea to that of an English walnut, usually sensitive to pressure, sometimes slightly painful at each act of micturition. This hard lump more or less rapidly enlarges, though it may remain stationary for an indefinite period, or even decrease in size; urethral fever comes on, generally described by the patient as "dumb ague;" the appetite fails, and the general health runs down; finally, pus forms and finds its way out through the perinæum, leaving a fistula behind. Instead of this slow course, if the quantity of urine which escapes is a little larger, acute perineal abscess forms.

The pus may burrow in all directions, and finally find an exit through the scrotum, along the body of the penis, upon the thighs, nates, or groins, or even upon the lower part of the abdomen. Sometimes the whole perinæum is riddled with holes through which the urine escapes, perhaps not one drop passing by the natural channel. In these cases the patient makes water sitting, the urine escaping as if through the sprinkler of a garden watering-pot. Civiale¹ reports a case of urinary fistula with fifty-two external openings.

The hard lumps outside the urethra, above alluded to, do not necessarily indicate that urine has escaped from the canal. An abscess may very rarely start outside the urethra near a stricture, just as pus may form near the anus, not primarily in connection with the gut. In the vast majority of these cases, however, the first lesion is upon the urethral mucous membrane, one of the dilated follicles behind the stricture being at fault. A drop of urine is retained in a follicle, decomposes, and causes it to necrose and slough; another drop of urine is then let in, more tissue is destroyed, and more inflammatory action set up in the neighboring tissue. This process goes slowly on, a drop of urine from time to time being let into the abscess through the mouth of the follicle, which is usually kept shut by the surrounding inflammatory swelling. The abscess now is not connected visibly with the urethra; it breaks externally, and it is only after a few days that the swelling decreases sufficiently to allow a little urine to get in at the fissure in the urethral wall, and to appear at the perineal opening. Much light has been thrown by Zeissl² upon the agency of this follicular necrosis in allowing extravasation of urine. Such abscesses forming around stricture may break internally and let in the urine in quantity, thus forming blind internal fistula, or they may break externally, or point by both routes.

Fistulæ are conservative efforts of Nature to establish an outlet for the urine, the natural course being dammed up. They will not close until after the stricture has been relieved. They narrow down after a

¹ *Op. cit.*, vol. i., p. 539

² "Zur Perforation der Urethra," *Allgem. Med. Wien. Zeitung*, 1861, ii.

while into little pipes surrounded by callous inflammatory material. Sometimes a deposit of the urinary salts takes place upon their walls, and they become incrustated with calcareous matter. Sometimes they get blocked up, especially if the internal orifice is larger than the external; then a little urine collects within them and a new abscess is formed which may burrow farther and find for itself a new outlet, establishing another fistula. More rarely a small abscess may form in the prostate, and, going through the stages just narrated, opening into the urethra and into the rectum, constitute what is known as prostatic fistula; or more rarely still some small ulceration in the floor of the bladder may give way into the rectum, making a vesico-rectal fistula.

If, instead of a drop of urine escaping from the urethra into an ulcerated follicle or fissure in an ulcer behind the stricture, the ulcerated portion has given way largely, perhaps by necrosis of a group of urethral follicles, we have the serious complication known as *infiltration of urine*. More or less of the altered fluid escapes in these cases outside of the canal, and burrows at once extensively. It is a property of decomposed ammoniacal urine to destroy the vitality of living tissue wherever it comes into contact with it, unprotected by epithelium. This property does not belong to limpid healthy urine. Menzel¹ demonstrated this fact experimentally. He first used acid urine, injecting it under the skin of a dog in quantities varying from a drachm to an ounce without any bad effect in several experiments. He dissected up the skin of a dog to the breadth of four inches, and injected eight ounces of healthy human urine in four different cases. The urine was all absorbed within four days in three of the cases, in the other healthy pus formed. He repeated these experiments in the ischio-rectal fossa without bad results in five cases. To test the opinion of Simon,² that the compression and distention of the tissues in urinous infiltration was the cause of gangrene, Menzel performed two experiments, injecting healthy urine into the tissues with such force as to raise a tumor of the size of the foetal head, and then prevented the escape of the fluid through the wound by means of suture. The quantity injected amounted to about half a pint, but in both cases it was absorbed without evil result within three days.

The next experiment consisted in cutting down upon the urethra of a dog and sewing up the wound so as to obtain infiltration. At each angle of the wound a fistula formed, but there was no poisoning or extensive death of tissue. He repeated the same experiment, tying the glans penis so as to cause all the urine to flow into the wound. An immense tumor formed, which only subsided when the glans penis became gangrenous and separated. The dog got well, with simply a fistula. In other similar cases he obtained the same result.

From these experiments Menzel concluded:

¹ *Wien. Medizin. Wochenschrift*, Nos. 81-85, 1869, and *N. Y. Med. Journal*, 1871.

² "Chirurgie der Nieren."

1. That normal urine does not possess septic qualities, and does not produce gangrene by its chemical properties.
2. That distention by infiltrated urine does not produce gangrene.
3. That gangrene, when it does occur (on infiltration of healthy urine), is caused by contusion or the accidental inoculation of septic matter.

Menzel next experimented with urine containing soda or potash. Urine so alkalinized proved innocuous; but urine rendered alkaline by ammoniacal fermentation he found to be exceedingly poisonous, and, when injected, to cause large abscesses and cutaneous gangrene. He also injected putrid urine directly into the blood, and obtained symptoms of blood-poisoning. He further adds the clinical experience of Prof. Billroth in nine cases of infiltration. In one, the urethra was perforated by a catheter; in three, there was a crushing injury to the perinæum; in another, laceration of the urethra by a splinter of bone from the pelvis; in the rest, rupture of the urethra behind a stricture. Death followed in four cases, in two of which there was stricture, and the urine probably ammoniacal.

These results, experimental and clinical, correspond with daily experience as well as with some (personal) experiments¹ undertaken upon the human subject—since the evidence derived from dogs and rabbits has been doubted—to substantiate the fact that healthy urine, injected into the connective tissue without contusion of that tissue, is as capable of absorption as the blandest fluid. This is true at least when a small amount is used (3j), a quantity certainly sufficient to establish that healthy urine, *per se*, is not destructive to human tissues. Muron,² an *interne* of Verneuil, stimulated seemingly by the results obtained by Menzel, performed a series of experiments by injecting urine under the skin of rabbits. His results corresponded closely to those reached by Menzel, only differing in one respect: for, while Menzel states that only urine in alkaline fermentation has destructive powers, Muron proved (upon rabbits) that urine strongly acid, dense, and full of salts, urates, etc., has the same powers to a less degree, attributable, he believes, to the density of the fluid injected, which by the law of osmosis attracts serum from the vessels instead of itself being absorbed into the latter; and again to the fact that urine, rich in urates, is apt to decompose quickly.³

¹ Dr. Partridge, one of the surgical staff of the Charity Hospital, injected, at my suggestion, under the skin of negroes and white patients, on many different occasions, thirty and sixty minims at a time, of healthy urine, limpid and taken indifferently from any source, the patient supposing that morphine was being injected. Absorption was perfect in every case. No abscess, no local death of tissue, followed any injection.

Dr. L. A. Stimson informs me that, in the winter of 1873, he saw Vulpian, in Paris, inject healthy human urine into the blood-vessels of dogs, in one case three and one-half ounces, without disagreeable result.—KEYES.

² "Pathogénie de l'Infiltration de l'Urine," Paris, 1872.

³ That Muron is incorrect in ascribing necessarily destructive properties to dense acid urine, rich in urates, I think must be granted. I obtained a specimen of urine from a child with acute inflammatory rheumatism. It was strongly acid, sp. gr. 1040, and de-

Hence it may be affirmed that healthy urine does not, *per se*, kill tissue, unless that tissue be contused and inflamed (absorption thus prevented and urine allowed to decompose *in situ*), and that, with infiltration relieved by free incision, the prognosis is vastly better if the bladder were previously healthy. After urethrotomy, and operations for stone, how rare is infiltration, when the urine is comparatively healthy and has a chance to escape, although it passes over a raw surface on its way out! The practical deduction from the above is, to let out urine as soon as it has extravasated, and the chances are that serious gangrene may be averted unless the urine was strongly ammoniacal and decomposed before its escape, which is, unhappily, too often the case.

In infiltration the urine may take any one of five directions:

1. It may when small in quantity get out of the urethra, but not penetrate Buck's fascia (p. 3), in which case it may long remain confined to one spot in the perinæum as a hard, rounded swelling—like the blind internal fistula already described.
2. It may find its way rapidly through the meshes of the corpus spongiosum and cause gangrene of that body, with sloughing of the glans penis, preceded by coldness and the appearance of a black spot upon the glans.
3. It may burrow inside of Buck's fascia, but outside of the corpus spongiosum, forming a fistula opening behind the glans penis or on the back of the penis near its root, a hard ridge marking the course of the fistula within Buck's fascia.
4. It may escape behind the triangular ligament into the cavity of the pelvis.
5. It may escape outside of the common fascia of the penis, in front of the triangular ligament; in which case it rapidly distends the perinæum, the scrotum, and the connective subcutaneous tissue of the penis, and mounts up over the abdomen, and may also, more rarely, perforate the deeper layer of the superficial perineal fascia, and descend upon the thighs.

When extensive infiltration of this sort occurs, all the parts affected become cedematous; gases form in the connective tissue, causing emphysema, and making the tissues crackle when pressed by the finger. Dark spots soon appear, indicating gangrene, and extensive portions of tissue may slough away unless relief be promptly afforded.

The constitutional symptoms are those of shock. A chill usually posited, on cooling, a dense precipitate of pink urates which equaled one-fourth of the volume of the liquid. A portion of this was taken a few hours after being passed, warmed until the urates dissolved, and injected by Dr. Partridge, of the Charity Hospital, into the subcutaneous tissue of the arm, in three patients, half a drachm being used in each case; absorption was immediate and perfect. Twenty-four hours afterward three other patients were similarly injected from the same specimen, with the same dose (3 ss each)—only the urine was injected cold with the urates in precipitation. The bottle was shaken and the fluid resembled pea-soup. A little tenderness on pressure for a few hours marked the spot of the injection, but absorption was prompt and complete in each case, without any suppuration.—KEYES.

occurs, followed by great depression; a cold, clammy skin; feeble, quick, irregular pulse; hurried respiration; furred tongue; complete anorexia; symptoms of septicæmia, and death.

When the urine escapes behind the triangular ligament, which it does more rarely, it infiltrates deeply around the prostate and rectum well back in the perinæum, around the bladder and up behind the pubes, forming abscess in the cellular tissue of the hypogastrium, or perhaps deep pelvic abscesses.

Rupture of Bladder.—Another very rare complication of stricture analogous to infiltration is rupture of the bladder. This occurs in the same manner as the escape of urine from the urethra behind a stricture. A comparatively healthy bladder will not rupture from retention (unless, of course, mechanical violence is added—as a fall). It will become immensely distended, and then be relieved by drops (overflow) through the urethra, the latter never being totally impervious to fluid, if time is allowed for inflammation and spasm to subside, and enough continued pressure is brought to bear upon it from within. In those rare cases, however, where a sacculus has become thinned, or an ulceration exists, the bladder may give way under the pressure of distention from retention, and the urine escapes into the peritoneal cavity. The vesical tumor subsides. A fatal collapse usually soon closes the scene.¹ The urine may escape into the sub-peritoneal tissue, giving symptoms like those of infiltration behind the triangular ligament. The rarity of rupture of the bladder in connection with stricture is shown by the few cases reported. Thompson says he never saw it, and quotes Sir Everard Home as having observed only two cases. Pitha refers to a case.² The kidney or ureter might be ruptured in the same way through an ulcerated spot, as they are subjected to a tension as great as that felt by the bladder.

The prostatic Urethra is necessarily hyperæmic, if not inflamed behind a tight stricture, but, besides this, the substance of the prostate may undergo interstitial inflammation (abscess). The inflammation may extend down the ejaculatory ducts, seize upon the seminal vesicles, or, usually passing farther, involve the epididymis.

Epididymitis is a very common complication of stricture. It may affect one or both sides, is usually very mild in character, and leaves behind a good deal of knotty induration, which is slow in disappearing, and may block up the canal and entail subsequent sterility. A certain amount of hypertrophy, with induration of the penis, and some œdema of the prepuce, is an occasional complication of stricture. Civiale³ accounts for these symptoms by the straining in urination, which prevents the return of venous blood, and keeps the penis congested. It is sometimes due to lymphitis.

¹ For treatment, see Rupture of Bladder.

² Quoted from *Mém. de la Soc. Chir.*, iii., 3, 1853.

³ *Op. cit.*, p. 141.

CONSTITUTIONAL DISTURBANCE.—The constitutional disturbance in stricture is very variable. Just as one patient may have cystitis from an amount of contraction not capable of sensibly diminishing the size of his stream, while another with a stricture only pervious to a filiform bougie, used with care, may pass limpid urine not more than three or four times daily, so also does the constitutional sympathy vary. As a rule, the latter depends upon the complications of stricture; and a patient with very tight stricture, uncomplicated, may enjoy robust health. When, however, the urethra behind a stricture begins to inflame, and the bladder to show symptoms of congestion of the neck, and cystitis; when paroxysms of urethral fever become frequent; when epididymitis and abscess come on, then the whole organism shows signs of distress. The appetite and strength fail, the skin becomes dry, pale, and harsh, the mouth coated and shiny, and the patient runs down to a shadow, a living picture of misery, while his main business in life is to pass water.

CAUSES OF DEATH IN STRICTURE CASES.—Stricture is not often fatal, except in neglected cases, such as are sometimes encountered in hospitals. Death occurs in various ways. Not to mention the rare cases of sudden death following the simple introduction of an instrument, and only alluding to rupture of the bladder, and death following surgical operations for the relief of stricture, the causes of fatal termination in cases of stricture are three:

1. Extravasation of urine, which, if extensive, kills at once by shock, or, later, by exhaustion; and blood-poisoning with suppuration, abscess, gangrene, pyæmia.

2. Uræmia, from implication of the kidneys, by the extension of inflammation up the ureters.

3. Cachexia and exhaustion, attended by pain, loss of rest, and inability to eat, due to the torment of constant unrelieved desire to urinate, and the agony and labor of the act. No more pitiable sight can be imagined than that of a man with peri-cystitis, trying to pass water every five minutes through an old tight stricture. Standing up, with his body bent forward, his head leaning against the wall, or on his knees, and half doubled up, his hands clutching at any thing within reach, he writhes and groans in agony, the sweat starting from his face, his whole body quivering and convulsed with pain. After a minute of this torture, he finds he has passed, perhaps, a teaspoonful of bloody, purulent, putrid urine, perhaps nothing at all, and he sinks exhausted upon his bed, only to renew the effort after five or ten minutes. No man can long endure torture of this sort. If the surgeon does not soon bring him relief, death will be more kind.

RECAPITULATION OF SYMPTOMS 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 of pus-corpuscles in the urine, pain, neuralgia of the urethra,

retention of urine, overflow, dribbling, imperfect erection, irritability of the bladder, hæmaturia, impotence—from urethral obstruction to escape of semen. The *remoter results of stricture* are cystitis, with various inflammatory, functional, and structural changes in the bladder, ureters, kidneys, rectum, often terminating fatally; stone in the bladder, infiltration, perineal abscess, fistula, rupture of bladder, epididymitis, and sterility—from obliteration of the canal of the epididymis.

A word must be said here concerning the effect of the sexual element in aggravating the symptoms of stricture. This is especially true concerning all 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 spermatorrhœa, is a very 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 intellectual excess.

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

CHAPTER VIII.

TREATMENT OF STRICTURE OF THE URETHRA,

With Details for all Complications, and a Recapitulation.

THE treatment of stricture of the urethra, and of its results, may be considered under three heads:

1. Treatment of Uncomplicated Stricture—

- (a.) Of Large Calibre.
- (b.) Of Small Calibre.
- (c.) Of the Meatus.
- (d.) Traumatic.
- (e.) Resilient—often irritable.

2. Treatment of Stricture complicated by—

- (a.) False Passage.
- (b.) Retention.
- (c.) Retention—the Stricture being impassable.

- (d.) Infiltration.
- (e.) Abscess.
- (f.) Fistula.
- (g.) Peri-cystitis.
- (h.) Enlarged Prostate.

3. Treatment of Fistula with Loss of Substance.

1. TREATMENT OF UNCOMPLICATED STRICTURE.

(a.) *Of Large Calibre.*—The majority of strictures which the surgeon is called upon to treat are of large calibre. The symptom of which the patient complains is persistent gleet, following gonorrhœa, or bastard gonorrhœa, with, possibly, some frequency in urination. These cases are of daily occurrence and often pass unrecognized, the gleet being treated, the stricture overlooked. Too much stress cannot be laid upon the importance of exploring the urethra, in such cases of gleet, with the bulbous bougie. One, two, or more strictures are found, the smallest, which is probably the deepest, allowing passage, perhaps, to a No. 9 bulb.

Treatment here is most simple. After the diagnosis has been made, no further instrumentation is advisable (if the patient can spare the time), until the effect of exploration has been observed. The chances of urethral chill, after first examinations, must be remembered. The patient's general condition and habits must be studied, and his urine tested for acidity, or possible kidney-disease. He must be instructed in urethral hygiene, and the nature of his malady explained to him, and he should be informed at the outset, to forestall future disappointment, that, after his symptoms have been removed by treatment, the permanence of his cure will almost certainly depend upon his own regular and intelligent use of an instrument upon himself at proper intervals, with the view of preventing tendency to recontraction of his stricture.

Being instructed not to mind the smarting at his next urination, and given such alkali, balsam, or injection, as the acidity of his urine and amount of discharge seem to call for, the patient is dismissed, to return in two days, to have his treatment commenced. The only treatment which gives satisfaction in the majority of these cases is dilatation with the conical steel sound. One of these instruments properly warmed is introduced in the manner already detailed (p. 32). Its size should correspond to that of the bulbous bougie, which has passed the stricture, and the utmost delicacy, care, and gentleness, should be used in its introduction. The wedge and lever should not be forgotten, nor should we abuse power because we possess it. At the strictured and tender points a spasmodic contraction may occur, arresting the instrument. To overcome this, patience is better than force. As soon as the instrument has entered the bladder it should be at once gently withdrawn. Nothing is gained by leaving it even for a moment. During withdrawal the