White. (J. W.) (3)

A CASE OF RUPTURE OF THE URETHRA,

WITH SOME REMARKS UPON THE SYMPTOMS AND TREATMENT OF THAT INJURY.

By J. WILLIAM WHITE, M. D.,

Clinical Professor of Genito-Urinary Surgery in the Hospital of the University of Pennsylvania; Surgeon to the Philadelphia and German Hospitals, etc.

presented by the author.

Reprinted from the Boston Medical and Surgical Journal of November 1, 1888.

BOSTON:
CUPPLES AND HURD, MEDICAL PUBLISHERS.
1888.

TWO CASES OF RUPTURE OF THE URETHRA, WITH SOME REMARKS UPON THE SYMPTOMS AND TREATMENT OF THAT INJURY.

J. WILLIAM WHITE, M. D.,

Clinical Professor of Genito-Urinary Surgery in the Hospital of the University of Pennsylvania; Surgeon to the Philadelphia and German Hospitals, etc.

RUPTURES of the pendulous portions of the urethra are rare, are not apt to be extensive, nor, although troublesome in regard to treatment and cure, are they usually dangerous. In the cases which I have seen the rupture has occurred during sexual intercourse, and has been accompanied by immediate pain and swelling followed by ecchymotic discoloration of the entire pendulous portion of the penis and by more or less severe hæmorrhage from the meatus. They have all done well under the use of evaporating lotions and rest followed by gentle catheterization after the blood has disappeared and the swelling subsided. Ruptures affecting the deeper portions of the urethra are, however, much more serious. Excluding those which result from instrumental violence, that is, false passages, which I do not propose to consider in this article, they are caused almost invariably by some form of traumatism applied to the urethra, most of the examples which have come under my own notice having been the result of falls astride

of hard or resistant bodies. The mechanism of rupture of the urethra has been variously explained. Franc, Velpeau, and Poncet have attributed the urethral laceration to the crushing of the membranous portion of the urethra between the offending body and the lower border of the pubic arch. If the accident occurred with the patient in a leaning position, the body directed forward, they believed that the posterior part of the spongy urethra could be crushed against the pubis; and think that when the force which produces the injury acts in the lateral direction the urethra is more probably pressed against the upper portion of the descending pubic ramus. Ollier refers lacerations of the membranous urethra to the pressure of the canal against the sharp edges of the sub-pubic ligament, which in his experiments seemed to have divided the upper wall of the urethra. Terrillon believes that when the body which is fallen upon is narrow the urethra is crushed against the ramus of the pubes, and thinks the injury is likely to be found about the region of the bulb; and when the fall is upon a broader substance the urethra is crushed against the anterior surface or inferior edge of the pubes and the lesion is found more anteriorly. Guyon says that in this accident, whether the cause is a fall or a blow, the mechanism is the same: the urethra and the soft parts which immediately surround it are pressed and crushed against the resisting pubic symphysis, whilst the superficial tissues, more supple and more elastic, escape or are scarcely involved. He believes, as does Terrillon, that such ruptures are frequently only partial, and that they are commonly situated in the spongy part of the urethra, an inch

or less in front of the anterior layer of the triangular ligament, and in this opinion he is supported by Iversen, who has recently analyzed twenty-nine cases of this accident. Duplay thinks that in a certain proportion of cases the urethra is ruptured by a temporary dislocation of the symphysis pubis, the soft bones springing back into their proper relation after the crushing force is removed and leaving no trace of the accident except the urethral lesion. He thinks that this ("rupture by traction") may also occur in case of fracture of the pelvis with a displacement of a portion of the pubic arch; and it is of course evident that the urethral wall could be wounded directly by a fragment of bone after such a fracture.

In attempting to diagnose a rupture of the urethra we must depend chiefly upon: 1, the history of the accident; 2, the phenomena connected with urination, which is usually difficult or impossible; 3, the appearance of blood either at the meatus or beneath the skin or in both situations; 4, the development of a swelling due to extravasated urine.

As in the majority of cases all these symptoms are present, the diagnosis in general terms of a rupture of the urethra can hardly be said to be difficult, but in exceptional cases, where one or more are absent, it may be a matter of great uncertainty. So, too, the recognition of the precise seat of the rupture may be comparatively easy if the case is a simple and an uncomplicated one, or, under some circumstances, may be almost impossible. The following case will serve to illustrate this point: —

A laboring man, aged twenty-five years, was admitted to the University Hospital on the morn-

ing of May 9th, 1888, with the following history. The previous day he had placed his foot accidentally upon one edge of an iron girder covering a man-hole in the deck of a vessel, tilting it into an upright position and alighting astride of it. The accident occurred about seven A. M. About two P. M. he endeavored to urinate for the first time, and found that it was impossible to do so. Before making the attempt he noticed and wiped away a small quantity of clotted blood from the neighborhood of the meatus. He repeated the effort at short intervals during the afternoon, suffering increasing pain and distress, and toward evening noticed swelling of the scrotum, which rapidly increased. He applied to a physician for relief, who gave him some powders, but made no attempt at instrumental interference. He suffered greatly during the night, and early the following morning came to the hospital. At this time the scrotum was swollen, tense, ecchymotic, and œdematous, the upper portion of the right thigh was similarly affected, and the left thigh to a very slight extent; there were perineal swelling and discoloration. He had absolute retention of urine, and was at this time unable to pass a drop. Catheterism was performed with some little difficulty by the resident physician, who withdrew thirty-six ounces of clear urine and left a soft catheter in the bladder, and by my directions made free incisions in the scrotal tissue to relieve tension. About three hours later, as there was evidence of continued extravasation of urine, I proceeded to operate. First having him etherized and placed in the lithotomy position, I made a free incision in the median line of the perineum and sought for the laceration in the

neighborhood of the bulb, where, on account of the swelling in the scrotum, I expected to find it. The successive planes of tissue were laid open, the accelerator urinæ muscles separated, and the urethra exposed for the distance of an inch or two. Failing in this way to recognize the site of the lesion, I placed my finger posterior to the bulb and had the anterior part of the urethra injected with warm water. The urethra in front of my finger become tense and distended with the liquid, showing that there was no outlet in the canal anterior to the triangular ligament, and I therefore conducted my search further backward. After considerable difficulty I found, situated in the left lateral aspect of the membranous urethra, and therefore between the two layers of the triangular ligament, a small rent through which with my finger nail I could touch the edge of a metallic sound which had been passed into the bladder. On still further examining the parts I found a laceration of the anterior portion of the triangular ligament itself, situated to the right of the median line, through which the probe passed in the direction of the urethral laceration. To the left of the latter, and extending up towards the apex of the prostate, was a cavity which would receive the tip of the little finger, and which contained a moderate quantity of blood clot. I cleaned this out, irrigated the whole wound, placed a rubber drainage tube with its upper end in the cavity at the side of the laceration, passed a soft catheter into the bladder, and tied it into position with tapes, dressed the wound with iodoform, and filled it loosely with sublimate cotton. A T-bandage was then applied, and, as the patient had considerable shock, he was given a hypodermic of

whiskey and digitalis, was covered with hot blankets, and a hot poultice was applied to the whole abdomen. He soon reacted and recovered rapidly and uninterruptedly.

In this case there could be from the beginning no question as to the character of the accident. The appearance of blood at the meatus, the retention of urine, the ecchymosis and extravasation, when taken in connection with the severe traumatism, clearly pointed to a urethral laceration, but the exact seat and character and extent of that laceration were not so readily determined. It was perhaps safe to assume, on the one hand, that it was not of the character described by Duplay as "interstitial rupture," in which the spongy tissue alone is involved while the mucous membrane and exterior fibrous envelope escape injury, nor of the variety in which the mucous membrane and sub-mucous tissue only are lacerated. While these injuries would account for the retention of urine, they would fail to explain the extravasation which occurred within ten or twelve hours of the accident, or the seat and extent of the ecchymosis. On the other hand, the fact that catheterization was possible with no very marked difficulty, would seem to show that the case was not one of complete rupture of the urethra, with the separation of the torn ends which usually occurs in that accident. The interval which elapsed between the injury and the signs of extravasation was also greater than is usual after cases of complete rupture. For these reasons it seemed probable that I had to do with a case of laceration of a portion of the urethral wall of not very great extent. The interesting question as to the seat of the laceration still remained.

The anatomical peculiarities of the part explain the usual course of urinary extravasation. The urethra may, for example, be divided into four regions. In all that part from the meatus to the scrotal curve, extravasation is accompanied by a swelling and discoloration of the penis, greatest in the immediate neighborhood of the injury.

In the region included between the attachment of the scrotum and the anterior part of the bulb, the course of extravasated blood or urine is governed by the attachments of the deep layer of the superficial fascia, or fascia of Colles. This is attached to the sides of the pubic and ischiatic rami, and behind, after dipping over the edge of the transverse perineal muscles, it is attached to the base of the triangular ligament, becoming continuous at the posterior edge of that ligament with the pelvic fascia, where it blends with the posterior layer of the triangular ligament. This fascia of Colles is continuous with the dartos tissue of the scrotum, and extends upwards to the abdomen, being attached in the middle line to the symphysis and on the outer side to the fascia lata, just beyond Poupart's ligament, leaving a space between the symphysis and the spine of the pubes, to which it is not firmly fixed; it then becomes continuous with the deep layer of the superficial fascia of the abdomen. Extravasation of urine occurring through laceration in the bulbous region of the urethra will first follow the space inclosed by this fascia in front and below, and by the anterior layer of the triangular ligament posteriorly, and, as it cannot reach the ischio-rectal space on account of the attachment of the fascia to the base of the ligament, and cannot reach the thighs on account of the in-

sertion of the fascia into the ischio-pubic line, it is directed into the scrotal tissues, and thence up between the pubic spine and symphysis until it reaches the abdomen. I have seen cases in which, from neglect to provide an outlet for such effusions, not only the entire scrotum, but the whole of the soft parts of the lower portion of the hypogastrium had sloughed away; and such cases have frequently been recorded.

If the injury affect the membranous urethra alone, the surrounding structures not being involved in the laceration, the extravasated urine would be confined to the region included between the layers of the triangular ligament, and would only gain access to other parts after suppuration and sloughing had given it an outlet. The consecutive symptoms would then depend upon the portion of the aponeurotic wall which first gave way.

If the injury is situated behind the posterior layer of the triangular ligament, *i. e.*, in the prostatic urethra, the urine may either follow the course of the rectum, making its appearance in the anal perineum, or, as it is only separated from the pelvis by the thin pelvic fascia, it may make its way through the latter near the pubo-prostatic ligament, where it is especially weak, and may spread rapidly through the subperitoneal connective tissue. According to Iversen, the external swelling is usually absent, and the above occurrences are to be suspected from the severity of the symptoms. In the case just described, it is evident that the conditions which were found were attributable to no single one of these four typical forms of laceration, as we had perineal swelling, extravasation upon the thigh, and scrotal and abdominal extra-

vasation coexisting. After the dissection the explanation became evident. The rent was a small one, and no large amount of blood was effused to cause immediate pain or uneasiness; no marked symptoms were produced at all, until, during the first attempt at urination, a portion of the urine escaped into the cellular tissue to the left of and beneath the membranous urethra. As repeated attempts were made, this found for itself a way into the perineum, passing laterally below the attachments of the fascia of Colles and through the rent in the triangular ligament, a portion reaching the right thigh, and a still smaller quantity the left thigh, the greater portion distending the scrotum and mounting upwards to the abdomen. The fact that the tear in the triangular ligament and the perineal fascia was on the right side, explains the greater degree of extravasation in the upper portion of the thigh of that side.

The important question of treatment in these cases may be simplified by adopting a classification similar to that employed by Guyon and Duplay, which is based upon symptoms rather than upon the anatomical seat of the injury. All cases may be divided into three classes, mild, moderate, and grave.

In mild cases, *i. e.*, in those where after such an injury there is an appearance of blood at the meatus, with difficult urination or with retention, but with no evidence of extravasation, and no general alarming symptoms, and in which catheterization is easy, the surgeon may be content with regular evacuation of the bladder, by means of a soft instrument, well greased with carbolized oil, and with prescribing absolute rest, the patient

being carefully watched for the onset of fever, or the appearance of local swelling.

In cases of a more severe type, in which, in addition to urethrorrhagia and retention of urine, there are evidences of extravasation, and in which catheterism, though difficult, is possible, it is wisest to leave a full-sized catheter in the bladder, and at the same time freely to lay open the perineum and scrotal tissues, or any which have been involved in the extravasation.

In cases of greater gravity, in which catheterism is impossible, careful perineal section should at once be made, the rent in the urethra sought for, and a catheter passed through it into the bladder. This is sometimes one of the most difficult procedures in operative surgery, particularly if it has been delayed until inflammatory changes, or local gangrene, have altered the appearance and relations of the parts involved. If persevering and careful search fails to reveal the proximal end of the torn urethra, I believe that supra-pubic cystotomy, for the purpose of retrograde catheterization, is justifiable, the anterior urethra being almost always discoverable. Except as to the latter point, surgeons, as a rule, are agreed upon the above-described methods of treatment, and a number of them, including Iversen, endorse the propriety of the supra-pubic operation in such cases. The case above described belongs to the second class, or those of moderate gravity, and I know of no point in the treatment which would be considered open to reasonable discussion. It may be said that as the introduction of the catheter was effected with comparative ease, it would have been better to empty the bladder at periodical intervals, rather

than run the risk of continued extravasation by the side of the instrument left *in situ*. Birkett and others have shown, however, and the experience is one familiar to every practical surgeon, that while catheterism at a given time after any injury to the urethra, whether accidental or operative, may be easy, the lapse of a few hours may render it difficult or impossible. This would at once transfer the case to the third class, and would greatly reduce the patient's chance of recovery.

In cases of complete rupture, after the introduction of the catheter, I should certainly be inclined to follow the course recommended by Erasme, who details the following indications as undoubtedly existing in such cases: 1st, to open a large passage for the accumulating fluids; 2nd, to keep up a free flow of urine; 3rd, to encourage rapid union of the two ends of the urethra and the walls of the cavity formed by the extravasation into the perineum; 4th, to prevent the formation of a cicatricial stricture of the urethra. Supra-pubic aspiration (Lefort, Molliere) is palliative, and meets none of the indications. External urethrotomy (Guyon and others) does not provide for prompt union of the canal, and does not prevent consecutive contraction. Antiseptic measures carried out by allowing an elastic catheter to remain in the perineal wound, which is tamponed, or by suturing its borders produce more rapid union, but are likewise followed by urethral coarctation. The stitching of the proximal end of the urethra into the wound, and catheterizing only after healthy granulations have formed, while reducing risks to the life of the patient, is followed by the same results.

Erasme, believing that immediate union of the

two ends of the torn urethra is the result to be aimed at, and basing his opinion partly upon the results obtained by Kaufmann, of Zurich, in experiments on dogs, which were very successful, has reported a case of his own in which, after a fall upon a cask, a man aged thirty-eight years had a rupture of the perineal urethra. The two ends, when discovered by dissection, were separated from a third to half an inch. A large English catheter was introduced, and the two ends of the urethra brought well together with cat-gut stitches inserted so as not to include the mucous membrane. The transverse perineal muscles and the others which were divided were then brought together by sutures, as well as the more superficial tissues. The patient had no fever; almost no urine passed by the wound (not a drop after five days); in about seventeen days the wound was entirely healed; in three weeks a sound went easily into the bladder, no obstruction being felt, and the patient was discharged, to report for future examination. He prefers this method of suturing to that recommended by Kaufmann, who placed his stitches first in the mucous membrane, tying them in the interior of the canal. This case, with others of a similar nature which have recently been recorded, tends to show that suturing of the divided ends of the canal is the proper operative procedure in complete rupture of the urethra. Early operations through tissues not yet inflamed or infected are certainly far preferable to those performed later, as shown by the following statistics of mortality: early perineal incisions, 8.79 per cent.; hypogastric aspiration, 19.04 per cent.; late perineal incision, 20 per cent. It is to be expected that early suturing will show still more favorable results.

On the evening of the same day, May 9th, a case was admitted to the German Hospital, where I was also on duty, with the following history: The patient, a man aged forty years, was caught between the bumpers of two freight cars, which squeezed him severely, pressing upon the outer surfaces of the crests of the ilia, the soft parts below them, and the great trochanters; these regions on both sides being considerably bruised and abraded. He immediately had great pain, which he referred to the body of the pubes on the right side and behind it. After his admission to the hospital distinct crepitus was found. When brought in he was in a condition of severe shock, had a swollen, tense, and tender abdomen, and was unable to void his urine. An English catheter was introduced with much difficulty, and an ounce and a half of bloody urine was withdrawn. I directed that the man be allowed to remain without catheterism for three hours, during which time hot poultices were to be applied to the abdomen and the general treatment of shock instituted. At the end of that period catheterism showed that urine to the extent of four ounces had accumulated in the bladder and was slightly less bloody. His general condition had somewhat improved. As each introduction of the catheter had been followed by increased bleeding, the blood appearing at the meatus, I had a catheter left in the bladder continuously. There was no perineal or scrotal swelling.

The question of diagnosis at this time lay between a rupture of the bladder and a laceration of some portion of the urethra. I discarded the former hypothesis on account of the amount of urine which

the bladder would retain, the disappearance of the blood from it after the catheter was tied in, the absence of progressive shock or peritonitis or pelvic cellulitis, and the appearance of blood at the meatus. I believed the case to be one of laceration of the urethra, resulting either from direct injury by a fragment of broken bone, or from the stretching and tearing of the urethra on account of the displacement of the pubis at the time of the injury, the fragment dragging upon the sub-pubic and triangular ligaments and by these means tearing the urethral wall. This diagnosis was apparently confirmed by the slow appearance of a discoloration which first affected the scrotum, then the lower portion of the abdomen above the pubis, and finally the upper part of the thighs, stopping a little below Poupart's ligament and evidently outlined by the attachment of Colles' fascia. This would on anatomical grounds indicate that the site of the injury was somewhere in the bulbous portion of the urethra. This view was sustained by the appearance of blood at the end of the penis. I believed the ecchymosis to be referable to the urethral lesion rather than to the fracture, on account of its course. If it had been the usual effusion of blood due to fracture, it would probably have appeared first in the neighborhood of the broken bone and would not have begun in the scrotum and gradually ascended. The case was of course complicated by the fracture, and so far as the urethral lesion was concerned may be said to belong to class first, or the mild cases in which catheterism and rest, or at the most the continued retention of the catheter, meet all the immediate indications. The patient's temporary escape from extravasation was probably due to the fact that, on

account of his graver injury, he had made no effort to urinate until his admission to the hospital, when it was discovered that he was unable to empty his bladder and catheterization was immediately resorted to. The ecchymosis showed that the rupture, although largely interstitial or submucous, was at the same time complete, blood escaping into the urethra and also around it.

This patient steadily improved for a time; all blood disappeared from his urine; he retained several ounces of urine; his belly became flat and soft, and his pulse and temperature normal. Deceived by these occurrences, and fearing cystitis from catheterism, I ordered the latter stopped. In forty-eight hours he became worse, and in a day or two more showed increased swelling with crepitation at the groin. An opening was made above the broken pubes into the pelvic cavity and a large quantity of pus and urine was evacuated. It was evident then that there had been a small wound or tear in the bladder, the edges of which had adhered and were undergoing repair so long as the bladder was kept empty by catheterism; but which separated and permitted extravasation to occur when the urine was allowed to accumulate. The patient's general condition contra-indicated further operation, and he died in a few days in spite of careful and thorough drainage and frequent antiseptic irrigation. An autopsy revealed a small rent in the bladder and another in the bulbous part of the urethra. An immediate laparotomy, performed within a few hours of the accident, would possibly have saved this patient; but on reviewing the symptoms I cannot think that they justified this procedure. The peculiar course of the case undoubtedly arose from the

circumstances that the rent in the bladder was a very small one; that its edges lay in such close apposition; and that there was also a partial rupture of the bulbous urethra,—a group of conditions whose coexistence must be rare. The results of laparotomy for intraperitoneal rupture of the bladder, as shown in the cases of MacCormac, Holmes, Halstrom, Grant, Blum, and others, is in the highest degree encouraging,—seven out of sixteen cases having recovered; while in eight of the nine fatal cases the average time between the operation and the injury was twenty-eight hours, and in the ninth case the vesical sutures were faulty. In Blum's case recovery ensued though the operation did not take place until forty hours after the rupture. The *Medical News* has recently made the editorial suggestion that, in view of the frequent uncertainty when the quantity and character of the urine are depended upon as the chief diagnostic signs, it would be well to add to our present tests for the occurrence of vesical ruptures the gentle introduction of hydrogen gas into the viscus, noting whether it distended merely the bladder itself, went into the surrounding tissues producing emphysema (extra-peritoneal rupture) or distended the general peritoneal cavity (intra-peritoneal rupture). The test seems to me a practical one, and in the above case might have established the diagnosis in time to permit of successful operation.

1810 South Rittenhouse Square, Philadelphia.