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OBSERVATIONS ON GUN-SHOT WOUNDS OF THE URETHRA

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The relative rarity of injuries to the genito-urinary tract noted in a general military hospital has already been commented upon by numerous observers. Wounds of the bladder are usually associated with injuries to other viscera and a large proportion of these cases do not survive long enough to reach an evacuation or base hospital. Wounds of the urethra, too, are invariably associated with injuries to adjacent structures and the immediate mortality depends largely on the extent of these complicating wounds. Following an injury to the urethra there is usually obstruction to urination and often a rapid extravasation of urine. On this account these cases urgently require immediate attention but, unfortunately, conditions on the field are such that it is rare for the wounded man to receive surgical intervention within six hours from the time of the infliction of his wound. The poor prognosis which most writers have noted in this type of case is dependent on this unavoidable delay, during which time the surrounding tissues, devitalized by the trauma of the projectile and the increasing extravasation of urine, form a most favorable medium for the growth of microörganisms carried into the wound by the projectile. Stevens was impressed by the small number of cases of genito-urinary wounds seen in base hospitals and by their high mortality. French statistics show a mortality of 56 per cent for non-complicated bladder wounds and of fifteen cases in which both the bladder and intestines were injured, only one patient survived. Stevens observed four patients with perineal wounds, only one of whom recovered.

Certain cases which were observed in a base hospital in France and which illustrate the principle which should be followed in their treatment will be reported. The first case is particularly interesting in that it brings out the numerous complications which may follow a gun-shot injury of the genito-urinary tract and emphasizes the importance of the after care of these difficult cases.

Case 1. P. H. G., private, 23d Infantry, was wounded on June 14, at 2.00 p.m., by a shell fragment which entered the posterior aspect of the right thigh, passed just posterior to the femur, the exit wound being on the inner aspect of the thigh close to the perineum. The projectile then entered the perineum, severed the urethra close to the bulb, divided the left spermatic cord, and tore its way out through the abdominal wall in the left inguinal region without entering the peritoneal cavity. The patient arrived at a mobile hospital at 10.00 p.m., where antitetanic serum was administered and immediate operation performed. The operation consisted of debridement of the thigh wound, left castration and suprapubic cystostomy. The patient's field card contained the following brief notes made at the mobile hospital:

June 18. Thigh wound dirty and discharging large amount of foul pus.

June 19. Suprapubic incision infected. Dorsal surface of penis swollen with definite crepitation—culture showed gas bacilli, Suprapubic incision opened, necrotic tissue excised; four incisions made on the dorsal surface of the penis and Dakin's tubes placed in all wounds, a large tube left in bladder. Thigh wound discharging fecal material (this fact was not corroborated at the later examination of the patient after evacuation. The copious foul discharge of an extensive, badly infected wound especially in this region may well lead one to suspect an injury of the bowel).

Patient evacuated June 22.

On arrival at Base Hospital 18 on June 23, the patient's general condition was poor. Examination revealed a large sloughing wound of the hypogastric region measuring about 3 by 4 inches. The slough involved the fascia and recti muscles. A large tube was in the bladder and the wound was bathed in very foul urine. The debrided thigh wound was discharging large amounts of foul pus. An incision in the left groin and upper portion of the scrotum had broken down, and four incisions on the dorsal surface of the penis were also obviously infected, but no

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crepitation could be demonstrated in the surrounding tissues. All wounds were treated with continuous Dakin's solution and frequent dressings done. The wounds became slowly cleaner and the general condition of the patient somewhat more favorable until June 28, fourteen days after the patient was wounded. On this date clonic spasms associated with severe pain in the region of the thigh wound were noted. On the following day the spasms were more severe, a slight trismus was present, and the reflexes were hyperactive. A diagnosis of tetanus was made, and 20,000 units of antitetanic serum was administered. The general condition was worse the next day and a lumbar puncture withdrew fluid under tension. During the next few days the general condition remained unchanged, and morphia, sodium bromide and chloral hydrate were used to combat the spasms and opisthotonos, which had now appeared. The patient received 10,000 units of antitetanic serum subcutaneously each day. On July 3 a second lumbar puncture was done and 20,000 of antitetanic serum given intraspinally.

Steady improvement in the general condition now began. On July 6, the patient had so improved that an external urethrotomy was done under ether anaesthesia. From this date the wounds became rapidly cleaner and the patient stronger, and, although definite trismus was still present, together with occasional spasms, the antitetanic serum was no longer given. The suprapubic tube was now removed and the good effect of the dependent drainage afforded by the external urethrotomy was soon demonstrated in the condition of all the wounds. Several large sloughs separated from the suprapubic wound and the thigh wound filled in rapidly. Two large bedsores, which had developed during the course of the tetanic infection, also began to share in the general improvement. On August 1 a slight stiffness of the jaw persisted, but the spasms had not been noted for some days. This trismus, the last sign of tetanus, disappeared in the next few days. During this time, the urethra, anterior to the point at which it had been severed, was kept patent by means of a permanent catheter and by the frequent passage of sounds. On August 16, the patient was voiding through the perineal fistula with perfect control. The anterior urethra was patent from the meatus to the perineum in close proximity to the urethrotomy wound. The suprapubic wound had healed firmly and the thigh wounds and bedsores were closed except for healthy granulating areas. It was hoped at a later operation to restore the continuity of the urethra by a plastic operation. However, owing to the fact that the hospital was at this time functioning as an evacuation hospital, it was necessary to evacuate the patient on account of the exigencies of the service.

The patient was again seen in June, 1919. His general condition was excellent, all wounds were healed and he had perfect control of the urine, which passed entirely by the perineal fistula. The urethra anterior to the fistula had been allowed to close and was entirely obliterated. The patient is to return at a later date for a plastic reconstruction of the canal.

Better drainage could have been obtained in this case, and it is probable that some of the sloughing of the abdominal wall would have been avoided had an external urethrotomy been done at the same time as the cystostomy. The latter operation alone will not entirely prevent some urine from extravasating into the injured tissues about the urethra, and this factor was undoubtedly responsible for part, at least, of the very foul infection of the patient's thigh wound. The complication of tetanus, in spite of the prompt administration of antitetanic serum at the field hospital, illustrates the wisdom of the orders of the Chief Surgeon, A. E. F., that a second prophylactic injection should be given in all seriously wounded men, within two weeks after the first injection. Finally the fact that the patient ever recovered in spite of so many and such grave complications is due entirely to the constant and devoted attention he received from the nursing staff of the hospital.

Plans had at this time already been drawn up for a special hospital for urological cases alone, and had it been possible to evacuate this man to such a hospital, where he would have had the benefit of the attention of skilled urologists, much might have been done to prevent the unfortunate ultimate result. Reconstruction of the anterior urethra in this case, after the lapse of such a long time, will be a very difficult procedure, one which will require several operations and ultimate success is by no means assured.

Case 2. W. B., Sergeant 30th Infantry, was wounded by a rifle bullet on June 20, 1918, the projectile entering the right side of the scrotum, severing the urethra at the peno-scrotal junction, entering the inner aspect of the left thigh and making its exit by the gluteal fold of the left thigh.

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The patient was admitted to Field Hospital 27 where "paralysis of left leg, no injury to femur" was noted. A catheter could not be passed. A suprapubic cystostomy was done and the patient was evacuated. At Evacuation Hospital 7 it was found "impossible to catheterize either anterior or retrograde."

The patient was admitted to Base Hospital 18 on June 23, in poor condition. Under ether, the thigh wounds were opened and a large accumulation of pus evacuated. This pus cavity surrounded the sciatic nerve, but the nerve itself was apparently uninjured. It was again impossible to pass a catheter either by the meatus or in retrograde fashion through the suprapubic wound. The thigh wounds were treated by Dakin's solution and the general condition of the patient rapidly improved. The suprapubic wound drained well, the incision was clean and the bladder was apparently not badly infected.

On July 8, under ether, an external urethrotomy was performed, and an attempt made to approximate the torn ends of the urethra. A tube was placed in the bladder through the perineal wound and the suprapubic tube removed. On July 13, a catheter was passed by way of the meatus out into the perineal wound where it was reintroduced into the bladder. The perineal wound was now closed over this continuous catheter with a small protective drain to take care of any leakage. The suprapubic wound closed a few days later and on July 20, the catheter was withdrawn. The patient was able to void naturally, but within forty-eight hours urine was leaking both by the suprapubic and by the perineal wounds. The catheter was reintroduced from meatus to bladder and the suprapubic wound promptly healed. The catheter was withdrawn in seven days, and gradual dilatations of the urethra commenced. On August 10, it was necessary to evacuate the patient. He was now in excellent condition, the thigh wounds closed except for small granulating areas. The sensory and motor paralysis of the sciatic nerve showed distinct improvement and, as the continuity of the nerve had been demonstrated at operation, it was considered probable that complete function would be restored. The patient was voiding at normal intervals clear, uninfected urine, and a number 24 sound could be introduced into the bladder. A small perineal fistula was present through which a few drops of urine leaked.

This case was a very satisfactory one in every particular, and, in spite of the fact that an external urethrotomy was not done until some time had elapsed, the cystostomy took care of the

urine and there was little or no infection in the suprapubic wound or in the bladder itself. This good result is in part, at least, due to the fact that the wound was caused by a rifle bullet. In general, it may be stated that wounds from shell fragments are more lacerated, cause more damage to surrounding tissues and are far more liable to be followed by severe infection.

Case 3. E. G., private 39th Infantry, was wounded by machine gun bullets on August 5. One bullet passed through the soft part of the left leg and a second entered the upper and inner portion of the right thigh, passed into the perineum, severed the membranous urethra with fracture of the ischium and extravasation of urine. At Field Hospital 19, the wounds of the soft parts were debrided, an external urethrotomy with plastic reconstruction of the urethra and a suprapubic cystostomy were done.

The patient was admitted to Base Hospital 18 on August 9 in good condition. The bladder was draining well by suprapubic and perineal tubes, the debrided wounds of the soft parts were clean, but the suture line of the incision in the perineum was badly infected. Three stitches were removed, a large amount of foul pus evacuated and all wounds were treated by continuous Dakin's solution.

On August 14 all wounds were cleaner. The suprapubic tube was removed and all urine was passing by the perineal tube. It was possible to pass a catheter through the meatus into the perineal wound and it was planned to treat this case by the method which had been used in case 2. However, at this time a general evacuation of the hospital was ordered to prepare for fresh convoys of casualties and it was unfortunately necessary to evacuate the patient.

This case illustrates the inadvisability of attempting any plastic procedures for the repair of the urethra at the first operation. It was necessary to open the perineal wound widely, introduce Dakin's tubes and undoubtedly the resulting scar will seriously hamper any further operative procedure for the repair of the urethra.

The medical authorities of the French army soon recognized the importance of special attention for urological cases and special urological hospitals were established in various regions to care for these patients. On account of this policy, French urologists

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have had an unequalled opportunity to observe this type of case and they have made many contributions to the literature of the subject. Escat states that if the patient survives to reach a base hospital, the general immediate results are good, but that the end results are often disappointing. He emphasizes the long post operative attention to complications that is necessary, and remarks that the problem of a urethral wound is divided in two stages; first—efforts to combat retention and infection by means of suprapubic and wide urethroperineal incisions; and second—reparation by urethrorrhaphy or autoplastic procedures with continued deviation of the urine. For the repair of the urethra, Marion advises resection of the scar tissue interposed between the ends of the canal which is reconstructed by end to end suture. If the latter procedure is impossible, the periurethral tissues should be approximated over a catheter, and he emphasizes that a cystostomy must be maintained until recovery.

Le Fur cites a case illustrating the numerous complications which may result from a urethral wound in which eleven successive operations were performed, including resection of the hip and arthrotomy of the knee.

Pasteau performs a cystostomy and thoroughly opens the perineal wound. The torn ends of the urethra are placed in alignment and a permanent catheter inserted. Later on, he opens the perineal wound widely and explores any fistulous tracts, leaving them open for a long time, the cystostomy opening being maintained. He considers this the best procedure to prevent or to treat strictures.

Loumeau has cited an unusual case of urethral wound in which the patient was able to urinate after the injury. However, increasing difficulty finally necessitated external urethrotomy.

At a symposium on this subject, Legueu, Cathelin, Jeanbrau and other well known urologists reported their experience at the urological hospitals, and their conclusions in regard to the treatment of these cases may be summed up under three heads.

1. Deviation of urine by suprapubic cystostomy associated with a wide opening of the traumatized area.

2. Immediate suture, always a long and delicate operation, should only be attempted when associated with suprapubic deviation.

3. Evacuation of patients to urological hospitals and application of the procedure that seems best suited to the individual case for the repair of the urethral defect.

It is evident that the most urgent necessity in the case of a patient with a ruptured urethra from a gun shot wound is deviation of the stream of urine from the injured area and suprapubic cystostomy should immediately be done. At the same time external urethrotomy should be done, the tract of the projectile cleaned and some attempt made at approximating the ruptured ends of the canal. However, it would be rarely advisable to attempt a plastic repair, as sutures must almost invariably become infected. External urethrotomy alone should be done only in exceptional cases for, although this operation is amply sufficient in cases of ruptured urethra seen in civil practice, gunshot wounds offer a different problem on account of the danger of serious infection, and adequate drainage must be obtained on account of the long journey to which these patients must necessarily be subjected to reach a base hospital in time of war.

There is no type of case which requires more painstaking and tedious after care, and the best results can only be obtained in a special hospital under the direction of men who have had special training in urological surgery.

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