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URETHRAL INJURIES IN THE CIVIL WAR

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ABSTRACT

Purpose: We compiled all cases of urethral injury received in battle during the Civil War to detail their management and determine the outcome of treatment.

Materials and Methods: Surgeon medical reports of individual cases of urethral injury listed in the Medical and Surgical History of the Civil War, and pension records available in the National Archives and Records Administration were reviewed.

Results: A total of 105 cases of urethral injury from gunshot wounds, comprising 7% of all urogenital casualties, were reported during the Civil War between 1861 and 1865. Of them 22 (21%) were fatal and 83 patients (79%) cases survived. Débridement and catheter drainage of urinary extravasation or perineal urethrotomy was initial treatment. The majority of urethral injuries were complicated by troublesome strictures, fistulas, urinary incontinence and erectile impotence. Only 19 patients (23%) recovered fully.

Conclusions: Civil War urethral injuries had devastating long-term consequences.

KEY WORDS: urethra; wounds and injuries; history of medicine; American Civil War; wounds, gunshot

During the Civil War from 1861 to 1865 army surgeons treated 1,497 cases of genitourinary injury.[1] Only 7% of the cases involved the urethra and, like most battle casualties, gunshot wounds caused almost all urethral injuries. While engaged in battle, men were shot in the perineum, genitals, groin or buttocks lying prone, kneeling or in a stooped position.[2] Most wounds were inflicted by the dreaded minié ball, a heavy, .58 caliber lead bullet that traveled at relatively low velocity, fired from a rifled musket.[3] Minié balls expanded on impact, ripped apart tissue and shattered bones. Bullets also carried dirt, pieces of clothing and bacteria into deep-seated wounds. Since the bullet usually traversed the deep pelvis, the urethra was perforated directly by bullet or bone fragments, or disrupted by necrosis and secondary infection of adjacent soft tissue.

Although it was seldom fatal compared to chest or abdominal wounds, urethral injury probably more than any other battle wound, including amputation of a limb, was the most troublesome and indeed was most likely to disable injured survivors for the rest of their lives. Dire consequences of wounds to the urethra included traumatic strictures, urinary fistulas, incontinence, recurrent infection, impotence, chronic pelvic pain and the inability to void without the aid of a bougie or catheter.

How did surgeons manage urethral injuries and what was the ultimate result of their treatments? We compiled all urethral injuries recorded during the Civil War and reviewed the principles, types and outcomes of treatments extant at the time.

METHODS

The Medical and Surgical History of the Civil War, 1861–1865 lists all individual cases of urethral injury, including the nature of wounds, site of injury, initial and subsequent treatments, and outcomes (death and type of complications) provided by firsthand medical reports of the treating surgeons.[4] Pension records detailing individual outcomes and degrees of disability up to 10 years after the war are available in the National Archives and Records Administration in Washington, D. C. Manuals and handbooks for military surgeons also provided recommendations for treating acute urethral injuries.[5,6] We reviewed each case of urethral injury filed by army surgeons in their remarkably detailed daily medical reports and correlated the initial management with complications and long-term outcomes cited in primary source documents for individual cases.

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RESULTS

The table shows that surgeons reported a total of 105 cases of gunshot wounds of the urethra during the Civil War, of which 22 (21%) were fatal. All except 1 fatality involved major disruption of the prostatic urethra. Surgeons observed that "if urine gained access to the serous sac, fatal peritonitis resulted; if it permeated the pelvic fascia, sloughing or diffuse suppuration was less promptly, but almost surely, mortal."[4] Inability to successfully divert the urine was invariably fatal.

A total of 83 men (79%) survived the urethral injury. In these cases the prostatic urethra was involved in only 7% compared with 54% for the bulbomembranous urethra and 39% for the penile urethra.[4] Although survival was worse for proximal urethral injuries and it was least likely when the urethra was disrupted at the bladder neck, downstream injuries were more likely to become intractable.[4]

Urethral injuries were rarely uncomplicated. Only 19 patients (23%) recovered completely, including 10 who eventually recovered months and even years after urinary fistulas closed (7) or traumatic strictures no longer required dilation (3). Of 6 injuries to the prostatic urethra only 1 (17%) recovered satisfactorily compared with 9 of 45 (20%) bulbomembranous and 9 of 32 (28%) penile urethral injuries.

Three-quarters of the patients were partially or totally disabled by troublesome traumatic strictures, urinary fistulas, incontinence or impotence. Many men experienced more than 1 complication. Few strictures did not require dilation at frequent or regular intervals to maintain a patent urethra. According to pension records filed up to 1873 at least 1 of every 4 survivors (20, 24%) required a catheter to evacuate or lived with an indwelling catheter. Many others had persistent urethral fistulas and 20% were incontinent. Of 5 men

Gunshot wounds of urethra in Civil War, 1861 to 1865

Variable	No. Cases (%)
Total injured:	105
Survived	83 (79)
Died	22 (21)
Injury site (survivors):	
Prostatic urethra	6 (7)
Bulbomembranous urethra	45 (54)
Penile urethra	32 (39)
Complication outcome	64 (77)
Full recovery outcome:*	19 (23)
Prostatic urethra (6 cases)	1 (17)
Bulbo-membranous (45 cases)	9 (20)
Penile urethra (32 cases)	9 (28)
Complication type:	
Stricture	29 (35)
Fistula	39 (47)
Incontinence	17 (20)
Impotence	10 (12)
Full recovery:*	19 (23)
Catheter used (40 cases)	16 (40)
Catheter not used (43 cases)†	3 (7)
Associated genitourinary injuries:	
Testicle loss	12
Penile amputation	2

* Defined as normal voiding via the meatus without stricture or catheter use, including 10 cases that recovered completely after temporary urethral fistula (7) or traumatic stricture (3).

† Catheterization was not attempted or it was unsuccessful.

with a urethrorectal fistula only 1 healed partially and 4 were permanently incontinent of urine through the scrotum and anus. Urethral injuries were associated with loss of a testis in 12 cases and of the distal penis in 2.

DISCUSSION

Wounds of the urethra assumed great interest among surgeons during the war because of the challenges that they posed. If possible, bladder catheterization was regarded as indispensable and it became the established rule of practice during the war. The Medical and Surgical History of the Civil War, 1861–1865 states, "The immediate introduction of a catheter after a shot laceration of the urethra will often present great difficulties to the field surgeon, pressed for time and unprovided with a variety of catheters. Nevertheless the attempt must be made, with the utmost caution and delicacy of manipulation, without waiting until the desire to urinate is urgent."[4] Experience justified this practice since, when a catheter was promptly and successfully inserted into the bladder, 40% of patients recovered relatively normal voiding compared with only 7% when it was not (see table).

Catheters used during the Civil War were made of silver metal or gum-elastic, that is silken thread frame coated with a mixture of linseed oil and a hard, lustrous gum resin called copal.[7] They were curved and came in various sizes and shapes with 1 or 2 side holes recessed from a conical, olivary or cylindrical tip (fig. 1).[4] Caoutchouc (a form of latex) catheters were also used, especially toward the end of the war. Such catheters were softer and more pliable than rigid metal or stiff gum-elastic (despite its name) catheters and they were much better tolerated in cases of self-catheterization or if continuous catheter drainage was required for more than a few days. Self-retaining Foley and Malecot catheters had not yet been invented.

The major cause of morbidity and death from urethral injury was sepsis from urinary infiltration into the surrounding soft tissue. Surgeons noted 2 forms of urinary extravasation. "When freely infiltrated into the perineal and scrotal tissues, there is rapid swelling with discoloration, and constitutional disturbance. There is also a chronic form, when the urine slowly permeates the connective tissue, producing a brawny tension of the part and, ultimately, urinous abscesses."[4] The 2 forms were considered potentially fatal, for

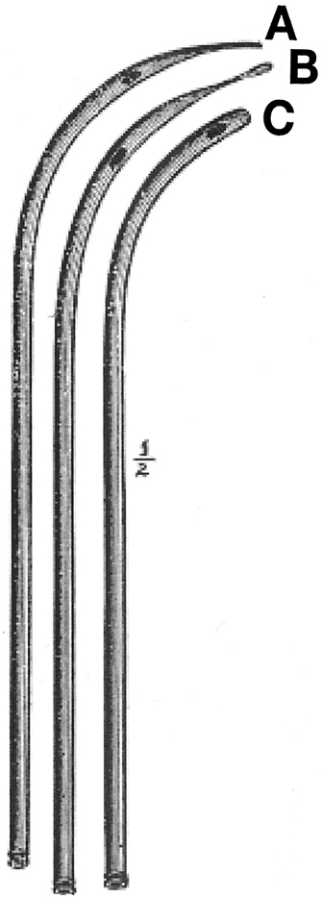

FIG. 1. Gum-elastic catheters. *A*, conical. *B*, olivary. *C*, cylindrical.

which "the important and essential remedy was evacuation of urine and disorganized tissues and exudations."[4]

If a rigid, full-sized or small flexible catheter could not be inserted into the bladder, the surgeon attempted to introduce a filiform, made of gum or whalebone. Filiforms were often used as guides for soft rubber catheters, open at the vesical end, to be passed over the conductor as often as necessary to evacuate urine, keep the urethra realigned and promote healing of complex urethral injuries (fig. 2).[4]

If the smallest catheter could not be passed, surgeons were advised to avoid creating false passages by insisting on catheterization. In such cases perineal urethrotomy, referred to as perineal section or incision, was advised. Using a vertical incision in the perineum the surgeon cut down onto a sound placed as far as it would go into the urethra, "allowing the urine to escape freely through the laceration."[4] In many cases perineal urethrotomy facilitated realignment of the urethra over a catheter passed retrograde into the bladder and then antegrade out through the meatus. In cases of urinary retention the bladder was punctured directly above the pubis or in rare cases through the rectum, using a trocar.

The following case illustrates application of sound surgical principles resulting in a reasonably favorable outcome of proximal urethral disruption with the judicious use of catheters and perineal urethrotomy.

> Case 1061. Private JR, 8th Infantry, age 27, was wounded, February 2, 1865. Several surgeons reported "Shot wound of left buttock, exiting through the scrotum, destroying the right testis. The perineum and right groin were much ecchymosed and swollen. Urine passed in small quantity through the perineal opening. The urethra was severed in the membranous portion. At mid-day no urine passed and the bladder became