

The Urethra, Victim of Increasing Violence: Management of Anterior and Posterior Urethral Injuries in Uyo, South-South Nigeria

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Abstract

Original Research Article

Aim: The aim of this retrospective study was to describe the presentation and management of anterior and posterior urethral injuries seen over a 20-year period. **Patients & Methods:** We retrospectively evaluated patients with urethral injuries treated between 2005 and 2025 in University of Uyo Teaching Hospital and KSH specialist Hospital Ltd. Data retrieved from patients' case notes, theatre, wards and clinic records included patient age, gender, aetiology, mode of presentation, diagnostic parameters, management and outcome. **Results:** A total number of 125 urethral injuries were seen out of which 120 (96%) were male and 5 (4%) females (ratio of 24: 1). The age range varied from 3 to 60 years with peak between 20-40yrs (mean 31.15 + 9.35SD). Of the male patients 72/120 (60%) had anterior urethral injuries and 48/120 (40%) had posterior urethral injuries. The major etiological factors were road traffic injuries with pelvic fractures in 41 patients (32.8%); straddle/ fall astride injuries in 36 (28.8%); iatrogenic injuries in 20 (16%); fall from heights in 11(8.8%) penetrating injuries 10 (8%); industrial crush injuries 3 (2.4%); penile fracture and amputation in 3 (2.4%) and one rape victim 1 (0.8%). **Conclusion:** Treatment was determined by the location, extent of injuries and aetiological factors involved. Early suprapubic cystostomy, urethrography and delayed urethroplasty were the mainstay of management.

Keywords: Pelvic fracture, anterior, posterior urethra, urethral trauma, urethroplasty.

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INTRODUCTION

Urethral injuries can be caused by external blunt or penetrating trauma and internal iatrogenic trauma [1,2]. Anterior urethral injuries are commonly caused by iatrogenic trauma following urethral catheterisation, accounting for 3.2 urethral injuries/1000 hospital admissions [3,4]. Other causes of anterior urethral injuries include blunt trauma from straddle/fall astride injuries where the bulbar urethra is crushed against the ischiopubic rami resulting in contusion or urethral disruption; and penetrating trauma from gunshots, stabs or impalement injuries, penile fractures and urethral foreign bodies. Posterior urethral injuries may result from blunt pelvic trauma with massive deceleration events following automobile and occupational/industrial crush injuries, falls from heights, penetrating gunshot/stab wounds and iatrogenic injuries complicating endoscopic surgery and radical prostatectomy. The frequency of urethral injuries from

pelvic fractures varies from 5 to 25% [1] and are secondary to motor-vehicle accidents (68-84%) or falls from heights (6-25%) [7,18]. Pelvic fractures may be stable or unstable. Stable fractures include uni- or bi-rami fractures, iliac and sacral fractures. Fracture subtypes associated with urethral injuries include straddle (tetra-ramic) and Malgaigne fractures involving disruption through ischiopubic rami anteriorly as well as ipsilateral sacroiliac joint dislocation posteriorly [3,10,15]. The direction of major force of injury i.e. anteroposterior compression, lateral compression and vertical shear injuries lead to rotational instability which can cause urethral injuries [10,15]. Pelvic fracture urethral injuries may be associated with multiple non-urolologic intraabdominal, thoracic, orthopaedic and other life-threatening injuries, thus patient resuscitation and stabilisation is important. Urethral injuries in women occurring in 4-6% of pelvic fractures are less common because of the short, mobile urethra situated behind, but with no significant attachments to the pubic bone [1].

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Straddle pelvic fractures in children may injure the prostatic urethra or bladder neck because of the undeveloped prostate and more likely results in a complete urethral transection [1].

The mechanism of injury in PFUI is due to avulsion of the membranous urethra from the bulbar urethra at the bulbomembranous junction rather than prostatomembranous disruption as a result of rupture of ligamentous attachments during pelvic ring disruption [3,7]. In complete urethral injuries, the periprostatic venous plexus can be injured, leading to a large pelvic haematoma formation displacing the prostate upwards and posteriorly. The immediate risk of non-iatrogenic urethral trauma is urinary extravasation and haematoma with potential for secondary infection, gangrene and septicaemia [3]. This risk can be mitigated by early suprapubic cystostomy to divert the urine and surgical drainage of the extravasated urine and haematoma [3].

Urethral injuries present with the classic triad of blood at the urethral meatus, difficulty or inability to void, and a palpable distended bladder, though patients with partial injuries may void with gross haematuria. Abdominal examination may show muscle guarding in the hypogastrium, suprapubic tenderness and dullness due to pelvic haematoma. Perineal bruising, ecchymosis, perineo-scrotal haematoma or urinoma/extravasation would suggest urethral disruption. On digital rectal examination, the prostate may be high riding or impalpable, replaced by a boggy mass due to haematoma. Blood on examining finger indicates anorectal injury. Pelvic fractures involving displacement of pubic rami relative to the rest of the pelvis and pelvic haematoma indicate concomitant PFUI [1]. Retrograde urethrography (RUG) is used to diagnose and classify urethral injuries [1,3]. Patients with urinary retention should have a suprapubic catheter inserted. Emergency treatment options include suprapubic cystostomy (SPC) alone, Primary Surgical Realignment (PR), and Endoscopic Realignment (ER). The aim of this study was

to describe the spectrum of urethral injuries managed in three referral hospitals over a 20-year period.

MATERIALS AND METHODS

A retrospective study of patients treated at University of Uyo Teaching Hospital, a tertiary referral centre serving Akwa Ibom and neighbouring states in South-South Nigeria; and KSH Specialist Hospital between January 2005 and December 2025 was carried out. Patients requiring emergency treatment for urethral injuries and delayed treatment for posttraumatic strictures were included in the study. Those with incomplete clinical data were excluded from the analysis. The primary outcome was to describe patients' age, aetiological factors, investigations, emergency and delayed treatment modalities. The secondary outcome was to evaluate the results of treatment and complications. Evaluation included clinical history, physical examination, haematological and biochemical parameters. The diagnosis was confirmed by retrograde urethrography. Complete urethral rupture was diagnosed by extravasation of contrast medium in the area of the urethra outside the corpus spongiosum, with no contrast entering the bladder. Partial urethral rupture was diagnosed when contrast was extravasated in the area of the urethra within the corpus spongiosum, with contrast entering the bladder. Patients with urinary retention had emergency suprapubic cystostomy, with simultaneous retrograde urethrogram and micturating cystourethrogram done 3 weeks later to determine the location, length and severity of the stricture, to plan for delayed or secondary repair.

RESULTS

A total of 125 patients with age ranges from 3 to 60 years with peak between 20 – 40 years (mean = 31.15 + 9.35 SD) were treated between 2005 and 2025. There were 120 (96%) males and 5 (4%) females (ratio of 24:1). The age incidence is shown in Table 1.

Table 1: Age Incidence of Patients with Urethral Injuries.

AGE	NOS	%
0-10yrs	2	1.6%
11-20yrs	9	7.2%
21-30yrs	61	48.8%
31-40yrs	37	29.6%
41-50yrs	11	8.8%
51-60yrs	5	4%
Total	125	100%

Seventy-two 72/120 (60%) male patients sustained anterior urethral injuries while 48/120 (40%) had posterior urethral injuries. The major etiological factors were pelvic fracture following road traffic accidents in 41 patients (32.8%), straddle/fall astride injuries in 36 (28.8%); iatrogenic injuries 20 (16%), falls

from height in 11 (8.8%), and penetrating injuries from stabs/gunshots, perineal impalement in 10 (9.8%). Other causes were penile fracture/amputation in 3 patients (2.4%), industrial crush injuries in 3 patients (2.4%) and one rape victim (0.8%) as shown in Table 2.

Table 2: Aetiological factors in 125 patients with urethral trauma

S/N	Aetiology	NO	%
1.	Road Traffic Injury + Pelvic Fracture	41	32.8%
2.	Straddle Injuries	36	28.8%
3	Iatrogenic Injuries	20	16%
4.	Fall from Heights	11	8.8%
5	Stab/gunshot Injuries	10	8%
6	Penile fracture/ Amputation	3	2.4%
7.	Crush Injuries/Industrial accident	3	2.4%
8.	Rape Victim	1	0.8%
	Total	125	100%

Of the 72 male patients with anterior urethral injuries, 20/72 (27.7%) had iatrogenic injuries with contusions following traumatic catheterisation/ forceful decatheterisation or prolonged indwelling catheters. Treatment was insertion of urethral stent for 10-14 days, or placement of a suprapubic tube. Partial ruptures of the anterior urethra occurred in 36/72 (50%) of patients from straddle injuries and were managed by suprapubic urinary diversion, with follow up urethrograms at 3 weeks. Complete transection of the anterior urethra occurred in 16/72 (22.2%) of patients. Ten patients had penetrating injuries from gunshot, impalement and stab wounds which required immediate exploration, debridement, and SPC. Three patients who had penile amputation and penile fracture from sexual misadventure, with lacerations extending into the urethra were repaired primarily by anastomotic urethroplasty over a stenting catheter, repair of corpus spongiosum, corpora cavernosa and tunica albuginea followed by SPC. Patients with complete urethral transection with urinary extravasation, urinoma, perineal and scrotal haematoma had suprapubic cystostomy, surgical drainage of haematoma and extravasated urine, with RUG and secondary repair at 3-6 months post injury. Broad spectrum antibiotic cover was given. The secondary repair was extended anastomotic urethroplasty if the resultant stricture was less than 2cm or augmented urethroplasty when the length was greater than 2cm.

Five female patients had urethral injuries, comprising three with longitudinal lacerations, one avulsion injury following pelvic fractures and one laceration following rape. Primary repair was performed all in five female patients.

Of the 48 patients with posterior urethral Injuries, 15/48 (31.3%) had partial disruption with extravasation, while 31/48 (64.6%) had complete urethral disruption. Patients with PFUIs had emergency suprapubic cystostomy and delayed urethroplasty at 6 months. Postoperatively, peri-catheter urethrogram was done at 3rd week and if there was no leakage, the catheter was removed at 4 weeks.

Two boys 2/48 (4.2%) sustained PFUI from fall from heights. One boy had emergency SPC and delayed

primary alignment while the second patient had secondary repair at 3 months.

Long-term complications seen in the male patients included recurrent urethral stricture, urinary tract infections, urethrocutaneous fistulae, bladder calculi, erectile dysfunction and urinary incontinence.

DISCUSSION

Management of the urethral injuries was determined by the location and extent of the injury, aetiology and associated injuries. Seventy-two (60%) of the male patients had anterior urethral injuries and 48 (40%) had posterior urethral injuries. This contrasts with other series in which posterior urethral injuries were more frequent [12]. Pelvic fracture urethral injuries from high velocity motor vehicular accidents occurred in 41 patients (32.8%) while straddle injuries to the bulbar urethra were seen in 36 patients (28.8%). Anterior urethral trauma may result in contusion, partial rupture or complete transection and the magnitude of injury was determined by retrograde urethrography. PFUI in polytraumatized patients required stabilization, assessment of non-urollogic injuries and assessment of urethral injury. In unstable patients requiring laparotomy, urethral catheterisation should be avoided to prevent conversion of a partial rupture to a complete one and introduction of infection into the pelvic haematoma [18]. A suprapubic cystostomy should be done for urinary drainage. Though 'blind' catheterisation has the risk of making the PFUI worse, in practice, catheterisation would have been attempted by the emergency room staff before referral to urologists. According to Mundy *et al* [3], catheterisability is probably the single most common diagnostic criterion for the presence or absence of significant urethral injury. In stable patients, the diagnosis was established by urethrography, those with urinary retention had suprapubic cystostomy with simultaneous micturating cystourethrogram and retrograde urethrograms. RUG is the most accurate means to diagnose and classify urethral trauma but does not clearly distinguish between partial and complete injuries [3]. The European Association of Urology (EAU) classification of Anterior and Posterior Urethral Injuries according to grade of injury, generic for all urethral trauma combines the best of previous

classifications and has direct implications for management [2,6,15] as shown in Table 3.

Table 3: EAU Classification of anterior and posterior urethral injuries.

Grade	Description	Appearance
I	Stretch Injury	Elongation of urethra without contrast extravasation.
II	Contusion	Blood at the urethral meatus; no contrast extravasation.
III	Partial Disruption	Extravasation at injury site with contrast visualised in the proximal urethra or bladder.
IV	Complete Disruption	Extravasation of contrast at injury site without visualisation of posterior urethra or bladder.
V	Complete /partial disruption of posterior urethra+ tear of BN, rectum or vagina	Extravasation at urethral injury site± blood in vaginal introitus. Extravasation of contrast at BN during cystography± rectal or vaginal filling with contrast.

Ultrasound scan in patients with abdominopelvic trauma demonstrated pelvic haematoma, distended and high riding bladder, or associated hemoperitoneum. Plain pelvic X-ray showed the type of pelvic fractures and CT scan demonstrated associated chest or abdominal injuries. Flexible urethrocytoscopy was not available although its use for the diagnosis and management of PFUI has increased recently in patients in whom endoscopic primary realignment is planned [9,15].

Of the 72 male patients with anterior urethral trauma, 20/72 (27.7%) of patients had urethral contusions from iatrogenic injuries, 36/72 (50%) had partial ruptures, while 16/72 (22.2%) had complete transections. Partial ruptures were treated by initial suprapubic urinary diversion, with follow up urethrograms at 3-6 weeks post injury. SPC had the advantage of avoiding urethral manipulation, which could produce further urethral trauma. Indeed, satisfactory urethral canalization can occur in about 50% of partial anterior urethral disruptions with potential for stricture free healing, providing the urethral lumen was not further traumatized by instrumentation or damaged by infection [2,3]. The suprapubic catheter was clamped after 4 weeks and repeat urethrograms were done. The catheter was removed if the patient could void normally and there was no extravasation or stricture seen in the urethrograms. Some patients presented months to years following blunt perineal trauma with poor urinary streams, lower urinary tract symptoms, urinary retention from urethral stricture, infectious sequelae like urethrocutaneous fistulae, recurrent urinary tract infections and periurethral fibrosis. These bulbourethral strictures had excision and end to end anastomosis via perineum if the length was 2cm or less. Strictures longer than 2cm after urethral mobilization were treated by augmentation urethroplasty after 3-6 months. All the 16 (22.2%) patients with complete ruptures of the anterior urethra were treated primarily with SPC, with delayed overlapping spatulated bulbo-bulbar anastomotic urethroplasty done at 3-6months [10,11,20,25].

Penetrating injuries from stab/gunshot wounds and impalement injuries to anterior urethra occurred in

10 (8%) of patients, with associated penile, scrotal and testicular injuries. They had immediate exploration, debridement and primary repair of the urethra with placement of urethral catheter and urinary diversion [1,2,10]. Defects up to 2cm in bulbar urethra and up to 1.5cm in penile urethra were repaired primarily.

Of the 48 patients with posterior urethral injuries, 15 (31.3%) had partial disruption in whom retrograde urethrography showed continuity with extravasation and contrast entering the bladder, while 31 patients (64.6%) had complete urethral injuries with pelvic fracture urethral distraction defects without contrast entering the bladder. Partial tears of the posterior urethra were managed by SPC alone, without attempt at urethral catheterization to avoid conversion of the partial tear to a complete one, and RUG was repeated after 3 weeks. Short membranous urethral strictures were treated by urethral dilatation, while dense strictures had delayed anastomotic urethroplasty at 3-6 months. Management of patients with complete or total bulbomembranous disruption is challenging and controversial. Complete urethral ruptures were managed by immediate suprapubic cystostomy to provide urinary drainage and drainage of extravasated urine; with delayed anastomotic urethroplasty done about 6 months later. After SPC, alternative acute treatment options include leaving the SPC alone or doing endoscopic primary realignment or open primary realignment [3]. Primary endoscopic realignment has become a contemporary management option for treatment of posterior urethral disruption in some high-volume centres [16,18,26,27]. In a series of 14 patients with posterior and anterior urethral disruptions, Olapade-Olaopa reported successful early primary realignment in 13/14 patients (93%) [26]; while Darawany in a study of 27 patients with complete posterior urethral disruptions reported success in 24/27 (88.8%) [27]. In an Italian high-volume centre, Barbagli et al reported that SPC was the most frequent (49%) emergency treatment for PFUI, endoscopic realignment accounted for 27.7%, while bulbo-prostatic anastomosis was the most frequent (62.2%) delayed treatment in patients with PFUD [16]. Delayed primary options include delayed endoscopic primary realignment or urethroplasty at 2 weeks post injury. Immediate

realignment may reduce the incidence of subsequent stricture formation, but patient conditions were not ideal for exploration after pelvic fracture and could lead to catastrophic bleeding requiring blood transfusion. The proposed advantage of delayed primary realignment at 10 days to 2 weeks when the patient is fairly stable is avoidance of emergency pelvic exploration. Shittu *et al* treated 12 patients with posterior urethral rupture using delayed primary endoscopic realignment and reported success in re-establishing urethral continuity in 8 patients (66.7%) [13].

Delayed urethroplasty (DU) or secondary repair at 3-6 months after healing of pelvic fracture is the gold standard and recommended approach [1,2,3,10,12]. Delayed endoscopic treatment, with incision of the scar tissue between urethral ends is said to have a high failure rate [2,10]. Patients with posterior urethral injuries in this series except one had placement of suprapubic catheter, with a delayed urethroplasty at 6 months. Transperineal progressive approach was used for long prostatobulbar gaps with high prostate dislocation [5,10,12,19,24]. Bulbomembranous anastomosis (BMA) or bulboprostic anastomosis (BPA) required perineal mobilization of bulbar urethra and transection through the site of obliteration, with urethra mobilized back to attachment of the suspensory ligament. The posterior urethra was exposed by cutting on the tip of dilator passed down the bladder neck into posterior urethra with excision of the fibrosis. A spatulated overlapping, tension free anastomosis was performed [10,12,19]. If there was tension, the intercrural plane was developed to straighten out the curve of the bulbar urethra. The abdominoperineal transpubic approach to delayed repair of long-standing complex distraction defects with sidetracking and perineal fistulae pioneered by Waterhouse *et al* has been used for long posterior urethral distraction defects [28]. Koraitim, in a review of 145 patients treated in 17 years, found that anastomotic urethroplasty, performed by the perineal (95%) or transpubic (97%) approach was successful in the repair of posterior urethral strictures and disruptions complicating pelvic fracture urethral injuries [7,29]. The hinged transpubic approach was also used by Essiet *et al* for delayed repair of posterior urethral distraction defects complicating pelvic fractures [14]. Inferior wedge pubectomy and urethral rerouting was not required for patients in the present series.

We attempted exploration and delayed primary urethral alignment in two patients. One was a 10-year-old boy who fell from height and sustained pelvic fracture with symphyseal diastasis and posterior urethral rupture. Realignment of the urethra using the linked catheter technique was abandoned due to severe haemorrhage from exploration of the pelvic haematoma. He had suprapubic cystostomy and secondary perineal repair three months later. The second boy sustained undisplaced ischiopubic rami fracture with posterior urethral rupture and minimal pelvic haematoma. Delayed

primary urethral realignment was possible and a catheter was placed in the bladder. Healing occurred with a stricture which was managed by urethral dilatation. Delayed primary repair was mainly used in female urethral trauma [2,20,23]. Five female urethral injuries were treated in our series, three longitudinal lacerations, one avulsion injury following pelvic fractures and one urethral/vaginal laceration in a rape victim. They were treated by delayed primary repair via a combined vaginal and transvesical approach. Patel *et al.*, [20] reviewed published reports of 158 female patients with urethral trauma. Of these, 83(53%) were managed with immediate repair, 17/83 (20%) via primary alignment and 66/83 (80%) via anastomotic repair. The remaining 75/158 (47%) were managed by delayed repair. Rates of urethral stenosis and fistula were highest after primary alignment, and patients experienced more incontinence and vaginal stenosis after delayed repair. Thus, primary anastomotic repair via the vaginal approach as soon as patient was stable appeared to be the optimal approach [20,23].

Iatrogenic urethral injuries occurred in twenty patients with mucosal contusions following traumatic catheterisations, prolonged indwelling catheters, inflation of the balloon within the urethra, forceful decatheterisation without deflating the balloon and urethrocystoscopy. The symptoms included penile/perineal pain (100%), and urethral bleeding (86%) [4]. Treatment of acute iatrogenic injuries was by temporary urethral stenting or placement of suprapubic catheter. Other causes of iatrogenic trauma include transurethral resection of the prostate, open radical prostatectomy, brachytherapy, abdominoperineal resection of rectal tumours, gynaecological procedures and circumcision [2,10]. Three patients had post transurethral resection of the prostate (TURP) strictures and two patients had urethral stenoses after open radical retropubic prostatectomy. They were treated with endoscopic incision and resection respectively.

The major complications of pelvic urethral trauma include stricture, erectile dysfunction and incontinence. Koraitim [9] reviewed different techniques used in a personal series of 100 patients combined with a review of 771 patients from published reports. Immediate and early realignment (n=326) was associated with 53% stricture rate, a 5% incontinence rate and a 36% impotence rate; while primary suture (n= 37) was associated with rates of 49%, 21%, and 56% respectively compared with SPC and delayed urethroplasty (n=508) associated with rates of 97% stricture, 4% impotence and 19% incontinence [1,7]. Incontinence was not common in our patients as associated bladder and bladder neck injuries were not common. However, severe trauma leading to bladder and bladder neck injuries with damage to pelvic plexus would likely lead to voiding difficulty and incontinence [3,10,19]. Injuries to the prostate and bladder neck or associated rectal injuries should have early repair [3,10]. Erectile dysfunction (ED) is said to

occur in 20%-60% of patients with PFUI, due to the severity of the initial pelvic fracture injury [2,10]. Spontaneous return of potency may occur within two years and ED can be managed by phosphodiesterase 5 inhibitors like sildenafil and intracavernosal pharmacotherapy [2,10].

CONCLUSION

Early recognition of urethral trauma, radiographic diagnosis and proper management would prevent late complications of stricture disease, incontinence and erectile dysfunction. Straddle injuries of the bulbar urethra with partial or complete disruption should be managed by suprapubic cystostomy to limit the extent of inflammation following urinary extravasation and mitigate the severity of stricture formation. Delayed anastomotic urethroplasty can then be done after 3-6 months. In pelvic fracture urethral injuries, suprapubic cystostomy at time of injury with delayed urethroplasty at 6 months is the optimal approach for unstable patients with major visceral and musculoskeletal injuries.

RECOMMENDATIONS

Prevention of catheter related iatrogenic trauma is by ensuring proper technique, deflation of balloon before removal of catheter, use of silicon catheters for prolonged catheterisation, protective urethral catheterisation in major abdominopelvic surgeries and continuing education and training of nurses and resident doctors. Effective road, industrial and occupational safety measures would help to reduce and prevent pelvic fracture related urethral injuries.

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Conflict of Interest: NIL

Consent: All the patients had signed consent forms placed in their case notes before operation.

Ethical Approval: This was a retrospective study. Approval was obtained from the Ethical Research Committee of the Hospitals before retrieval of information from the case notes.

Author Contributions:

OEA- Conception and design of study, patient management, data collection and analysis, wrote the protocol, first draft, review and final draft of the manuscript.

AEU- Patient management, literature search, data collection and analysis, review of manuscript.

EAU- Patient management, data collection and analysis, review of manuscript.

All authors read and approved the final manuscript.

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