

Research Article

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Penile Fracture with Concomitant Urethral Injury: Surgical Decision-Making Intraoperative Urethral Assessment and Functional Outcomes

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ABSTRACT

Background: Penile fracture is rupture of the tunica albuginea of the erect corpus cavernosum. It is a urological emergency requiring urgent surgical exploration. Concomitant urethral injury complicates 10–22% of cases and urethral injury patterns demonstrate anatomical heterogeneity, ranging from common proximal (bulbar) to rare distal (fossa navicularis–proximal) tears.

Aim: To assess the functional outcomes after repair of penile fracture with concomitant urethral injury

Materials and Methods: We conducted a retrospective analysis of five patients who were diagnosed with penile fracture and concomitant urethral injury between January 2016 to June 2026. They underwent systematic evaluation including clinical assessment, penile ultrasonography, and intraoperative cystoscopy. All patients underwent urgent surgical exploration within 24–48 hours of presentation. Data on injury pattern, surgical approach, repair technique, perioperative parameters, and follow-up outcomes were recorded.

Results: Five males aged 27–52 years (mean 38.2 years) were included. Concomitant urethral injury was confirmed in all patients. Intraoperative cystoscopy was performed in all patients. On follow-up, four patients had IIEF-5 score ≥ 22 (one of whom had a scar under surveillance), and one had mild ED. No urethral stricture, penile curvature, or urethrocutaneous fistula was identified in any patient.

Conclusion: This case series demonstrates the clinical and anatomical heterogeneity of penile fracture with variable urethral co-injury patterns. Systematic intraoperative cystoscopy enables accurate urethral localisation and guides simultaneous primary repair. Excellent functional outcomes are achievable, particularly with early presentation and repair.

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Introduction

Penile fracture results from rupture of the tunica albuginea of the erect corpus cavernosum. During erection, haemodynamic engorgement

thins the tunica from approximately 2–2.4 mm at rest to as little as 0.25–0.5 mm, rendering it vulnerable to sudden bending forces [1]. Blunt coital trauma accounts for up to 80% of cases; alternative mechanisms include manual bending (taqaandan) for detumescence and accidental rolling over in sleep [2]. Concomitant urethral injury is reported in 10–22% of cases [3]. This case series was conducted

to describe the clinical presentation, injury heterogeneity, operative decision-making, and functional outcomes of five patients with penile fracture and concomitant urethral injury.

Materials And Methods

Study Design

This retrospective study was conducted as a case series in which patients who underwent penile fracture repair with concomitant urethral injury during the study period from January 2016 to June 2026 were included.

Inclusion Criteria

- Adult males (age ≥18 years)
- Clinical diagnosis of penile fracture (at least two of: audible crack, immediate detumescence, and rapid penile swelling/deformity)
- Presentation within 72 hours of injury
- Willingness to provide informed written consent and attend structured follow-up
- Blood at meatus

Exclusion Criteria

- Known coagulopathy or anticoagulant use
- Prior penile surgery or Peyronie’s disease
- Previous urethral stricture disease
- Penile haematoma without tunical rupture confirmed on high-resolution ultrasonography and intraoperative exploration

Preoperative Evaluation

All patients underwent structured clinical assessment, high-resolution penile ultrasonography, baseline blood investigations & urine

microscopy. Penile MRI and pre-operative retrograde urethrography was not routinely performed; urethral assessment was conducted intraoperatively.

Surgical Technique

All patients underwent urgent surgical exploration under spinal or general anaesthesia within 24–48 hours of presentation. Intraoperative cystoscopy was performed in all patients as the primary urethral assessment modality. The standard incision was a circumferential subcoronal degloving incision and an extended penoscrotal approach was employed when haematoma extended beyond Buck’s fascia. Tunical defects were repaired with interrupted 3-0 absorbable polyglactin sutures. Urethral injuries were repaired primarily with interrupted 4-0 absorbable polyglactin sutures over a 14–16Fr silicone urethral catheter. Artificial erection testing (Gitte’s test) was performed in all patients to confirm watertight tunical and urethral closure. Penile rehabilitation with Tadalafil 5 mg once daily was commenced immediately after surgery and continued for 3 months. Patients were instructed to abstain from sexual intercourse for 3 months; gentle masturbation was permitted after catheter removal to promote corporal blood flow.

Patients were reviewed at 1 week (wound assessment), 4 weeks (voiding trial and catheter removal for urethral repair cases), 6 weeks (clinical and voiding assessment), 3 months (IIEF-5, uroflowmetry, clinical examination), and 6 months (IIEF-5, uroflowmetry, clinical examination, urethroscopy if indicated) and then yearly. Further follow-up was arranged as clinically indicated. Discharge from routine follow-up was offered to patients with normal functional outcomes at 6 months.

Table 1: Summary of Patient’s Details

Patient	Age	Diagnosis/injury type	Clinical presentation	Imaging findings	Procedure	Complications (cd)	Outcome
1	43	Penile fracture + distal urethral injury (proximal to fossa navicularis)	Eggplant deformity; blood at meatus; 24h delay	USG: 2.5–3mm left ventral defect; bilateral corporal involvement; urethral injury not seen on USG	Subcoronal degloving; tunical repair (3-0 polyglactin); urethral repair (4-0 polyglactin over 14Fr Foley); cystoscopy-guided	None (Grade 0)	Complete recovery; IIEF-5 24; normal uroflowmetry
2	31	Penile fracture with proximal urethral injury	Typical triad; leftward deviation; meatal bleeding	USG: 3mm right dorsal defect; haematoma confined	Subcoronal degloving; tunical repair (3-0 Polyglactin); urethral repair (4-0 polyglactin)	None (Grade 0)	IIEF-5 25; no curvature; discharged
3	38	Penile fracture + proximal urethral injury	Ventral swelling; meatal bleeding; scrotal extension	USG: 2.5mm ventral left defect; scrotal haematoma tracking	Subcoronal + ventral extension; tunical repair; urethral repair over 16Fr Foley	Wound oedema (Grade I); possible early urethral scar (surveillance)	IIEF-5 22; Qmax 12 mL/s; under urethral surveillance
4	52	Penile fracture (bilateral corporal) + scrotal haematoma + proximal urethral injury	36h delay; bilateral scrotal ecchymosis; obesity; DM; meatal blood	USG: 4mm right ventrolateral defect; bilateral haematoma extension	Penoscrotal approach; bilateral haematoma evacuation; tunical repair; bilateral drains; cystoscopy urethral injury	Scrotal wound infection (Grade II)	IIEF-5 17 (multifactorial ED); no stricture; PDE5 inhibitors continued
5	27	Penile fracture + proximal urethral injury	Classical triad + meatal blood	USG: 2.5mm left dorsal defect; spongiosum defect present	Subcoronal degloving; tunical repair; cystoscopy-urethral injury	None (Grade 0)	IIEF-5 25; normal uroflowmetry; discharged

Results

Five male patients were included in this series. Mean age was 38.2 years (range 27–52 years). One patient had pre-existing comorbidities: type 2 diabetes mellitus with obesity. Vaginal intercourse was the causative mechanism in all five patients. Presentation was immediate (within 6 hours) in three patients (60%) and delayed in two patients.

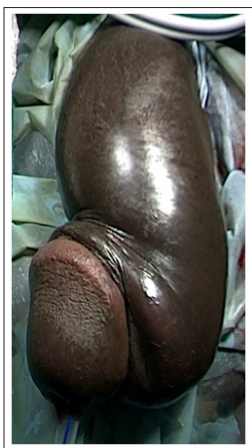


Figure 1: Preoperative Clinical Appearance- Eggplant Deformity with Diffuse Oedema, ecchymosis, and rightward penile deviation

The classical triad (audible crack, immediate detumescence, penile swelling/deformity) was present in all five patients. Blood at the urethral meatus was present in all patients.

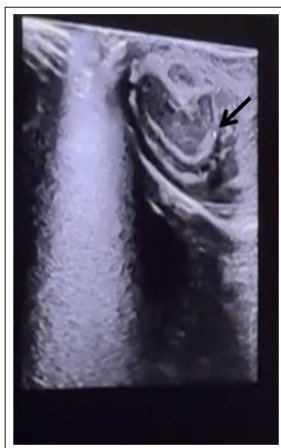


Figure 2: Ultrasonographic Evidence of Tunical Disruption (Arrow)

High-resolution penile ultrasonography was performed in all five patients and successfully identified the tunical defect in all cases. Tunical defect size ranged from 2.5 to 4 mm (mean 2.9 mm). Bilateral corporal involvement was demonstrated on ultrasonography in 2 patients. Ultrasonography failed to detect the urethral injury in all patients.

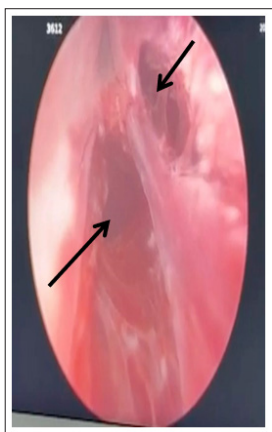


Figure 3: Intraoperative Cystoscopy - Mucosal Defect (Arrow) In The Distal Urethra, Proximal to the Fossa Navicularis

Intraoperative cystoscopy was performed in all five patients. Urethral injury was identified in all patients one had a distal urethral tear proximal to the fossa navicularis and the other four had a proximal penile urethral injury.

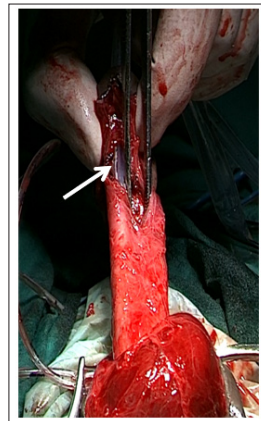


Figure 4: Intraoperative Identification of Injuries -Left Corporal Tear Held Open By Forceps, Distal Urethral Tear on Ventral Aspect (White Arrow)

Subcoronal circumferential degloving was the primary incision in four patients. A penoscrotal incision was required in one patient, owing to bilateral haematoma extension, delayed organisational haematoma, and obesity limiting subcoronal access. Simultaneous primary urethral repair was performed in all patients. Gitte's test was performed in all patients to confirm watertight closure and the absence of post-repair curvature.



Figure 5: Post-Repair Appearance- Restoration of Anatomical Continuity Following Simultaneous Corporal and Urethral Repair.

Three patients had no complications. One patient developed mild wound oedema on Day 3, resolving spontaneously (CD Grade I). One patient developed a localised scrotal wound infection on Day 7 requiring oral antibiotics (CD Grade II). No Clavien-Dindo Grade III or higher complications were recorded in any patient. There were no intraoperative complications (including bleeding, anaesthetic events) in any case.

At the most recent follow-up, IIEF-5 scores were: Patient 1—24 (no dysfunction); Patient 2—25 (no dysfunction); Patient 3—22 (borderline, improving trend); Patient 4—17 (mild dysfunction, multifactorial); Patient 5—25 (no dysfunction). Uroflowmetry was normal in four of five patients. One patient demonstrated a mildly reduced Qmax (12 mL/s) with a plateau flow curve; urethroscopy confirmed minimal mucosal scarring without clinically significant stricture, and the patient is on surveillance.



Figure 6 : Follow up Image at 6 Months

No patient developed urethral stricture requiring intervention, penile curvature (Peyronie-like fibrosis), or urethrocutaneous fistula at follow-up. No recurrent penile fracture was recorded in any patient during the observation period. Mean hospital stay was 2.8 days (range 2–5 days). All patients were discharged in satisfactory clinical condition.

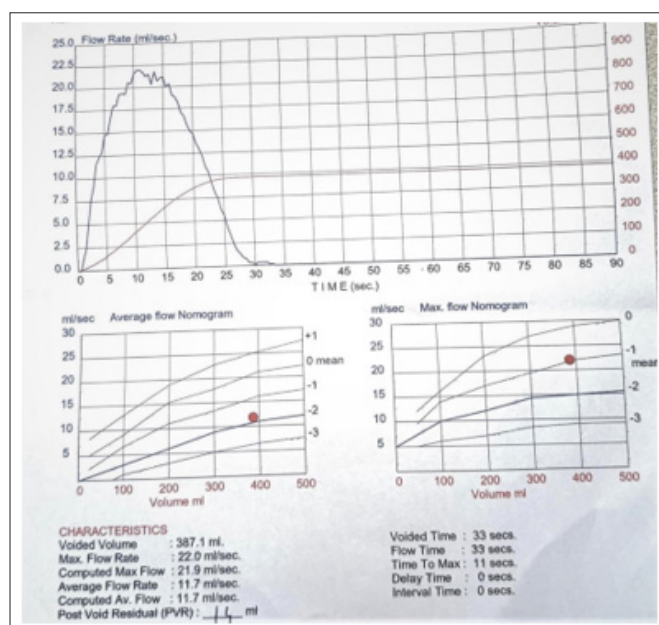


Figure 7 : Uroflowmetry on Follow Up at 6 Months

Discussion

Penile fracture represents a biomechanical failure of the tunica albuginea caused by an abrupt rise in intracavernosal pressure rather than by direct tissue laceration alone. During normal erection, intracavernosal pressure approximates 100 mmHg, whereas the tensile strength of the tunica albuginea permits it to withstand pressures approaching 1500 mmHg. When an erect penis strikes the partner's perineum or pubic symphysis, the corpora cavernosa behaves as closed hydraulic cylinders filled with incompressible blood. The sudden bending force generates an instantaneous hydraulic pressure spike ("water-hammer" effect) that exceeds the tensile capacity of the stretched tunica, resulting in transverse corporal rupture. Extension of the tear ventrally into the corpus spongiosum explains the occurrence of concomitant urethral injury, particularly in patients with bilateral corporal rupture [4].

Proximal urethral injuries are commonly produced by the most frequent coital mechanism in which the partner's perineum or

thigh applies an abrupt dorsoventral bending force to the erect penis at or near the penoscrotal junction [5].

Barros et al. confirmed in their narrative review that the vast majority of urethral injuries in penile fracture involve the proximal urethra, with only a small proportion involving distal sites [4].

Distal urethral injuries, with a tear proximal to the fossa navicularis, are considerably rarer. Rare reports of distal corporal rupture extending into the corpus spongiosum and distal urethra suggest glans-directed bending potentially concentrating shearing stresses within the distal urethra [6].

The diagnosis of penile fracture is predominantly clinical. Ultrasonography confirmed the tunical defect without CT radiation exposure in all patients, and cystoscopy provided direct urethral injury localisation with superior specificity to retrograde urethrography. A recent systematic review (Wang et al., 2025) reported MRI's superiority and noted its value in directing incision without full degloving in selected cases; however, imaging must not delay theatre [7].

The distal urethral injury in one of our patients (proximal to the fossa navicularis) aligns with reports by Kupeli et al. and Barros et al. confirming that distal injuries represent fewer than 5% of urethral injuries in penile fracture [4]. prospectively confirmed that concomitant urethral repair does not adversely affect functional outcomes and yields a stricture rate below 8% at 26 months, consistent with our series [5]. demonstrated a 21% urethral injury rate nationally yet formal evaluation in only 23% of patients, reinforcing that clinical triggers (meatal blood, haematuria, voiding difficulty) must systematically activate urethral assessment [8]. Von confirmed that 54% of patients with suspected penile fracture may have an alternative diagnosis; in our patients, imaging served a confirmatory rather than diagnostic role, validating the AUA's principle that typical presentations proceed to theatre without mandatory pre-operative scanning [9].

Whereas more proximal urethral injuries may require extended exposure, distal urethral tears can usually be adequately accessed and repaired through a circumferential subcoronal degloving incision alone. As in our 4 cases, complete exposure and repair were achieved without additional perineal dissection, thereby avoiding unnecessary morbidity [10].

The 2025 meta-analysis by Ismail et al. demonstrated a 64% reduction in post-operative erectile dysfunction with early repair [11]. On follow-up, four patients had IIEF-5 score ≥ 22 (one of whom had a scar under surveillance) and one had mild ED.

The primary advantage of the described management protocol is its systematic approach to urethral evaluation in all patients with penile fracture, regardless of clinical urethral symptoms. Gitte's testing as a universal intraoperative quality-assurance step ensures watertight closure in all cases.

Conclusion

Penile fracture encompasses a heterogeneous clinical and anatomical spectrum, ranging from isolated tunical rupture to complex multi-site injuries involving the urethra, bilateral corpora, and perineal soft tissues. This case series demonstrates that systematic intraoperative cystoscopy enables accurate identification of urethral co-injury in a significant proportion of patients and guides precise simultaneous primary repair.

Subcoronal degloving remains the preferred approach for most patients, with extended incisions reserved for extensive haematoma and complex anatomical disruption. Early surgical repair guided by anatomy and injury mechanism yields excellent functional outcomes in terms of erectile and voiding function at intermediate-term follow-up.

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