

Penile Fractures

Evaluation and Management

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KEYWORDS

- Penile fracture • Penile rupture • Penile trauma • Urethral injury • Corpus cavernosum
- Collagenase clostridium histolyticum

KEY POINTS

- Penile fracture is a urologic injury with unique etiologies depending on geography and culture.
- Diagnosis of penile fractures can be made based on history and physical examination alone, but ultrasound or MRI can be helpful adjuncts.
- Patients should be evaluated with retrograde urethrogram or cystoscopy when urethral injury is suspected.
- Surgical management is favored over conservative measures to improve outcomes.

INTRODUCTION

Penile fracture is a urologic injury defined as the disruption of the tunica albuginea with rupture of the corpus cavernosum, usually occurring as blunt trauma to the erect penis during intercourse.¹ Although penile fracture is a clinical diagnosis using history and physical examination, imaging is evolving as a helpful adjunct. Immediate surgical management is the standard of care per AUA and EUA guidelines.^{2,3}

EPIDEMIOLOGY

The incidence and etiology of penile fractures is highly variable based on geography. The incidence of penile fractures in the United States is reported at 1.02 per 100,000 men per year,⁴ although a rate as high as 10.48 per 100,000 men has been reported in a specific area of Iran.⁵ The most common etiology of penile fracture in the United States is sexual intercourse,^{6,7} representing 46% of cases in a recent meta-analysis.⁸ Other causes include forced flexion of the penis (21%), masturbation (18%), and rolling over on the erect penis (8.2%).⁸ The incidence of fracture

occurring during sexual intercourse has been reported as up to 94% of cases,⁹ whereas it was the reported cause in just 7.9% of cases in an Iranian series.¹⁰ In Middle Eastern and Northern African countries, up to three-quarters of fractures are due to the practice of Taqaandan, the manual bending of the erect penis to achieve detumescence.^{5,10} In Japan, masturbation was found to be the most common cause, with sexual intercourse representing only 19.9%.¹¹

Penile fracture during intercourse is a result of the erect penis forcefully striking the perineum or pubic bone.¹ During heterosexual intercourse, the “woman on top” and rear-entry “doggy style” positions are associated with the highest risk of penile fracture, with the latter associated with more severe injuries.^{3,7,12} Penile fractures may occur more commonly in stressful situations, such as illicit or extramarital sexual intercourse.¹³

A rising contributor to penile fractures is the use of Collagenase Clostridium Histolyticum (CCH) injections for the treatment of Peyronie’s disease. In a safety analysis of patients receiving CCH injections, 0.5% of patients had surgically confirmed fractures,¹⁴ an approximate 500-fold increase from reported incidence in the general population.

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An additional study suggests the rate of fracture after CCH injection may be even higher at 4.9%, with majority (80%) occurring between 15 and 19 days.^{14,15} Penile fractures after CCH injections can occur without any intercourse/manipulation, as up to 31% result from nocturnal erections alone.¹⁶ The severity of these fractures tends to be lower and management is more likely to involve a nonoperative approach.

PRESENTATION

The tunica albuginea is a strong fascial layer, which envelopes the corpora cavernosa and helps maintain erections. The normal tunica albuginea is 2 mm thick,¹⁷ but thins to 0.25 to 0.5 mm during an erection, losing elasticity.^{18,19} During normal erection and intercourse, intracorporal pressures increase to several hundred mm Hg. The tunica can withstand pressures up to 1500 mm Hg before rupture.^{19,20} The ventrolateral tunica has less collagen deposition and thus is thinner²¹; almost all penile fractures occur on the ventral or lateral aspect of the penis.¹⁰ The vast majority of penile fractures occur in the proximal or midshaft, and nearly all occur distal to the suspensory ligament.^{6-8,18} Rupture of the albuginea is usually unilateral (86%–96%), and more commonly right-sided (up to 74%).^{19,22,23}

Rupture of the tunica albuginea usually occurs with an audible “pop” (69%); other presenting symptoms include pain, swelling, and rapid detumescence^{1,6,18,23,24} (Fig. 1). On physical examination, hematoma is the most common finding, present in nearly all cases.²³ If Buck’s fascia remains intact, a localized clot may form over the site of injury, which can be felt as an immobile lump when rolling a finger over the area (“rolling sign”).^{19,25–27} The “rolling sign” may be more appreciable in delayed presentations when edema and swelling have improved.²⁸ Likewise, when

Buck’s fascia remains intact, the classic “eggplant deformity” may develop, in which the swollen and bruised phallus deviates away from the injury due to mass effect.^{1,19} Conversely, in penile fractures with concomitant disruption of Buck’s fascia, hematoma can expand to scrotum, perineum, and suprapubic region, creating the “butterfly sign”.^{1,18,23} Gross or microscopic hematuria, blood at urethral meatus, and/or inability to urinate should raise concern for urethral injury, which occurs in 5.6% of cases.^{8,29}

DIAGNOSIS

The diagnosis of a penile fracture can be made with a careful history and physical examination.^{1,8} Patients presenting with audible “pop” followed by detumescence, swelling, and positive “rolling” signs have an underlying penile fracture in virtually all cases. “False” fractures are penile vascular injuries (superficial dorsal vein, deep dorsal vessels, or nonspecific bleeding from dartos) usually occurring during intercourse and can mimic penile fractures.^{30,31} Key clinical differences include absence of rapid detumescence, ability to achieve an erection after injury, and absence of palpable tunical defect.^{30–32} Although snapping sound can be heard with false fractures, it is less common, occurring in only 22% of patients.³³ Another uncommon mimic is suspensory ligament rupture, which can be differentiated by lack of detumescence, minimal bruising/pain, penile hypermobility, and palpable gap between base of penis and pubic bone.^{19,34}

Imaging for suspected fracture can be considered per AUA and EUA guidelines (Fig. 2), when diagnosis is unclear and may provide reassurance that tunica is intact.^{1–3} Imaging can also be useful in the localization of injury. Ultrasonography has become the preferred imaging modality to evaluate penile fractures, as it is fast, readily available, and inexpensive.¹ Although highly operator dependent, ultrasound has proven to be quite accurate with sensitivity up to 88% and specificity up to 100%.^{22,25,35} Ultrasound findings include disruption of the tunica (hypoechoic line or area) and/or intracavernosal or extracavernosal hematomas.^{35–37} The “Turkish Eye” sign describes the appearance of an intracavernosal hematoma as a hypoechoic region surrounded by the echodense corpora, which can reliably diagnose penile fractures.³⁷ Urethral evaluation is difficult with ultrasound, but evidence of a distended proximal urethra or air within the corpora should raise suspicion for urethral rupture.^{38,39}

Magnetic resonance imaging (MRI) is another accurate means for detecting penile fractures,^{35,40–42} but its use is limited by cost and



Fig. 1. A 50-year-old man presenting after penis hit tailbone during sex, causing acute pain, loud snap, and rapid detumescence; voiding small amount of bloody urine.

| | Imaging Findings | Reliability | Strengths | Weaknesses |
|------------------------------|--|---|--|--|
| Ultrasound | Disruption of the hyperechoic line around the corporal bodies, intra- or extra-cavernosal hematomas ("Turkish Eye" sign) | Sensitivity up to 88% Specificity up to 100% | <ul style="list-style-type: none"> Fast Inexpensive Readily available | <ul style="list-style-type: none"> Operator dependency Poor urethral evaluation |
| MRI | Disruption of the tunica albuginea (low-signal intensity layer). | Sensitivity and negative predictive value of 100% | <ul style="list-style-type: none"> Operator independent Accuracy May also detect corpus spongiosum disruption | <ul style="list-style-type: none"> Availability Cost Time-consuming |
| Cavernosography | Injection of dye under live fluoro reveals extravasation | False negative rate of 28% | Useful when fracture suspected but not found intra-operatively | <ul style="list-style-type: none"> Operator dependency Time-consuming Invasive Risk of complications |
| RUG and/or cystoscopy | Urethral disruption; extravasation of contrast | | Ability to detect urethral injury | <ul style="list-style-type: none"> Time-consuming |

Fig. 2. Diagnosis of penile fractures can be made with a careful history and physical examination. However, imaging can be useful in certain clinical scenarios.

availability. The tunica albuginea appears as a low-signal intensity layer on MRI, and its disruption can easily be detected.⁴⁰ MRI is operator-independent and has been proven to be superior to ultrasound with regard to accuracy. Both the sensitivity and negative predictive value of MRI in the diagnosis of penile fractures is 100%,^{40,42,43} and localization accuracy is 97%.³⁵ This high rate of localizing the disruption may allow surgeons to make an incision directly over the defect.⁴¹ Although MRI can also detect disruptions of corpora spongiosum, its accuracy is lower with sensitivity of 60% and specificity of 78%.⁴³

EUA guidelines cite cavernosography as an additional option,³ although its use in the initial evaluation of penile fractures is limited because of its time-consuming nature and unfamiliarity among most urologists and radiologists.^{1,44} Cavernosography involves the injection of an erectogenic agent to facilitate tumescence; after a degree of tumescence is obtained, contrast is injected into the corpora under live fluoroscopy.^{18,23} Cavernosography has a high false-negative rate of up to 28%.^{45,46} Cavernosography also carries the risks of pain, infection, corporal fibrosis, and priapism.^{23,44,47,48} This technology may be useful in intraoperative settings when a fracture is suspected but not discovered.¹⁹

Because the aforementioned imaging studies have relatively poor accuracy with regards to urethral injuries, AUA and EUA guidelines recommend either retrograde urethrogram (RUG) or

cystoscopy at the time of surgical intervention if urethral injury is suspected^{2,3} (**Fig. 3**). Urethral injury should be suspected in patients with gross or microscopic hematuria, difficulty voiding, or blood at meatus.^{8,29} In addition, RUG or cystoscopy should be performed in the setting of bilateral rupture, as concomitant urethral injury is near ubiquitous in this circumstance.^{7,22,27,29}

MANAGEMENT AND OUTCOMES

Conservative management of penile fractures includes application of hot or cold compresses, pressure dressings, suppression of erections, and anti-inflammatory drugs.¹⁸ Conservative



Fig. 3. Retrograde urethrogram concerning for concomitant penile urethral injury.

management has fallen out of favor because of higher complication rates and inferior erectile preservation outcomes compared with surgical management.^{8,49–52} Specifically, conservative management is associated with a greater risk of penile curvature, erectile dysfunction, painful erections, arteriovenous fistulas, and infections.^{8,51,52} Conservative management is also associated with prolonged hospitalizations.^{8,49,51}

Urgent (not necessarily emergent) surgical repair is considered the standard of care for penile fractures.²⁸ In absence of urethral injury, delay of surgery does not seem to be overly detrimental with regards to outcomes. Kozacıoğlu and colleagues⁵³ found no difference in erectile dysfunction, penile curvature, or painful erections when comparing surgery within 6 hours, 6 to 12 hours, and 12 to 24 hours of injury. Some advocate for even longer delay of 7 to 12 days so that edema may resolve and the site of injury can be better appreciated.^{28,54} In a study of 24 patients with unilateral penile fractures without urethral involvement, a 7 to 12 day delay with an incision directly over injury was not associated with any long-term complications.⁵⁴ In a systematic review of immediate (<24 hours) and delayed (>24 hours) surgical repair, there was no difference in erectile dysfunction, nor scar formation. There was a statistically significant increase in the rate of penile curvature in the delayed group, but in most cases, this was mild and exerted no negative effects on sexual function.⁵⁵ In a large retrospective study, Bozzini and colleagues⁵⁶ did note a statistically significant correlation between erectile dysfunction and undergoing surgery beyond 8.23 hours;

this may not yield clinical significance given only mild erectile dysfunction noted.

Multiple surgical approaches to fracture repair have been described including circumferential degloving, inguinoscrotal, midline ventral penoscrotal, and lateral. There is no data suggesting any approach is universally superior.⁵⁷ The main advantage of the subcoronal circumferential incision is maximum exposure, allowing examination of all 3 corporal bodies and reducing the risk of missing a bilateral injury or urethral injury.^{1,18,23,57} The disadvantage of the circumferential degloving approach is the extensive dissection, which can lead to decreased sensation and rarely, skin necrosis.^{23,54,58} This incision also makes exploration of the proximal penis difficult, especially when there is a large amount of hematoma or tissue edema. The ventral midline penoscrotal incision allows excellent exposure of the site of most penile fractures (proximal, ventral, and lateral) and the urethra^{1,59} (Fig. 4). A direct longitudinal incision directly over the fracture site may be beneficial when location of the fracture is known and there is no concern for bilateral or urethral involvement.^{1,28,54,60} This approach may be performed under local anesthesia and allows for less dissection; it has generated satisfactory outcomes in immediate and delayed settings.^{28,54,60,61}

Regardless of the incision of choice, the key principles in surgical repair of penile fractures are exposure, evacuation of hematoma, identification of the site of injury, wound toilet and debridement, suturing of tears in tunica albuginea, and urethral repair as needed.¹⁹ Closure of the tunical defect should be performed with 2-0 or 3-0 absorbable



Fig. 4. Ventral midline penoscrotal incision provides excellent exposure, allowing the penile fracture (blue arrow) and concomitant urethral injury (green arrow) to be identified.

sutures in an interrupted or running fashion.^{1,8,26,41} Palpable suture can be avoided by inverting the knots.^{10,27} After tunica closure, some experts recommend artificial erection with saline or methylene blue to assess for leak in the repair and separate injuries.^{1,19,27,46,57} Urethral defects should be repaired over a catheter with fine (4-0 or 5-0) absorbable suture^{1,19,29,57,62,63} (Fig. 5). The catheter should remain in place for at least 7 to 10 days.⁵⁷ Postoperatively, patients should be advised to abstain from sexual intercourse for 4 to 6 weeks, as early erections may lead to dehiscence of the corporal repair.^{1,9,41,48,62}

Although surgical repair is superior to conservative management, postoperative complications occur at a rate of approximately 20%.⁸ The most common complications are palpable penile nodule (13.1%), penile curvature (2.8%), erectile dysfunction (1.9%), painful erections (1.4%), and wound infections (0.2%).⁸ Despite erectile dysfunction being uncommon after surgical repair, many patients suffer from performance anxiety and fear of recurrence, which may affect sexual function.^{58,64} Surgical repair of urethral disruption in the setting of penile fractures does not seem to predispose to urethral stricture disease.⁶⁵

Of note, the management of post-CCH fractures remains controversial. A survey of clinicians (specifically, members of the Sexual Medicine Society of North America [SMSNA]) who administer CCH and had experience managing postinjection fracture indicated that the vast majority (85%) of post-CCH fractures occurred at the location of Collagenase injection. Most participants (62%) reported that the tunica tissue at the time of surgical repair was of worse quality than what is typical in penile fracture. Of the 44 cases reported in the survey, 33% were managed nonoperatively; SMSNA members reported no significant difference between surveillance and surgery with regards to sexual function, curvature, and patient satisfaction.¹⁶ Larger data sets and long-term data are required, but initial experience appears to indicate

that conservative management may be appropriate in some cases of post-CCH penile fractures.

SUMMARY

Penile fracture is a urologic injury with an etiology that varies based on the cultural milieu. Diagnosis can be made based on history and physical examination alone. Patients should be evaluated with RUG or cystoscopy when urethral injury is suspected. Ultrasound or MRI is a helpful adjunct when the diagnosis is unclear, and can assist in identifying the location of the rupture. Surgical management is favored over conservative measures to improve outcomes. Delayed surgical repair may not be inferior to immediate intervention.

CLINICS CARE POINTS

- Penile fractures require urgent urologic evaluation.
- Diagnosis should be promptly made with careful history and physical exam.
- Imaging to aid in the diagnosis can be considered when diagnosis is unclear.
- Immediate surgical exploration remains the standard of care.

DISCLOSURE

The authors have nothing to disclose.

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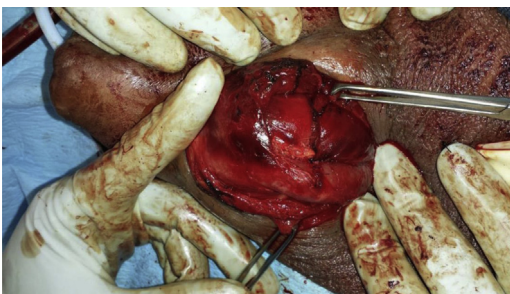


Fig. 5. Repair of the tunical defect, and closure of urethral defect over catheter.

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