

### Evaluation and Management of Penile Fracture\*

*Learning Objective:* At the conclusion of this continuing medical education activity, the participant will be able to describe the etiology and pathophysiology of penile fracture. He or she will also be able to discuss the prognosis, proper workup, diagnosis, treatment options and patient counseling for penile fracture.

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## INTRODUCTION

Penile fracture is a rare urological injury that is defined as rupture of the tunica albuginea of the corpora cavernosa as a result of blunt or bending trauma to the erect penis.<sup>1</sup> Conservative management of penile fracture was first reported in the 10th century by the physician Abulcasis<sup>2</sup> and was the mainstay of therapy until the 20th century, when Fetter and Gartman described the first surgical repair of a penile fracture in 1936.<sup>3</sup> Since then, surgical management has been shown in multiple studies to lead to superior patient outcomes and fewer complications vs non-operative management, and it is now the standard of care per American Urological Association and European Association of Urology guidelines.<sup>4,5</sup> Although this injury is typically diagnosed using history and physical examination alone, over the past few decades different imaging modalities have been found to be helpful when the diagnosis is unclear. This Update will discuss the epidemiology, presentation, diagnostic workup and management of this condition.

## EPIDEMIOLOGY

Penile fracture can occur anytime there is blunt trauma or a significant mechanical force applied to the erect penis. The incidence is reported at 0.29–1.36 per 100,000 males,<sup>6–8</sup> although in the Middle East the occurrence is as high as 1.14–10.48 per 100,000 males.<sup>9</sup> This injury most commonly involves men between 20 and 40 years of age.<sup>10–20</sup> Due to embarrassment or cultural taboos, patients may delay seeking medical attention and may not provide an accurate history.<sup>21</sup>

**A recent meta-analysis of 58 studies from 26 different countries involving 3213 patients showed that the most common presenting etiologies of penile fracture were sexual intercourse (46%), forced flexion of the penis (21%), masturbation (18%) and rolling over onto an erect penis (8.2%).**<sup>22</sup> However, the typical mechanism of injury varies greatly by region and culture. In Western countries penile fracture most commonly occurs during vigorous intercourse, accounting for more than 75% of patient presentations.<sup>10,13,15,23–29</sup> Here the injury is often the result of missed intromission against the pubic bone or the perineum. In certain regions of the Middle East and North Africa coital injury is a less frequent cause of rupture and accounts for only 7.9% of observed fractures.<sup>11</sup> In these areas self-inflicted injury from the practice of “Taqaandan” (meaning “to click” in Kurdish) accounts for the majority of presentations.<sup>9,11,16,30</sup> Taqaandan involves forceful, quick bending of a distal part of the shaft of the erect penis while holding the proximal shaft stationary, often done out of habit, for pleasure and/or to achieve detumescence.<sup>11,16</sup> In Japan only 19.9% of penile fractures occur during intercourse, while masturbation is the most common etiology.<sup>17</sup> More obscure cases reported in the literature include falling out of bed onto an erect penis, placing an erect penis into tight pants, a kick to an erect penis

from a cow and an injury sustained while masturbating with a vacuum cleaner.<sup>1,7,22,24</sup>

An emerging trend in the incidence of penile fracture is occurrence following collagenase clostridium histolyticum injections in the treatment of Peyronie’s disease. In a pooled safety analysis of patients who received at least 1 dose of CCH, including patients from IMPRESS (Investigation for Maximal Peyronie’s Reduction Efficacy and Safety Studies) I and II, the reported rate of surgically confirmed penile fracture was 5 in 1044 (0.5%), with an additional 9 patients (0.9%) suspected of having corporal rupture based on symptoms and examination findings who were managed without surgical intervention.<sup>31</sup> Other studies have suggested that the rate may be higher, including a study that demonstrated fracture in 4.9% of patients, with 80% of these injuries occurring 15 to 19 days from the time of injection.<sup>32</sup> Additionally in a survey of members of the SMSNA 34% of respondents reported having had experience with patients suffering from penile fracture after CCH administration.<sup>33</sup> While sexual activity is the most common predisposing factor, spontaneous rupture with no manipulation may occur with nocturnal erections in 31% of CCH treated patients presenting with penile fracture.

**Penile vascular injuries, or “false” fractures, can closely mimic rupture of the tunica albuginea and result from rupture or avulsion of the penile superficial dorsal vein, deep dorsal vein or artery, or may be due to non-specific dartos bleeding.**<sup>14</sup>

<sup>34</sup> False fracture is seen in 5%–18% of men presenting with concern for penile fracture, with sexual intercourse being the causative factor in the majority,<sup>10,14,25,34–37</sup> although this is less common in regions where non-coital injuries are more prevalent, affecting as few as 2.8% of patients in these areas.<sup>11</sup>

## PRESENTATION

During an erection the tunica albuginea functions to prevent blood from escaping the corpora cavernosa and maintain the erect state. Based on anatomical studies, the elastic and collagenous tunica is thinner ventrally due to decreased collagen deposition.<sup>38,39</sup> When the penis is flaccid, the tunica albuginea is about 2 mm thick but this tissue thins to 0.25–0.5 mm during an erection.<sup>1</sup> During typical intercourse intracavernous pressure increases to around 100–180 mm Hg.<sup>8,40</sup> However, this tissue is robust and can withstand pressures up to 1500 mm Hg before rupture.<sup>38</sup>

The majority of penile fractures can be diagnosed with a careful history and physical examination. **Rupture of the tunica albuginea occurs after a rapid increase in intracorporal pressure caused by an impaction or rapid bending of the erect penis. This disruption of the tunica albuginea and subsequent exposure of the corpora cavernosa often occurs with an audible “snap” or “pop” that is followed by rapid detumescence and bleeding that can fill all fascial components between the skin and the fractured tunica. The classic “eggplant deformity” of penile ecchymosis, swelling and occasionally a lateral deviation of the penis occurs when the tunica albuginea is violated but Buck’s fascia remains intact (fig. 1).** Penile deviation is caused by mass effect from hematoma, which is often palpable. **In the**

**ABBREVIATIONS:** AUA (American Urological Association), CCH (collagenase clostridium histolyticum), EAU (European Association of Urology), ED (erectile dysfunction), MRI (magnetic resonance imaging), RUG (retrograde urethrogram), SMSNA (Sexual Medicine Society of North America), US (ultrasound)

scenario of simultaneous disruption of Buck's fascia ecchymosis and swelling can extend to the scrotum, suprapubic region or perineum, resulting in a "butterfly" hematoma.<sup>41</sup> Tunical and cavernous injuries of the flaccid penis should not be regarded as penile fractures due to the different nature of the injury.<sup>1,41</sup>

On physical examination penile hematoma is the most common finding, occurring in up to 100% of cases.<sup>15, 16, 20, 25, 26, 30, 37</sup> Other common manifestations, as reported in a large review, are penile swelling (86%), rapid detumescence (79%), penile pain (79%), an audible cracking sound (69%) and penile devia-



**Figure 1.** "Eggplant deformity" of penis following penile fracture.

tion (57%).<sup>16</sup> Often clot can become trapped in a localized position under Buck's fascia and can be palpated on examination as a smooth, immobile lump at the fracture site when rolling one's finger over this deformity, which is called a "rolling sign."<sup>8, 42</sup> Several studies have shown positive "rolling signs" in 25%–96% of patients.<sup>30, 42, 43</sup> **The presence of all 4 signs of penile bruising/swelling, immediate detumescence, an audible "snap" and a positive "rolling sign" is virtually diagnostic, with a reported sensitivity, specificity, positive predictive value and negative predictive value of 100% each.**<sup>42</sup>

Given the common mechanisms of injury and the fulcrum required to overcome the tensile strength of the tunica albuginea, it fits that 88%–100% of observed penile fractures occur in either the proximal or mid shaft.<sup>10, 12, 17, 20, 25, 30, 44, 45</sup> Nearly all penile fractures occur distal to the suspensory ligament.<sup>1, 46</sup> Unilateral fracture is more common than bilateral fracture in all case series. For unknown reasons fracture of the right corpus cavernosum is typically more common than the left, with multiple studies showing the right corporal body to be preferentially involved in 52%–74% of patients.<sup>2, 10, 11, 17, 25, 26, 30, 37, 45</sup> **While the fracture location on the circumference of the penis often is unreported, nearly all fractures occur ventrally or laterally,<sup>11, 25</sup> which corresponds to the areas of the tunica albuginea**

**that are naturally more thin.** The tunical defect is found to be transverse in 60%–100% of patients undergoing surgery,<sup>20, 30, 47, 48</sup> and is typically 0.5–4 cm long, with most studies indicating a mean length of 1–2 cm.<sup>2, 47–49</sup>

The majority of penile fractures do not involve the corpus spongiosum or urethra. Results from a large meta-analysis suggest urethral involvement in 5.6% of patients.<sup>22</sup> However, there is a marked geographic variation in reported rates of urethral injury. In Western countries the observed rate of urethral involvement is 10%–30%,<sup>1, 10, 15, 23–29</sup> while in Asian and Middle Eastern countries the rate is 1.4%–4.4%.<sup>2, 11, 49, 50</sup> This difference could be due to the contrasting force of injury sustained during the prevailing fracture etiologies in the 2 groups, ie vigorous sexual activity vs manual manipulation. **There is a strong association between bilateral corporal involvement and urethral injury. Multiple studies have demonstrated that all patients in their cohorts with bilateral penile fractures had a concomitant urethral injury.**<sup>10, 12, 26, 30, 36, 37, 51</sup> Blood at the meatus is seen in 8%–28% of patients,<sup>12, 13, 15, 23, 25, 30, 37, 51, 52</sup> and some degree of voiding difficulty up to acute retention is observed in 1%–18% of cases.<sup>12, 16, 21, 23, 50</sup> **It is noteworthy that while patients with urethral injury often present with these symptoms, their presence does not confirm urethral involvement and their absence does not preclude urethral injury.**<sup>13, 16, 22</sup>

Patients presenting with false penile fractures will often have presenting symptoms that are similar to or indistinguishable from those with "true" tunical rupture. Penile shaft ecchymosis and edema are seen in almost all patients with penile vascular injuries. **However, some key differences that suggest a potential false penile fracture include gradual rather than immediate post-injury detumescence, the ability to achieve an erection following injury and the absence of a palpable tunical defect.**<sup>14, 34, 53</sup> While audible "snaps" can be present in patients with false fracture, it is much less common than in patients with confirmed fracture.<sup>14, 34, 35, 53</sup> In a study by Dias-Filho et al of 65 patients presenting with concern for fracture those with a false fracture heard an audible "snap" significantly less frequently than the cohort with true fracture (22% vs 74%).<sup>35</sup> Because the superficial dorsal vein is external to Buck's fascia, rupture of this vessel can lead to ecchymosis that spreads to the scrotum, perineum or pubic area, and false fracture should be considered in patients with this pattern of bruising. While most patients with penile fracture present within 24 hours of injury, the average patient with false fracture tends to present nearly 74 hours later.<sup>9, 10, 23, 25, 26, 49, 50, 54</sup> Additionally patients with confirmed penile fracture tend to be younger than those with isolated vascular injury.<sup>10</sup>

Case reports of avulsion or rupture of the penile suspensory ligament are extremely uncommon.<sup>8, 55</sup> Patients tend not to experience detumescence, and the pain and bruising are reportedly minimal compared to penile fracture or penile vascular injuries. Instead, severe penile hypermobility is noted, which makes penetration difficult. A palpable gap between the base of the penis and the pubic bone is noted on examination.

Diagnosis of post-CCH injection penile fracture can also be challenging. Some degree of penile ecchymosis and edema occurs in up to 85% of patients following injection and generally resolves without intervention,<sup>31, 33</sup> although history and examination findings typical of penile fracture, if present, should raise clinical suspicion for tunical injury. **In the SMSNA survey the site of tunical rupture was located over the treated**

**plaque in 84% of cases.**<sup>33</sup> Initial safety analyses showed that fractures often occurred within 5 days of treatment,<sup>31</sup> although more recent data have demonstrated that up to 44% of these fractures occur in a delayed fashion, at 14–30 days after an injection cycle.<sup>32,33,56</sup> **Patients should be advised to abstain from restarting intercourse or masturbation for 30 days following a treatment cycle as sexual activity in this setting is a major risk factor for fracture.** Penile modeling in this period is another potential hazard,<sup>56</sup> although it is noteworthy that penile fracture may occur in up to 31% of CCH treated patients without manipulation as a result of spontaneous erections.<sup>32,33</sup>

## IMAGING AND WORKUP

Although penile fracture is largely a clinical diagnosis, use of adjunctive imaging can be considered in select patients. Both AUA and EAU guidelines suggest that ultrasound and magnetic resonance imaging can be considered for equivocal cases, with EAU guidelines also stating that cavernosography is an option.<sup>4,5</sup> A recent consensus document published by the British Association of Urological Surgeons, Section of Andrology and Genito-Urethral Surgery also proposes that US can confirm the diagnosis and map the location of the tunical tear to help plan the appropriate surgical approach.<sup>57</sup>

**Cavernosography.** Although classically used and currently mentioned within EAU guidelines, penile cavernosography has fallen out of favor in current clinical practice and remains controversial. In multiple studies the false-negative rate was as high as 15%–28%.<sup>48,52,58</sup> These false-negative results can be due to an overlying hematoma causing a “ball valve” effect on the site of rupture,<sup>21,58</sup> or simply due to poor interpretation of the images given that most urologists and radiologists are unfamiliar with cavernosography.<sup>1,59</sup> There are additional reported risks of infection, adverse reactions to contrast medium in some patients, priapism and induction of corporal fibrosis.<sup>1, 7, 41, 46, 59, 60</sup> Thus, there has been a push toward performing US or MRI if a diagnostic imaging study is warranted.

**Ultrasound.** US is the most commonly used complementary imaging modality for assisting in the diagnosis of penile fracture.<sup>46</sup> US can be performed quickly, is readily available in most emergency settings, and is non-invasive and inexpensive. **US can be fairly accurate in the diagnosis, with sensitivity as high as 88%,<sup>20</sup> specificity and positive predictive value of 100%,<sup>20, 36, 42</sup> and the ability to correctly map the exact location of tears with 81% accuracy.<sup>20</sup>** Color Doppler can also help delineate the relationship between hematoma and penile vasculature.

Penile ultrasound should be performed with real-time B-mode scanning and color Doppler using a high frequency (7.5–12 MHz) linear probe in the longitudinal and transverse planes along the entire length of the penile shaft.<sup>60–65</sup> **On US the tunica albuginea appears as a thin hyperechoic line enveloping the corpora.<sup>62–64</sup> After corporal rupture US can often depict the exact location of the tear, which is seen as an interruption of this line.<sup>20, 63</sup>** In addition to a visible tunical defect, the presence of an intracavernous hematoma, seen on US as a hypoechoic region surrounded by the echo dense corpora, can reliably diagnose penile fracture.<sup>61</sup> Hematomas can be exclusively intracavernous in up to 60% of penile fractures.<sup>20</sup> During evaluation for penile fracture the location (proximal/mid/distal and dorsal/ventral) and size of any observed fracture or hematoma should be noted, and a mark should be placed on the overlying skin to indicate the fracture location.<sup>57, 65</sup>

Limitations of US include its highly operator dependent nature, ie specific expertise is required due to the rarity of penile fractures. Additionally small tears in the tunica albuginea can quickly be filled with clot that can be indistinguishable from the tunica, leading to relative inaccuracy in diagnosis compared to MRI.<sup>20, 36, 42</sup> Ultrasound also performs poorly in identifying tunical rupture proximal to the base of the shaft.<sup>20</sup> Evaluation of the urethra is also normally limited with US, as it is typically collapsed within the spongiosum. **However, identification of a distended urethra is suspicious for urethral injury.<sup>65</sup> Air within the corpora cavernosa is also suggestive of urethral rupture and should be evaluated further.<sup>62, 63</sup>**

**Magnetic resonance imaging.** MRI is a potentially valuable and highly accurate tool in the workup and diagnosis of penile fracture. Compared to US, patients tend to physically tolerate MRI better as there is no manipulation or direct pressure to the penis. MRI is also operator independent and is significantly more accurate in detecting and localizing fracture.

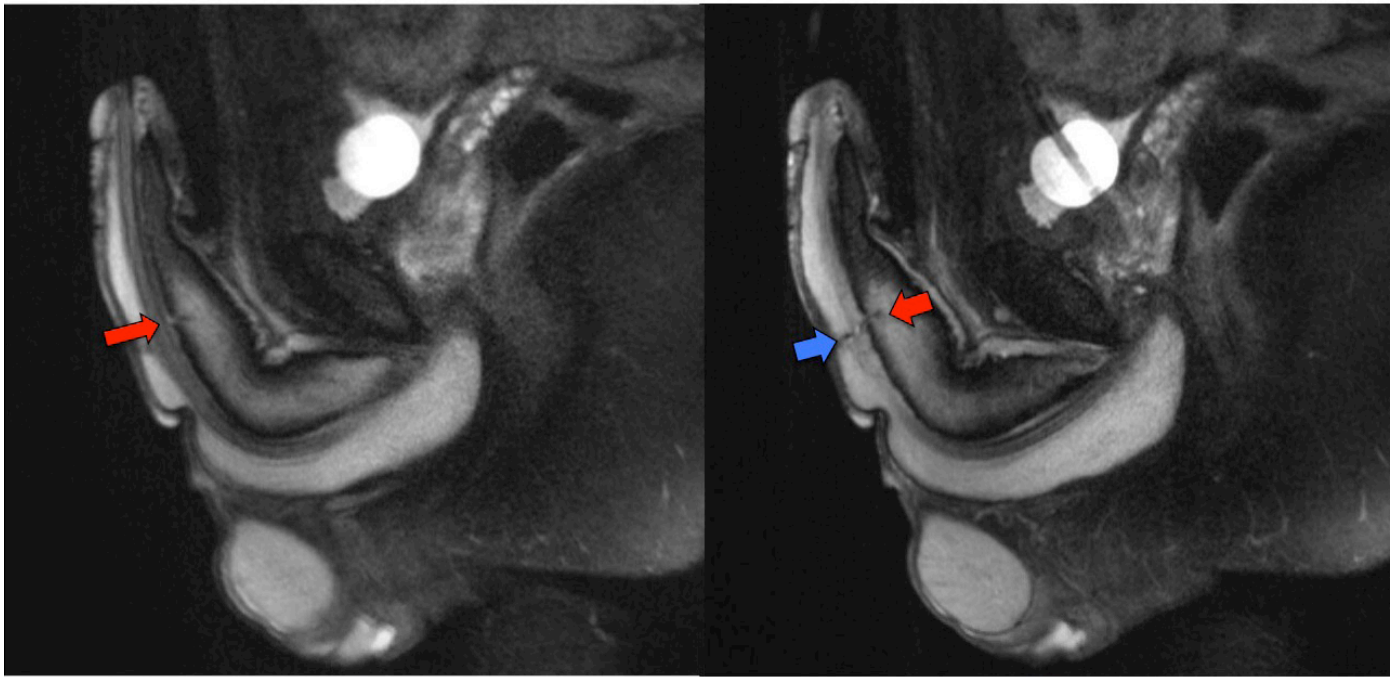
On MRI the tunica albuginea has a low signal intensity on standard T1 and T2-weighted images.<sup>20, 66, 67</sup> A penile fracture can be diagnosed as a discontinuity in this low signal intensity layer (fig. 2).<sup>20, 66</sup> Additionally associated injuries such as hematoma and corpus spongiosum injury can be detected. Typically a non-contrast MRI is sufficient to evaluate trauma to the penis.<sup>67, 68</sup>

MRI is far more accurate than ultrasound in diagnosing penile fracture. In multiple studies the sensitivity of MRI has been found to be 100% in the detection of tunical tears, with a negative predictive value of 100% and a mapping accuracy of 97%.<sup>20, 27, 45, 66</sup> **Additionally MRI can be particularly helpful in obtaining a diagnosis for patients who present with an atypical history and/or examination findings suggestive of fracture. MRI can detect up to 100% of tunical ruptures in these patients, including those with negative ultrasonographic findings.<sup>43</sup>** MRI can also detect injuries to the corpora spongiosum, although its diagnostic accuracy is far less than for rupture of the tunica. For injuries to the urethra and corpora spongiosum MRI only has a sensitivity of 60% and a specificity of 78.3%.<sup>27</sup> **Thus, when history and examination findings are suggestive of urethral injury, cystoscopy or retrograde urethrography is recommended.** The major limitations of MRI are its expense, limited availability in many emergency settings and time requirements involved.<sup>46</sup> **AUA guidelines suggest that MRI be limited to equivocal cases in which ultrasound is negative.<sup>4</sup>**

**Retrograde urethrography and cystoscopy.** Evaluation of the urethra should be performed whenever there is suspicion of involvement. RUG is typically used as a selective approach for patients with urethral bleeding or gross hematuria, voiding difficulty and bilateral corporal rupture confirmed by imaging or surgery.<sup>2, 8, 10, 18, 28, 42</sup> An alternative to RUG would be cystoscopy at the time of surgery to visually inspect the urethra. Cystoscopy in combination with appropriate surgical exposure is often enough to confirm the diagnosis and has become the more common practice.<sup>5, 28, 46</sup> **Both AUA and EAU guidelines suggest use of either cystoscopy or RUG at the time of surgical intervention if there is concern for urethral injury, citing that neither method is superior to the other and the urologist can use what is most readily available.<sup>4, 5</sup>**

## MANAGEMENT AND OUTCOMES

While penile fracture can be managed conservatively, multiple



**Figure 2.** Penile MRI in patient with equivocal presentation shows injury of tunica albuginea (red arrows) and corpus spongiosum (blue arrow).

studies have shown that long-term outcomes are superior with surgical intervention, which has become the standard of care. Typical complications of penile fracture can include erectile dysfunction, penile curvature, penile plaques and pain with intercourse, the incidence of which are reduced with surgical intervention.

*Conservative management.* Historically penile fracture was treated without operative intervention. Specific methods of conservative management vary between institutions but typically consist of pain control, penile splinting with a compressive dressing, Foley catheterization or suprapubic catheter placement, hot and cold compresses, estrogens or benzodiazepines to suppress erections, anti-inflammatory drugs and antibiotics.<sup>1,37,69</sup> However, studies have confirmed that operative management provides superior outcomes and reduced hospital stays,<sup>22, 37, 44, 49, 57, 69</sup> and patients should be counseled on the increased rates of adverse outcomes with non-operative management compared to surgery. **In a large meta-analysis patients managed conservatively had significantly more complications than those undergoing surgical repair, including increased rates of ED (22% vs 1.9%), penile curvature (17.1% vs 2.8%), palpable penile plaques/nodules (19.1% vs 13.1%), painful erections (5% vs 1.4%) and wound infection (2.3% vs 0.2%).**<sup>22</sup> Patients who are conservatively managed also tend to have longer hospitalizations, with a reported mean length of stay of 5.2 days vs 3.3 days for surgically treated patients.<sup>22, 49, 69</sup> If preoperative imaging and evaluation suggest an isolated vascular injury, conservative management can be considered.<sup>16, 34</sup> **However, it is the opinion of the authors that the long-term consequences of a negative exploration are far less compared to a missed penile fracture.**

It should be noted that there is no consensus on the management of patients presenting with penile fracture following CCH injection and some debate among experts as to whether surgical intervention is required in these select patients.<sup>32, 33</sup> **The majority of respondents (62%) in the SMSNA survey reported that**

**tissue quality at the time of repair of CCH related fractures was worse than for the typical patient with penile fracture.**<sup>32</sup> Since the rupture most often occurs at the site of injection in these patients, there is often degradation of the tissue surrounding the fracture site, which makes repair more difficult. In addition, the effect of the collagenase on the tunica is not a static process, and surgical repair may fail due to continued remodeling of the CCH treated tissue. Given these findings, Beilan et al suggest that in some cases surgical repair may necessitate significant patch grafting, which may not be feasible for most urologists.<sup>32</sup> In the SMSNA survey 33% of respondents managed these patients conservatively and reported that both conservative and surgical management had similar outcomes with regard to post-fracture curvature, ED rates, and patient and physician satisfaction.<sup>33</sup> Ultimately non-operative management of CCH associated penile fracture can be considered by the treating urologist based on clinical judgment. Because a minority of post-CCH penile fractures occur away from the injection site, it may be worthwhile to consider adjunctive imaging (US or MRI) in these patients.

*Surgical timing.* Currently most clinicians perform penile exploration and repair of the tunica within a few hours of patient presentation, and this timing is generally recommended for patients with urethral injury.<sup>9, 16, 46, 60</sup> **However, recent evidence suggests that in the absence of urethral injury a short delay in proceeding to surgery may not be detrimental to the patient and may allow for the case to be deferred to a more specialized or experienced surgeon, for preoperative medical optimization of the patient and/or for preoperative imaging to be performed.**<sup>16, 19, 22, 54, 70</sup> Studies examining the timing of surgical intervention in relation to long-term outcomes have shown that even if surgery is delayed more than 24 hours from the time of injury, there is little effect on the rates of ED, painful erections or penile curvature.<sup>19, 70, 71</sup> Delaying surgical repair beyond 24 hours from the time of injury may slightly increase penile curvature rates, although this curvature is typically reported as

mild with no interference in sexual function.<sup>19</sup>

**Surgical technique.** The key principles of surgical management in penile fractures are exposure, evacuation of the hematoma, identification of the fracture site, ligation of bleeding vessels, thorough wound toilet and débridement, suturing of tears in the tunica albuginea and urethral repair if needed.<sup>8</sup> There are multiple surgical incisions used with no clear consensus favoring one approach over another. These include a subcoronal circumferential (circumcising) incision, ventral penoscrotal incisions, smaller longitudinal incisions directly over the defect, inguinoscrotal incisions and lateral incisions.<sup>2, 14, 16, 22, 26-29, 37, 45, 54, 72</sup> The most commonly used approach in the literature is a subcoronal circumferential (circumcising) incision with degloving of the penile shaft (fig. 3). This method allows for evaluation and repair of injuries to all 3 corporal bodies and is useful in cases where the location of the tunical defect is unknown.<sup>1, 28, 49</sup> If this technique is used, it is generally recommended to perform a circumcision in uncircumcised patients to prevent preputial necrosis or other wound complications.<sup>15, 30</sup> Potential drawbacks of this approach are that it often requires incision through edematous tissue and hematoma, and typically requires extensive dissection that can lead to neurovascular injury or skin necrosis in some rare cases.<sup>51, 54, 71</sup>



**Figure 3.** Ligation of ruptured dorsal vein discovered after subcoronal circumferential degloving incision.

Another commonly used approach is a penoscrotal incision, which can be done in the midline or in a transverse fashion. Because the majority of penile fractures occur ventrally or laterally and in the proximal or mid shaft, this method allows for good visualization of most fracture sites without the need for extensive dissection and allows for visualization of all 3 compartments (fig. 4).<sup>10, 29, 57</sup> It also can avoid edema within the penile shaft or foreskin that would be encountered with a circumcising incision. In cases where neither bilateral injury nor urethral involvement is suspected and imaging confirms the location of the fracture a direct longitudinal incision over the fracture site provides an alternative approach that has shown similar long-term outcomes.<sup>49, 72, 73</sup>

Placement of a catheter is generally recommended before surgical intervention in cases without suspicion of urethral rupture in order to more easily identify the urethra intraoperatively and prevent iatrogenic injury.<sup>25, 26, 28-30, 44, 49, 54, 70</sup> Most authors use either 2-zero or 3-zero absorbable sutures to repair the



**Figure 4.** Midline penoscrotal incision reveals tunical rupture (tagged with suture).

defect in the tunica in either a running or interrupted fashion.<sup>12, 13, 22, 26, 44, 47, 49, 52, 73, 74</sup> **It is the opinion of the authors that synthetic absorbable sutures (eg polyglactin or polydioxanone) should be used instead of chromic sutures, which are fast absorbing and thus do not maintain their tensile strength nearly as long as synthetic materials.** There is some evidence that non-absorbable suture leads to a higher risk of palpable penile scarring, so it is typically avoided.<sup>1, 25</sup> Regardless of the suturing method, it is recommended that knots be inverted/buried to prevent the formation of a palpable nodule.<sup>11, 30, 46, 57</sup>

Ligation of intracorporal vessels and excessive débridement of any exposed erectile tissue should be avoided.<sup>46</sup> **If bilateral tunical rupture is discovered intraoperatively, the urologist should evaluate the urethra as accompanying urethral injury is likely.** Urethral defects are typically repaired with 4-zero or 5-zero absorbable sutures over a catheter, especially if an end-to-end anastomosis is needed.<sup>12, 13, 26, 49, 52, 57, 73, 74</sup> After tunical repair is complete some suggest injection of intracavernous saline with or without methylene blue to assess for a leak in the repair or a separate, previously unseen injury.<sup>8, 28, 30, 44, 47, 48</sup>

**Postoperative management and outcomes.** Postoperative management typically involves abstinence from intercourse, pain management and urinary diversion with a catheter in cases of urethral injury. **Patients are advised to abstain from sexual intercourse for 4–6 weeks after their fracture.**<sup>2, 26, 49, 50, 54, 57, 70-71, 73</sup> Pain management may include cold compresses and anti-inflammatory drugs in the postoperative period.<sup>2</sup> In cases not complicated by urethral injury catheters are typically removed on postoperative day 1.<sup>28, 49, 70</sup> **There is no consensus regarding the duration of Foley catheterization following urethral repair, but Foley catheters are generally recommended for 1–3 weeks in these patients, with some authors suggesting that the duration of catheterization should vary based on the extent or severity of the urethral injury.**<sup>8, 13, 25, 28, 30, 44, 49, 70</sup> **Peri-catheter RUG or a voiding cystourethrogram should be performed prior to Foley removal in all patients who undergo urethral repair.**<sup>49, 57</sup> Although 24%–31% of these patients may have worsening voiding symptoms following urethral repair, rates of urethral stricture are low.<sup>23, 26, 74</sup>

While rates of post-repair ED have been established within the literature, it should be noted that the degree of any dysfunction is typically mild for surgically repaired cases.<sup>16</sup> Although ED rates are typically low following surgically repaired penile

fracture, many patients will have sexual performance anxiety and fear of recurrence of penile fracture, which can have a negative impact on self-esteem and sexual relationships that typically lasts for 12–24 months following injury.<sup>50,51</sup> There is no standard follow-up protocol in the literature, and poor patient compliance with follow-up is common. Patients should thus be advised about early signs of long-term complications at the time of surgical repair.

## CONCLUSIONS

Penile fracture is an urgent urological issue. Diagnosis can often be made based on history and physical examination alone as patients typically present with penile hematoma and swelling, rapid detumescence and an audible “snap” shortly after direct blunt trauma to or bending of an erect penis. Patients should be assessed for the presence of simultaneous urethral injury. Adjunctive imaging, including either ultrasound or MRI, is most helpful in patients with an atypical presentation. Although there is no consensus technique or approach, prompt surgical management is recommended in order to reduce the risk of long-term complications. Postoperatively patients should abstain from intercourse for 4–6 weeks. In cases of concomitant urethral injury urethroplasty with Foley catheterization is recommended.

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### DID YOU KNOW?

- Penile fracture is an urgent urological issue. Surgical repair is recommended to decrease the risk of long-term complications and sequelae.
- Diagnosis of penile fracture can often be made based on history and physical examination alone as patients typically present with penile hematoma and swelling, rapid detumescence, a palpable nodule on the penile shaft and an audible “snap” shortly after direct blunt or bending trauma to an erect penis.
- Patients presenting with bilateral corporal rupture, blood at the meatus or gross hematuria, or voiding difficulty should be assessed for the presence of simultaneous urethral injury.
- Penile fracture is an uncommon complication following CCH injections for the treatment of Peyronie’s disease. These patients may have an atypical presentation, and surgical repair can be more difficult than in the index patient with penile fracture.
- Foley catheters are recommended for 1–3 weeks if urethral repair is required. Peri-catheter RUG or a voiding cystourethrogram should be performed prior to Foley removal in all patients who undergo urethral repair.

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# Study Questions Volume 39 Lesson 27

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1. A 42-year-old man with a history of Peyronie's disease is seen in the emergency department with penile bruising, swelling and pain sustained during intercourse. Twelve days ago this patient underwent intralesional collagenase clostridium histolyticum injection for the treatment of a left lateral penile curvature. Penile US confirms the presence of a tunical rupture. The most likely intraoperative finding is
  - a. rupture of right corpora, normal tissue quality
  - b. rupture of right corpora, poor tissue quality
  - c. rupture of left corpora, normal tissue quality
  - d. rupture of left corpora, poor tissue quality
2. The strongest predictor of concomitant urethral injury in a patient with penile fracture is
  - a. voiding difficulty
  - b. blood at the meatus
  - c. bilateral corporal rupture
  - d. injury sustained during vigorous sexual activity
3. A 48-year-old man is seen in the emergency department roughly 60 hours after sustaining an injury to his penis during sexual intercourse. He reports that he had pain and quickly developed penile bruising but did not immediately lose his erection and did not hear an audible sound at the time of injury. On examination he has ecchymosis of the penile shaft, scrotum and perineum. The next step is
  - a. wrap the penis with a compressive dressing and discharge with pain medications and estrogen therapy
  - b. penile ultrasound with Doppler
  - c. penile MRI
  - d. take emergently to the operating room for exploration
4. A 35-year-old man is seen in the emergency department with penile ecchymosis, swelling and pain. He heard a "snapping" sound during intercourse and rapidly lost his erection. He reports that he has voided without difficulty and denies gross hematuria. A penile ultrasound is performed and confirms a ventral right corporal rupture with an incidental finding of air bubbles within the right corporal body. What is the most appropriate next step in management?
  - a. immediate surgical repair with no need for evaluation of the urethra
  - b. immediate surgical repair with cystoscopy or urethrography at the time of surgery
  - c. immediate surgical repair with evaluation of the urethra only if intraoperative concern for injury
  - d. delayed surgical repair with evaluation of the urethra if patient develops voiding symptoms
5. The most common long-term sequela of penile fracture in surgically repaired patients is
  - a. erectile dysfunction
  - b. penile curvature
  - c. palpable penile plaque or nodule
  - d. pain with erections

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