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Fractures of the penis

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Abstract

A penile fracture is a traumatic rupture of the tunica albuginea of the corpora cavernosa in an erect penis, usually as a result of blunt trauma during sexual activity. The aetiology varies with geographical region, with the USA and Europe having a higher incidence of sexual trauma and the Middle East having a higher rate of self-manipulation. Diagnosis is usually clinical, but numerous imaging modalities have been used to confirm the fracture site and to help plan appropriate surgical management. Clinical examination will find a detumescent penis with a diffuse penile swelling and ecchymosis: the classic eggplant sign. The penis will often deviate away from the side of the injury. A history of the patient's inability to pass urine after the injury or of blood at the urethral meatus suggests an associated urethral injury. Immediate surgical management is the mainstay of treatment, with many surgeons favouring a degloving approach. Penile fractures also carry a risk of urethral tears and urethral repair may be necessary. This article describes the aetiology, presentation and management of penile fractures to enable identification and treatment in daily clinical practice.

Key words: Fracture; Non-penetrating wounds; Penis; Sexual trauma; Surgery; Urethra

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Introduction

Fractures of the penis occur when sexual trauma occurs to an erect penis, resulting in a rupture of the tunica albuginea of the corpora cavernosa. The condition is a urological emergency that calls for swift assessment and diagnosis as well as prompt surgical repair, as a delay in treatment is associated with higher complications. This article describes the aetiology, presentation and management of penile fractures.

Incidence

Penile fracture was first reported by Malis (1924). While a rare injury, with an incidence of 1/175 000 men in the USA (Pariser et al, 2015), it is likely that cases go underreported as a result of embarrassment so the incidence may be higher than quoted. There are notable geographical differences reported in the aetiology. Numerous studies have shown a clustering of cases in the Middle East, particularly in Iran, with around 30% of all reported cases of penile fracture occurring in western countries.

Anatomy

The penis is composed of three erectile bodies: two corpora cavernosa and the corpus spongiosum. Each corpus cavernosum is surrounded by the tunica albuginea. The three corpora are encased by a deep fascia (Buck's fascia), a superficial dartos fascia and finally the penile skin (Figure 1). When the penis is flaccid, the tunica albuginea is 2 mm thick. In an erect state the tunica albuginea thins to 0.25–0.50 mm.

During intercourse, intracorporeal pressures can reach 180 mmHg. The tunica albuginea can withstand pressures up to 1500 mmHg, but a sudden flexion force can increase pressures above 1500 mmHg, causing a rupture of the tunica albuginea (already thinned to 0.25–0.5 mm) and resulting in a penile fracture (De Rose et al, 2001). The ventrolateral aspect of the midshaft is the thinnest part of the tunica albuginea and the most common site of rupture. The urethra passes through the relatively weak corpus spongiosum and may be damaged as well if subjected to a shearing force.

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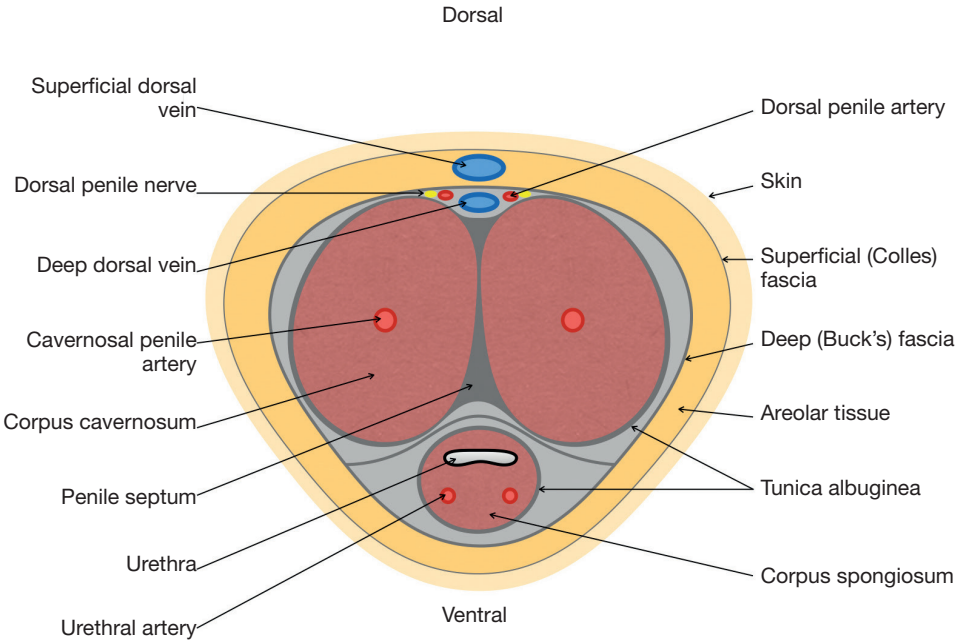

Figure 1. Normal penile anatomy.

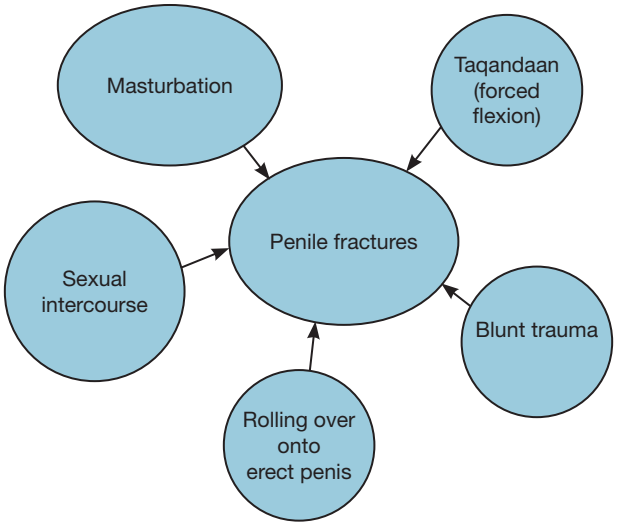

Figure 2. Aetiology of penile fracture.

Aetiology

Figure 2 illustrates common causes of penile fractures. The most common cause is sexual intercourse. The fracture usually occurs by the penis being compressed against the partner's pubic symphysis or perineum with force during failed entry. In the USA and Europe, the vast majority of cases arise from coitus (Nason et al, 2013). In the Middle East, in a 9-year study from one Iranian province, Zargooshi (2000) found 172 cases of penile fracture attributed to a practice known as 'Taqaandan'. Taqaandan is a practice in the Middle East, notably reported from Iran. It involves holding the root of the erect penis steady and forcing flexion of the top until a click is felt, achieving rapid detumescence. Other aetiologies include vigorous masturbation, violent blunt trauma and rolling over onto an erect penis. All these aetiologies can cause fracture to both corporal bodies, which increases the risk of urethral injury. Kamdar et al (2008) found that urethral injury is diagnosed more frequently in the USA and Europe, compared to the east. They also found that urethral trauma is more common in bilateral corporal tears, most likely as a result of shearing forces caused by

Figure 3. The 'eggplant deformity' in a fractured penis.

such extensive injuries. Batura et al (2017) report that concomitant urethral injury is rare with an incidence of 6.1% and, although most urethral injuries are partial, a few cases of complete urethral rupture are described. There are also positional differences within coitus associated with the incidence of penile fracture; Barros et al (2017) found that the 'man behind' position carried a 41% risk of fracture, followed closely by the 'man-on-top' position with a 23% risk of penile fracture. However, a meta-analysis of five studies by Amer et al (2016) showed that sexual position did not have an impact on relative risk of penile fracture.

Clinical features

Penile fractures are usually diagnosed on the patient's history and presentation. The patients often describe a 'pop' or 'cracking' sound from the erect penis at the moment of injury, accompanied by excruciating pain. Immediate detumescence of the penis follows with rapidly progressing penile swelling and deformity. The penis tends to deviate away from the site of injury. The swelling, misshapen appearance and discolouration caused by a rapidly spreading haematoma are known as the 'eggplant deformity' (**Figure 3**).

Zhou and Zhou (2018) reported that all patients describe a classic triad:

1. An audible crack
2. Rapid detumescence of the penis
3. Extreme pain.

These facets of presentation can be accurately relied on when diagnosing penile fracture. On palpation, the penis is acutely tender, with an area of focal fluctuance over the area of the fracture. Naraynsingh and Raju (2005) described a 'rolling sign' wherein the swelling over the site of fracture can be rolled by the clinician given the swelling's fluctuant nature. This area of focal fluctuation indicates the area of the cavernosal tear and can help site the incision at surgery. Clinicians must bear urethral injury in mind, so it is crucial to ask the patient if he has been able to urinate after the injury. An inability to urinate or blood at the urethral meatus could imply a urethral injury. It may be possible to palpate a full bladder, and this can be confirmed by a bedside bladder scan. If the patient is in retention, catheterisation is necessary. If urethral injury is suspected, a gentle attempt at urethral catheterisation by an experienced clinician should be permissible before considering suprapubic catheterisation. Urethral injury may be partial and urinary retention may be the result of compression of the urethra from haematoma, without any actual disruption. Sometimes suprapubic catherisation may be necessary, although it should be avoided if possible as it has its own associated morbidities.

Imaging

While the diagnosis of penile fractures is often clinical, imaging is useful where the diagnosis is not apparent, as an aid to siting the incision and in patients who present late. There is ongoing debate regarding whether magnetic resonance imaging or ultrasound should be used first line for the diagnosis of penile fractures.

Typically, penile ultrasound shows a hyperechoic tunica albuginea surrounding a hypoechoic corpus cavernosum and spongiosum. A fracture is recognised by a break in the hypoechogenicity of the tunica albuginea (Figure 4). Ultrasound has limitations: Mehrjardi et al (2017) found that ultrasound is unable to differentiate structures at the root of the penis and may not reliably identify tears towards the penile base. Ultrasound is also limited by the patient's inability to tolerate the ultrasound probe on an acutely tender fracture site. Shukla et al (2015) proposed an ultrasound grading system running from 0 to 4 that can be used to grade penile fractures (Figure 5).

Magnetic resonance imaging is helpful when ultrasound has been ambiguous. Magnetic resonance imaging visualises penile tissue planes better, has greater accuracy and delineates urethral disruption more reliably than ultrasound (Figure 6). Mehrjardi et al (2017) found that magnetic resonance imaging was far superior to ultrasound in fracture mapping and identifying the injury site to allow for targeted repair. In their patients, magnetic resonance imaging consistently diagnosed all tears present.

As magnetic resonance imaging is limited in availability and has a higher cost, ultrasound remains the first port of call in many centres as it is readily available, cheaper and can be undertaken with relative urgency.

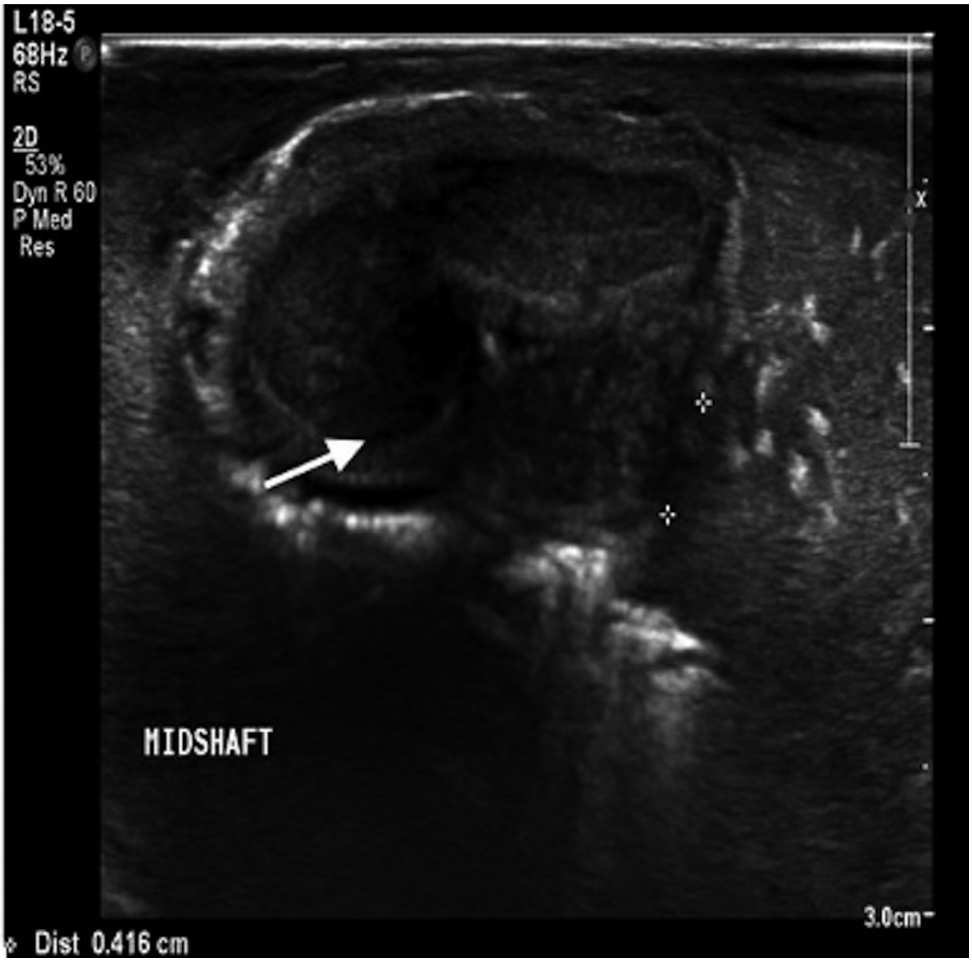

Figure 4. Ultrasound image of the penis in cross section, showing the haematoma (arrow) and surgical emphysema at the site of fracture.

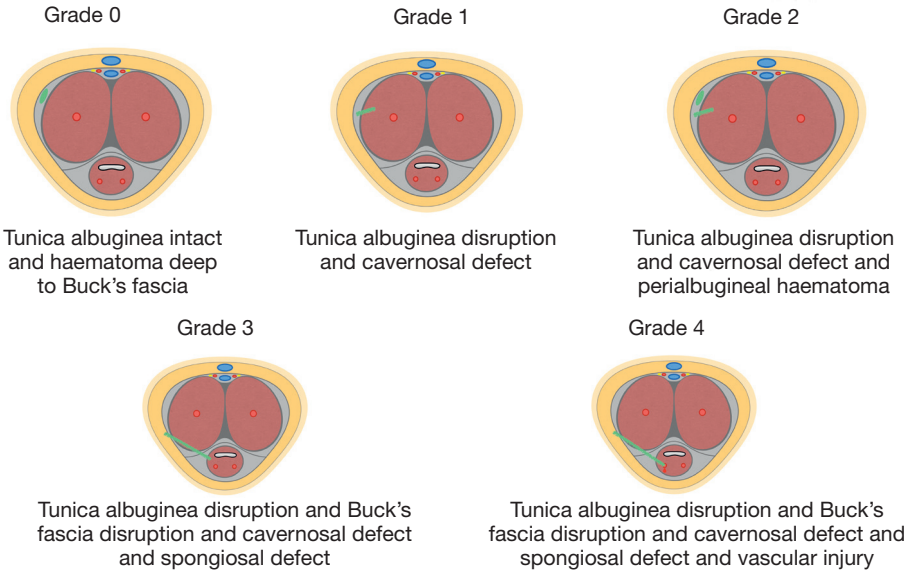

Figure 5. The ultrasound grading system for penile rupture (Shukla et al, 2005).

Urethral involvement was often investigated via retrograde urethrogram. However, this is no longer frequently used as it involves catheterising the terminal urethra to instil contrast. Urethrography may be useful postoperatively to visualise the success of urethral repair.

Cavernosonography involves injecting contrast into the corpora under fluoroscopy. It is rarely used because of its invasive nature and risk of complications. Pliskow and Ohme (1979) described multiple complications that include contrast-induced allergic reaction, corporal fibrosis and priapism.

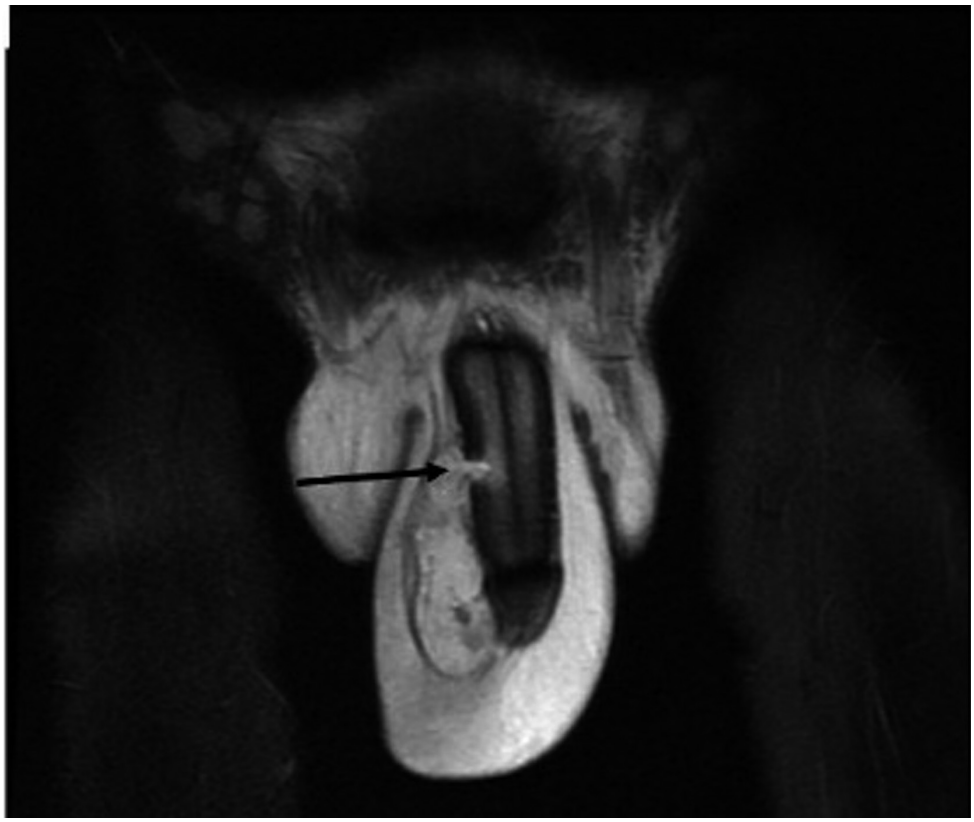

Figure 6. Magnetic resonance imaging coronal T2 image depicting a hyperintense breach of the tunica albuginea as a result of a right-sided distal penile fracture.

Management

Conservative management is not recommended for penile fracture as it leads to more complications, including infected haematoma, abscess formations, erectile dysfunction and abnormal curvature of the penis. In a retrospective study comparing long-term outcomes of conservative and surgical treatment of penile fracture, Muentener et al (2004) found that patients who had received conservative treatment had a significantly higher rate of complications than those treated surgically, both early after the injury and at a delayed mean follow up of 67 months (successful outcomes being the absence of associated penile complication, such as erectile dysfunction, 92% vs 59%). This study was instrumental in immediate surgery becoming the mainstay in the treatment of penile fractures.

Kamdar et al (2008) described the primary goals of surgical repair as being to expedite pain relief, prevent erectile dysfunction, allow normal voiding and minimise the risks of potential complications. Amer et al (2016) described the principles of surgical therapy as being to optimise surgical exposure, evacuate any haematoma that may have formed, correct any defect in the tunica albuginea, allowing for prompt repair of any associated urethral injury.

The literature describes three incisions: an incision directly over the defect, a circumcoronal degloving incision and an inguinoscrotal incision. The approach to siting an incision is unique to the surgeon and their own experiences in treating penile fractures, so it varies from institution to institution. At the authors' institution, surgeons favour the circumcoronal-degloving incision because of its ability to provide unrivalled access to the corpora and urethra, allowing in-depth exploration and direct visualisation of any potential urethral disruption that may have occurred during the trauma (Figure 7). This incision

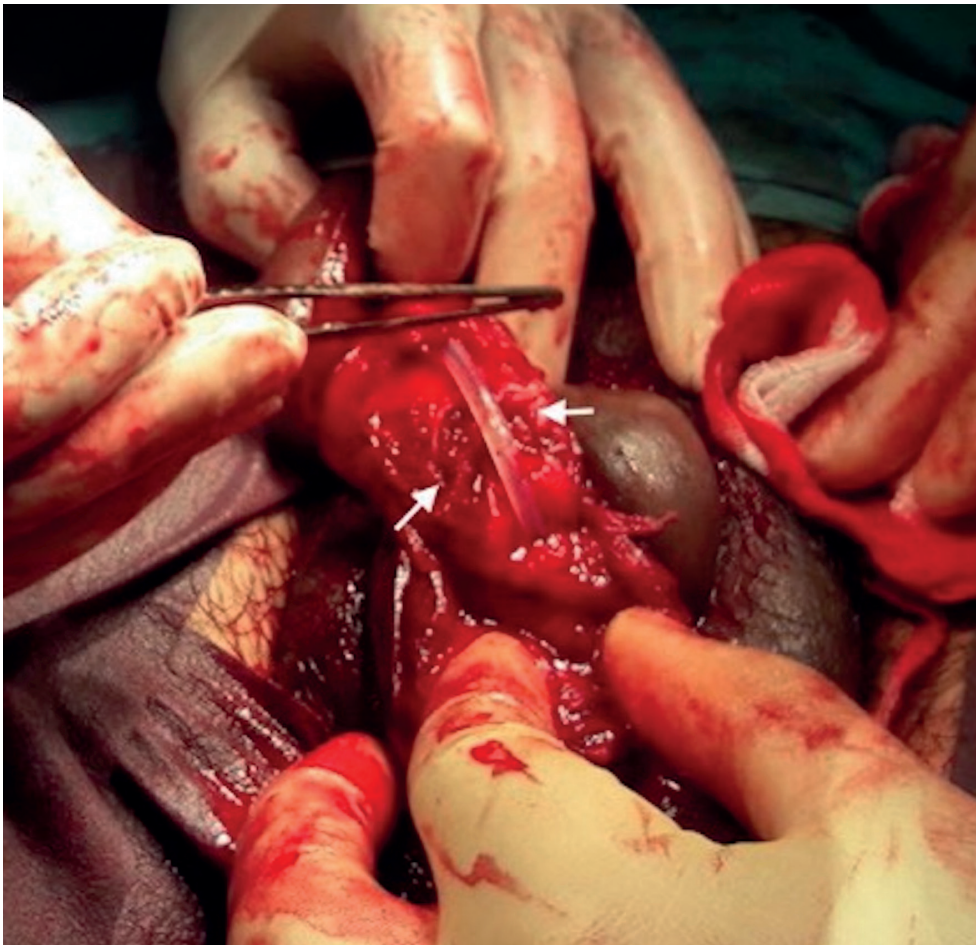

Figure 7. Operative view of a penile fracture. This patient had a fracture of both the tunica albuginea and a urethral disruption. The arrows show the break in the tunica albuginea on each side. The catheter can be seen bridging the urethral injury which was repaired with an end-to-end anastomosis.

also provides more aesthetically pleasing results than an incision made directly over the defect, which can lead to more significant scarring. Absorbable sutures may reduce the risk of pain and granuloma formation along the suture lines (Batura et al, 2017). Urethral catheterisation may be necessary if there is concomitant urethral injury.

Postoperative management

Patients should be managed postoperatively with adequate analgesia, antimicrobials, fluids, compressive dressings and rest.

Erections occurring soon after surgery can complicate the outcomes of repair such as dehiscence of corporal wounds. Benzodiazepines and anti-androgens have been prescribed postoperatively to suppress erections. Some clinicians believe that postoperative pain and patient fear is sufficient to prevent erections. Kamdar et al (2008) found that postoperative pain is more than adequate in preventing rigid erections that may potentially lead to wound dehiscence and did not recommend the use of anti-androgens or benzodiazepines.

In patients with urethral injuries a retrograde urethrogram can be undertaken to visualise urethral healing and strictures. Urethral integrity can be further confirmed with a uroflowmetry to evaluate the urinary flow rate. Sexual activity can be resumed after 6 weeks.

Postoperative complications

As with any surgery there are risks of postoperative complications, which rise exponentially with delayed surgery. Complications include a systemic infection or local wound infection. There is a risk of haematoma formation, so compressive dressings are used in postoperative management. Haematomas carry an increased risk of organisation and fibrosis, causing penile curvature. Instrumentation of the urethra may lead to urethral fibrosis and subsequent urethral stricture. There is also a risk of erectile dysfunction following penile fracture, although this tends to be self-limiting in nature. In a study of more than 300 patients, Zargooshi (2009) found no impact on sexual function postoperatively. In his study of 86 patients, Moslemi (2013) found that the vast majority of patients were able to maintain good erections but noted a 2.3% incidence of abnormal penile curvatures. The psychological impact has yet to be fully elaborated in patients with a penile fracture. Clinicians need to treat patients holistically, and they should be counselled with regards to fear of suffering another fracture.

Conclusions

Penile fracture is a urological emergency, calling for rapid clinical assessment and prompt repair. Imaging may be used to aid diagnosis if the clinical presentation is equivocal. Conservative treatment is not recommended as it leads to higher rates of complications, including penile deformity. The circumcoronal-degloving incision is versatile and cosmetically acceptable. A concomitant urethral injury should be suspected in patients who have difficulty in voiding, or have blood at the urethral meatus. Urethral repair may be necessary. Patients should be appropriately counselled postoperatively to ensure maintenance of quality of life and comfort.

Key points

- Penile fracture is an acute urological emergency and requires immediate attention.
- History and examination are the mainstays of diagnosis, although ultrasound or magnetic resonance imaging may be needed to confirm this.
- The clinician should have a high clinical suspicion for urethral injury.
- Emergency surgery is necessary.
- Appropriate postoperative care and counselling are vital.

Top tips

- Penile fractures are a surgical emergency; refer suspicious cases to the urology team immediately.
- Clinical history is important, particularly if the patient says that they felt pain during coitus.
- Look for the 'eggplant sign'.
- Have a high index of suspicion for concomitant urethral injury, particularly if blood is visible around the urethral meatus.
- If urethral injury is suspected, examine the abdomen for suprapubic fullness and never hesitate to perform a bladder scan.

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Conflicts of interest

The authors declare that they have no conflicts of interest.

Acknowledgements

Figures 1 and 5 are reproduced courtesy of Associate Professor Craig Hacking, Radiopaedia.org, rID 71772; Figures 3 and 6 are reproduced courtesy of Dr Praveen Jha, Radiopaedia.org, rID: 25999.

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Curriculum checklist

This article addresses the following requirements of the general internal medicine curriculum:

- Managing an acute speciality related take.
- Communicating effectively and is able to share decision making, while maintaining appropriate situational awareness, professional behaviours and professional judgment.
- Managing patients in an outpatient clinic, ambulatory or community setting, including management of long-term condition.
- Managing medical problems in patients in other specialities and special cases.

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