Penile Trauma: Ultrasonographic Pictorial Review

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Authors: M. S. R. O. Faustino, P. F. R. Santos, J. J. B. Leitão, I. Távora; Lisbon/PT
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Learning objectives

To review the normal ultrasonographic penile anatomy.

To review the types of non-penetrating penile traumatic lesions.

To illustrate the grey-scale and color Doppler manifestations of acute penile trauma.
Background

Ultrasonography including Color Doppler ultrasonography is the imaging modality of choice in patients with penile trauma because it allows full evaluation of the penile vasculature and excellent depiction of both the normal penile anatomy and pathologic conditions affecting the penis. The role of the radiologist focuses on defining the lesions that need surgical intervention, such as penile fractures in which there is disruption of the tunica albuginea. A delay in the surgical treatment increases the risk of complications, such as erectile disfunction, permanent penile curvature, damage to the urethra and pain during sexual intercourse.
Findings and procedure details

The penile shaft is composed of 3 erectile columns, the 2 corpora cavernosa and the corpus spongiosum, as well as the columns' enveloping fascial layers, nerves, lymphatics, and blood vessels, all covered by skin.

In the transversal axis the corpus spongiosum is seen in the ventral side of the penis as a hyperechoic circular surface. The corpora cavernosa are placed dorsally, slightly hypoechoic, with the cavernosal artery in the middle of it and separate by a thin hyperechoic membrane, the tunica albuginea.

Tunica albuginea surrounds both the corpora cavernosa and the corpus spongiosum. The Buck fascia, a second fibrous sheath, surrounds the tunica albuginea and is divided into dorsal and ventral compartments separating the corpora cavernosa from the corpus spongiosum.

Penile fracture is an uncommon injury caused by exertion of axial forces on the erect penis, resulting in a tear of the tunica albuginea with extrusion of blood subcutaneously. This lesion usually occurs during vaginal intercourse when there's misdirection of the erect penis against the pubic symphysis.

A blunt trauma to the flaccid penis usually does not lead to penile fracture and usually causes extratunical or cavernosal hematomas.

PENILE RUPTURE

The most common blunt injury to the penis is penile fracture, defined as the rupture of the tunica albuginea and one or both of the corpora cavernosa. Diagnosis of penile fracture is mainly based on clinical features. Sonography can show an irregular hypoechoic or hyperechoic defect at the cavernosal rupture site.

The integrity of the tunica albuginea is the key factor to the management of this lesion, since its rupture implies the need for surgical treatment. Sonography shows the exact site of a tear as an interruption of the echogenic line of the tunica albuginea.

PENILE HEMATOMA (without fracture)

After blunt trauma injury to the penile venous plexus or to the smooth muscle trabeculae can occur in the absence of tunical disruption resulting in cavernosal hematomas.
Intracavernosal hematomas result from injury to the cavernosal tissue of a flacid penis and are usually bilateral.

A penile hematoma can have different sonography features depending of its age. In the acute phase hematomas appear as hyperechoic or complex masses and later become cystic, often with septation. After cicatrisation, a poorly defined echogenic scar can be seen since fibrosis can result from cavernosal damage.

URETHRAL INJURY

About 20% of penile fractures are associated with lesions of the corpus spongiosum and urethra. Sonography can help to identify interruption of the urethral wall, but urethrography may still be needed. The presence of air in the cavernosal bodies in the absence of external penetrating trauma may be an indirect sign of urethral injury. Sonography may be able to show edema or hematoma of the corpus spongiosum after penile trauma. Small isolated corpus spongiosal injuries may not be visualized by sonography.

OTHER TYPES OF INJURY

Priapism is defined as persistent tumescence of the penis that is unrelated to sexual desire or stimulation. High-flow priapism is usually secondary to penile or perineal trauma and often characterized by fistula formation between the cavernosal artery and the lacunae in the corpus cavernosum, known as an arterial-lacunar fistula.

Color duplex Doppler sonography has replaced arteriography as the imaging modality of choice for the diagnosis of priapism because it is sensitive, noninvasive in nature, and widely available.

Rupture of the dorsal penile vessels may mimic penile fracture, but deformation and immediate detumescence do not occur because of the intact tunica albuginea. The hematoma may be superficial or remain under Buck’s fascia depending on the site of involvement of the penile veins. Thrombosis of the superficial and deep dorsal penile veins is also a rare urologic emergency, and the clinical and sonographic appearance can mimic penile fracture. Sonography shows a noncompressible dorsal vein and, if ruptured, associated hematoma.
Images for this section:

**Fig. 1:** Sonographic evaluation after coital traumatism depicting disruption of the tunica albuginea (green arrow)

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Fig. 2: Rupture of the tunica albuginea in the left corpora cavernosum

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**Fig. 3:** Penile hematoma (red arrow) without disruption of the Buck's fascia and the tunica albuginea (green arrow)

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Fig. 4: Sonography depicting a small contusion in the corpus spongiosum

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Fig. 5: Small rupture of the urethra - sonography depicts hypeechoic milimetric foci

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**Fig. 6:** Uretrocistography depicting an urethral rupture with contrast extravasation

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Conclusion

CONCLUSION

The knowledge of the sonographic anatomy and possible image findings in penile trauma is essential for the role that the radiologist has in the management of this pathology.

Ultrasound is a simple, efficient and non-invasive method for the diagnosis of penile trauma and its complications.
References


