

Ultrasound Emergencies of the Male Pelvis



Kimberly Weatherspoon, MD,* Stanley Polansky, MD,[†] and
Tara Catanzano, MD[‡]

Male pelvic emergencies are uncommon, and symptoms typically include scrotal pain, scrotal enlargement, or a palpable scrotal mass or all of these. Ultrasound is often the first-line modality for evaluation of male pelvic emergencies, which may be stratified into vascular, infectious, or traumatic causes. Entities such as testicular torsion, Fournier gangrene, and testicular dislocation are surgical emergencies and should not be missed or misdiagnosed, as this may cause a significant delay in urgently necessary treatment. Radiologists need to be familiar with the role of imaging as well as the key characteristic imaging findings of these injuries to direct the appropriate management.

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Introduction

Male pelvic emergencies are uncommon. However, diagnostic pelvic ultrasound is routinely performed on an emergent basis in male patients presenting with acute scrotal or penile symptoms.¹⁻³ These symptoms typically include scrotal pain, scrotal enlargement, or a palpable scrotal mass, or all of these.⁴ Emergent male pelvic conditions may be stratified into vascular, infectious, or traumatic causes.³ Vascular etiologies include testicular ischemia and infarction in the setting of testicular torsion. Infectious scrotal entities include epididymitis, epididymo-orchitis, testicular abscess, pyocele, and Fournier gangrene. Traumatic injuries include blunt and penetrating scrotal injuries, as well as degloving pelvic injuries due to scrotal sac avulsion.^{3,5}

Prior to the introduction of ultrasonography and cross-sectional imaging, the scrotum and its contents were examined predominately by palpation on physical examination and with transillumination. However, ultrasound is now the ideal imaging modality to use in the emergent setting, because it is portable, readily available, uses no radiation, allows for real-time imaging and is extremely useful in clearly delineating

testicular torsion from other acute scrotal pathologies, including complications of epididymitis.^{6,7} Although pelvic magnetic resonance imaging (MRI) can also diagnose and more thoroughly characterize a wide plethora of scrotal pathology, it is usually much more time consuming and not as readily available. Additionally, although pelvic MRI does have a role in more clearly delineating scrotal pathologies in ambiguous cases, it is impractical in the emergent setting.⁸

Anatomy

The anatomical structure most commonly evaluated emergently by pelvic ultrasonography in the male pelvis is the scrotum and its contents. The scrotum is a pouch divided by the median raphe, a midline structure, and contains a testicle in each hemiscrotum^{2,9} (Fig. 1). The tunica vaginalis surrounds the anterior, medial, and lateral margins of the testes. The scrotum is separated from the testicle by the tunica vaginalis that consists of 2 serous membranous layers, the visceral and parietal layers, arising from the processus peritoneum.^{2,7} The parietal layer lines the fascial wall of the scrotum, whereas the innermost visceral layer is closely adherent to a similar sounding structure, the tunica albuginea.^{3,9,10} The tunica albuginea, however, is composed of fibrous tissues covering the testicle, which helps the testis maintain its shape and integrity. Typically, the tunica albuginea looks like a hyperechoic line surrounding and outlining the testis (Fig. 2). Discontinuity of the tunica albuginea suggests testicular rupture.

The testis, epididymis, and spermatic cord contents including the vas deferens and the internal spermatic vessels, reside in each hemiscrotum, contained within the tunica vaginalis.^{2,3,9}

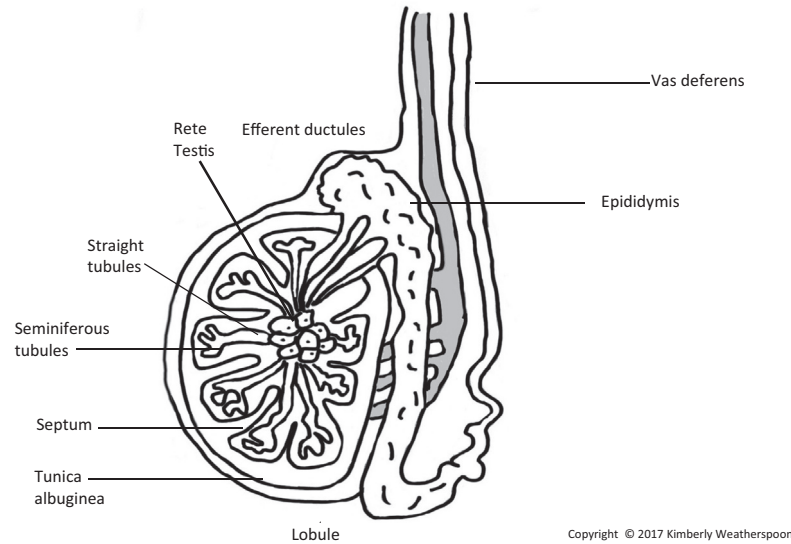
*Department of Radiology, Radiology resident Baystate Medical Center, University of Massachusetts, Springfield, MA.

[†]Department of Radiology, Assistant Professor Baystate Medical Center, University of Massachusetts, Springfield, MA.

[‡]Department of Radiology, Program Director Radiology Residency Program, Baystate Medical Center, University of Massachusetts, Springfield, MA.

Address reprint requests to Kimberly Weatherspoon, MD, MPH, Radiology Resident, Baystate Medical Center, University of Massachusetts, 759 Chestnut St, Springfield, MA 01199. E-mail: kweathe2@jhmi.edu

Sagittal view of the testis and epididymis

**Figure 1** Diagram of scrotal anatomy.

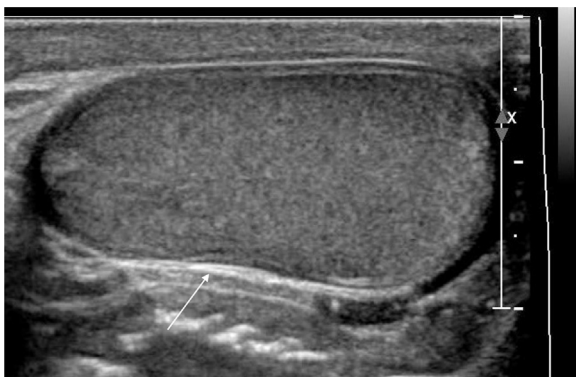
The testis is a mobile, ovoid structure, which typically measures between 3 and 5 cm^{10,11} (Fig. 3). The testicular parenchyma is homogenous, made up of multiple lobules, composed of seminiferous tubules, leading to the rete testis located deep within the testicular hilum. The rete testes are a fine network of tubules that function to carry sperm from the seminiferous tubules to the vas deferens and concentrate sperm¹² (Fig. 4). Tissues with fibrous septa radiating out toward the testicular periphery, known as the mediastinum testis, provide the structural support of the rete testis.

The spermatic cord suspends the testes in place and is located in the scrotum. The epididymis is located superior and lateral to the testis, containing an epididymal head, body, and tail that carry sperm away from the testicle. The epididymal tail drains downward as the vas deferens¹² (Fig. 5). Furthermore, the testis and the epididymis demonstrate a homogenous echotexture. Generally, the epididymis is hypoechoic relative to the testicle and demonstrates slightly less blood flow.^{2,3,12} Cases of relatively increased epididymal blood flow may indicate epididymitis in the

correct clinical setting. Within the substance of the epididymis, the epididymal body and tail are more echo-poor than the epididymal head, which is usually similar in echogenicity to the testis and contains converging tubules.²

The testicular artery arises from the abdominal aorta and serves as the main arterial supply to the testis. Additionally, the cremasteric artery, a branch of the inferior epigastric artery, supplies the scrotal wall.¹⁰ The deferential artery arises from the inferior visceral artery to supply the epididymis. The pampiniform venous plexus, a complex of veins in the scrotum wrapped around the testicular artery, drains the testis via the testicular veins. In the abdominal cavity, the right testicular vein drains into the inferior vena cava, and venous drainage from the left testicular vein is via the left renal vein. The cremasteric plexus drains the epididymis and the scrotal wall.

A very small amount of anechoic physiological fluid may be found in the scrotum normally, surrounding the testicle in the potential space between the vaginalis layers. However, excessive fluid in the scrotum surrounding the testicle raises concern for a significant hydrocele (Fig. 6A). When present, many small hydroceles are asymptomatic. However, large hydroceles may present clinically as an enlarging scrotal mass. Hydroceles may also be complex with interweaving septations (Fig. 6B). A congenital hydrocele is usually caused by a patent processus vaginalis. Normally, the processus vaginalis closes perinatally. However, a persistent, patent connection between the scrotum and the parietal peritoneum may result in a hydrocele.⁴ Other causes of hydroceles may be postinflammatory or even idiopathic. Nonetheless, regardless of a hydrocele's etiology, fluid is not ever present in the "bare area" at the testicular attachment to the tunica vaginalis.¹³

**Figure 2** Tunica albuginea. The echogenic structure surrounding the testicle (arrow) is the tunica albuginea.

Technical Considerations

When examining the scrotum and its contents sonographically, a high-frequency transducer should be used to yield high

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