Sonographic Imaging of Scrotal Emergencies Including Potential Pitfalls and Mimickers

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Overview

Objectives
• Describe normal scrotal anatomy.
• Understand the role of ultrasound in scrotal emergencies.
• Identify characteristic sonographic features of scrotal emergencies including ischemia, infection, and trauma.
• Be aware of potential mimickers of scrotal emergencies.

Target audience
• Radiology residents and practicing radiologists who would like a refresher on scrotal emergencies.
Background

- Ultrasound is the initial modality of choice in evaluating scrotal emergencies.

- Common diseases seen in the emergency department include epididymitis, orchitis, abscess, testicular torsion, and trauma.

- Familiarity with the characteristic sonographic features and common pitfalls and mimickers is essential to differentiate these conditions and initiate treatment.

- This is particularly important for Fournier’s gangrene, testicular torsion, and testicular rupture because timely treatment is crucial to preserving fertility and hormonal activity.
Anatomy

• Sperm is produced in the seminiferous tubules (S).
• The seminiferous tubules converge in the mediastinum testes as a network of tubules called the rete testes (RT).
• The efferent ductules (curved black arrow) bridge the testicle and epididymal head (EH), which leads to the epididymal body (EB) and tail (ET).
• Sperm exit the scrotum through the vas deferens (straight black arrow).
• The tunica albuginea (A) surrounds the testicle.
• The tunica vaginalis (arrowhead) has two layers and also partially surrounds the testicle.
• The testicular (internal spermatic) artery (white arrow) supplies the testicle.

Diagram courtesy of Avery et al. Radiographics 2013
Normal Anatomy

- **Tunica albuginea** – thin echogenic line
- **Mediastinum testes** – horizontal echogenic band
Testicular Torsion

Clinical History
• 7 year old with sudden onset of left testicular pain.

Imaging Findings
• Mildly heterogeneous echotexture with absent flow.

Teaching Points
• Testicular torsion is a urologic emergency, with testicular viability related to the duration of ischemia.

• Absent flow with symmetric echotexture indicates early torsion.
Clinical History
• 49 year old male presents with left testicular pain for 1 day.

Imaging Findings
• Heterogeneous echotexture of the left testicle with diminished arterial flow.

Teaching Points
• Normal gray-scale and color Doppler ultrasound findings do not exclude early, partial or incomplete torsion, or torsion/detorsion.
Torsed Appendix

Clinical History
• 64 year-old male with right testicular pain for 1 year.

Imaging Findings
• Small echogenic extratesticular lesion.

Teaching Points
• This usually occurs in pediatric population with a mean age of 9 years.
• Pedunculated nature of the appendix testis makes it prone to torsion.
• An enlarged appendix testis (>5.6 mm) with absence flow is characteristic.
• A reactive hydrocele is common.
Epididymitis & Epididymal Abscess

Clinical History
• Two weeks of right testicular swelling.

Imaging Findings
• Enlarged, hyperemic left epididymis containing a large cystic structure with layering echogenic fluid (abscess).
• Complex left hydrocele.

Teaching Points
• Infection spreads in a retrograde fashion. The epididymal tail is involved before the body and head and should be carefully evaluated.
Epididymo-orchitis

Clinical History
• Testicular pain for 3 days.

Imaging Findings
• Right testicle with heterogeneous echotexture and increased flow.
• Enlarged epididymis with heterogeneous echotexture and increased flow.

Teaching Points
• Infection spreads in a retrograde fashion. The epididymal tail is involved before the body and head, and should be carefully evaluated.
Testicular Tuberculosis

Clinical History
• Progressive low back pain for 1 year, weight loss, non-painful scrotal mass, and positive sputum AFB.

Imaging Findings
• Diffuse homogeneous hypoechoogenicity of the left testicle with decreased vascularity.
• Proximal to the left testicle, there are homogeneous solid masses demonstrating vascularity with echogenicity similar to that of the left testicle, likely representing granulomas.
• Normal epididymis (not shown).

Teaching Points
• The appearance of epididymo-orchitis varies from diffuse hypoechoic heterogeneous or homogeneous enlargement, nodular hypoechoic heterogeneous enlargement, and small hypoechoic nodules in the testis (miliary orchitis).
• To distinguish TB from bacterial infection, look for spotty flow to the peripheral portions of the tubercular epididymal abscess versus marked vascularity observed in pyogenic abscesses.
• Tuberculous granulomas may develop within the epididymis and testes.
Scrotal Abscess & Nonviable Testis

Clinical History
• Homeless male with history of grade 1 scrotal trauma with hematocele who presents a month later with acute onset of worsening right testicular pain and swelling.

Imaging Findings
• Complex fluid collection in the right scrotum.
• Thickening of the right scrotal soft tissues.
• Asymmetrically smaller right testicle without flow.

Teaching Points
• Orchitis unresponsive to antibiotics requires surgical drainage.
• Untreated orchitis can lead to vascular compromise resulting in testicular infarction and atrophy.
Scrotal Abscess & Necrotic, Torsed Testicle

Clinical History
- Leukocytosis and worsening right testicular pain and swelling despite 4 days of antibiotics

Imaging Findings
- Enlarged, heterogeneous epididymis with increased vascularity.
- Enlarged, edematous right testicle with minimal flow, representing severe orchitis and torsion.
- Large complex septated right hydrocele, compatible with an abscess.

Teaching Points
- Avascular hypoechoic area can represent orchitis, but absent or minimal flow throughout the testis is suspicious for torsion.
Leydig Cell Tumor

Clinical History
• 34 year old male with right testicular pain and swelling.

Imaging Findings
• Focal heterogeneous area in the testis with vascularity.
• Normal epididymis (not shown).

Teaching Points
• Focal orchitis would present as a hypoechoic area with or without peripheral flow, but no central flow.
• Orchitis is usually associated with epididymitis.
Embryonal Cell Tumor

Clinical History

- 26 year-old male with sudden onset of 10/10 right testicular pain for 2 hours with associated mild erythema and swelling.

Imaging Findings

- Hypoechoic irregular area with calcifications and increased flow.

Teaching Points

- Focal orchitis would not have calcification or central flow.
Fournier’s Gangrene

Clinical History
- 34 year old male with status post right orchiectomy 3 weeks ago due to trauma, who presents with left scrotal swelling, pain and fever for 3 days.

Imaging Findings
- **US:** Punctate *echogenic foci* within the left testicle, concerning for gas.
- **CT:** *Gas* in the left scrotum, which tracks into the inguinal canal, retroperitoneum, and along the left gonadal vein.

Teaching Points
- Fournier’s gangrene is a rapid progressive necrotizing infection involving both the superficial and deep fascial planes.
- It is a urologic emergency due to the high mortality.
- Gas within the soft tissues is characteristic, but it’s absence does not exclude the diagnosis.
- CT is the modality of choice because it may depict the source of infection and its pathways of spread.
Testicular Ruptured Testis

Clinical History
- Kneed in the scrotum while playing soccer.

Imaging Findings
- Markedly heterogeneous right testicle with loss of normal contour, disruption of tunica albuginea, and small hypoechoic regions.
- Avascular hypoechoic regions represent intratesticular hematoma.
- Complex fluid surrounding the testicle, representing a hematocele.

Teaching Points
- Findings of testicular rupture: heterogeneous testicular echotexture, testicular contour abnormality, or disruption of the tunica albuginea
Testicular Rupture & Fracture

Clinical History
• 28-year-old male who was hit in the right scrotum with a baseball 24 hours ago.

Imaging Findings
• Enlarged testicle with heterogeneous echogenicity and an irregular capsule (testicular rupture).
• More linear hypoechoic area (testicular fracture).
• Small avascular hypoechoic areas (intratesticular hematomas).
• Complex fluid surrounding the testicle (hematocele).

Teaching Points
• Both testicular rupture and fracture involves disruption of the tunica albuginea.
• Testicular fracture indicates a parenchyma defect.
• Look for a hypoechoic, avascular, linear or wedge-shaped area.
• A fracture line is rarely seen.
Ruptured lower pole of the left testicle with tubules extruding from the tunical defect

Clinical History

• Status post motorcycle accident 4 days ago with left testicular pain and swelling.

Imaging Findings

• Left scrotal hematoma.
• Hypoechoic, avascular area in the lower pole of the left testicle, compatible with ischemia.
• Discontinuity in the tunica albuginea, compatible with rupture.
Devascularized & Ruptured Testicle

Clinical History
• Clipped by a car while riding a motorcycle.

Imaging Findings
• Markedly heterogeneous testicle with avascular areas.

• Loss of normal testicular contour.

• Disruption of the thin echogenic tunica albuginea.
References

http://radiology.casereports.net/index.php/rcr/article/view/133/434
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