Scrotal Ultrasound
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Outline

• Normal anatomy and technique
• Acute scrotal pain investigation
• Scrotal trauma
• Evaluation of scrotal swelling or mass
• Common incidental findings
A 22 year-old male presents after a straddle injury with acute scrotal pain. Ultrasound image of the affected testis is shown. What are some potential complications of testicular rupture?

A. Arteriovenous malformation
B. Infertility
C. Testicular infarct
D. All of the above
The lesion depicted to the right is most likely a malignant lesion. This statement is:

A. True
B. False
C. Unable to determine, since it depends on patient age
Pretest question 3

• 4 year-old male presented with painless scrotal swelling. What is the diagnosis?
  A. Varicocele
  B. Scrotal cystic mass with mural nodule
  C. Epididymal head cyst
  D. Hydrocele
Pretest Question 4

- 25 year old male presents for scrotal ultrasound. What is the diagnosis?
  A. Testicular abscess
  B. Missed testicular torsion with infarct
  C. Testicular microlithiasis
  D. Seminoma on background of testicular microlithiasis
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Normal Scrotal Anatomy
Vascular Supply

• Note the origin of the left testicular vein
  • More common for varicoceles to be on the left

• Lymphatic drainage follows venous drainage
  • Paraaortic and paracaval lymph nodes are the initial nodal station affected by testicular malignancy
Embryology
Normal Ultrasound - Testis

Average adult size 3 x 3 x 5 cm
Normal adult patient

Adult male with Klinefelter’s Syndrome
Normal – Mediastinum Testis

- Coalescence of the dense fiber bundles of the tunica albuginea
Rete Testis
Ectasia of Rete Testis

• Dilation of the tubules
• Can become cystic in appearance
Normal Appearance – Epididymis
Spermatic Cord and Epididymis

- Spermatic cord
  - Vas deferens
  - Pampiniform plexus
  - Testicular artery
  - Lymphatics
- Epididymis
  - Head, body and tail
  - Appendix epididymis is intimate to the head.
    - Usually not visible except with torsion of this structure
Appendix epididymis

• Remnant of the Wolffian (mesonephric) duct
• Not usually visible but can be seen with Torsion
Appendix epididymis

- Vas deferens
- Epididymis
- Appendix epididymis
- Appendix testis
- Tunica albuginea
- Skin
- Parietal layer of tunica vaginalis
- Visceral layer of tunica vaginalis
- Cremaster muscle

[Image: Diagram of the male reproductive system with focus on the appendix epididymis.]

[Image: Ultrasound image of the appendix epididymis with markers indicating the location.]
Normal Appearance – Tunica Albuginea
Appendix Testis

- Focal expansion of the tunica albuginea
- Remnant of the Mullerian (paramesonephric) duct
- Not always visible unless there is fluid around it (hydrocele)
Technique

• Start with the unaffected side
• Two imaging planes (Trv and Sag). Can do a comparison image in Trv between left and right
• Sweep through the entire testis and scrotal contents
  • Testis
  • Epididymis
  • Cord
Doppler

• Crucial in suspected torsion or evaluating for causes of scrotal pain.

• Color Doppler
  • Gives indication of flow and direction

• Power Doppler
  • More sensitive to flow than color
  • No mapping of direction

• Pulsed Doppler
  • Low resistance arterial flow
  • Can pick up venous flow
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Ultrasound Evaluation for Scrotal Pain

**Testicular Torsion**

- Testis can twist around the axis of spermatic cord
  - Bell clapper deformity 12% of males (high insertion of the tunica vaginalis).
  - Can be bilateral in up to 40%

- Obstructs testicular artery flow - ischemia

- Time of onset to intervention crucial for salvage
  - < 6 hours - 90-100% viability
  - 12 hours – 50%
  - 24 hours – 0%
Scanning tips

• Power Doppler is more sensitive to slow blood flow than Color Doppler
  • Very useful if flow hard to find (pediatric patients)
• Turn up the Doppler gain, then gradually lower it so there is no more flash artifact
• Pulsed Doppler
  • Early torsion or torsion/detorsion can show preservation of arterial waveforms
  • Venous flow is the first to be compromised
  • Beware detorsion may cause increased vascular flow to affected testis – history and serial ultrasound key to recognizing torsion/detorsion sequence
Torsion - example

- No flow on right
- Hypoechoic right testis (edema)
Torsion - example

- Absence of Doppler flow
- Testicular edema
- Hydrocele
Torsion - example
Torsion – Whirlpool sign

- Twisted spermatic cord above the testis
Torsion of Appendix Testis

- Pediatric patients
- Clinically palpable at the top of the testis
- Blue dot sign
Ultrasound Evaluation for Scrotal Pain
Epididymo-Orchitis

• Most often retrograde spread from bladder or prostate
  • Gonorrhea, Chlamydia, enteric bacteria

• Can be the epididymis alone - epididymitis
  • Tail of epididymis affected first

• Both epididymis and testis – epididymo-orchitis

• Isolated to the testis is less common – orchitis

• Spermatic cord inflammation - funiculitis
Ultrasound of Epididymo-Orchitis

• Edema and inflammation
• Thickening, heterogeneity and hypoechoic appearance of epididymis
• Hypoechoic change of the testis
  • Heterogeneous or striated
• Hyperemia on Doppler
  • Compare sides if unsure
Epididymitis
Epididymitis
Epididymo-orchitis
Example - Orchitis
Example - Orchitis
Example – Orchitis with pyocele
Inflammation of the Spermatic Cord
Funiculitis
Fournier’s Gangrene
Funiculitis vs Varicocele

No change with Valsalva

Dilates with Valsalva
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Scrotal Trauma

• Direct trauma to scrotum
• Acute swelling and pain

• Testicular rupture complications
  • May lead to infertility due to disruption of the testis-blood barrier and resulting autoimmune reaction to spermatozoa
  • Testicular ischemia from elevated intratesticular pressure due to expanding hematoma and venous outflow obstruction
  • Arteriovenous malformation
Scrotal Trauma
Fracture
Scrotal Trauma
Hematocele
Severe Testicular Rupture
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Scrotal Mass

• Key to diagnosis is location
  • Extratesticular – vast majority (95%) are benign lesions (can be involved by TB)
    • Some exceptions (generally metastases, liposarcoma, leiomyosarcoma)
  • Intratesticular – vast majority (95%) are malignant
    • Germ cell vs sex-cord stromal tumors – younger patients
      • 50% Seminoma, 50% Nonseminomatous Germ Cell Tumors
    • Lymphoma (usually NHL) – older patients (over 60)
Intratesticular

Mixed germ cell tumor – 50% seminoma
Intratesticular

31 y.o. - Pure Seminoma
Intratesticular

- Epidermoid cyst
- Onion ring appearance due to layers of desquamated cells/keratin debris
- Benign lesion, but will undergo surgery
Extratesticular Epididymal cyst/Spermatocoele

- Most common extratesticular finding
- Can become large or multiseptated
- Occasional low level internal echoes
- Displace the testis
  - As opposed to hydrocele which surrounds the testis
Epididymal cyst
Extratesticular Hydrocele
Hydrocele vs Epididymal Cyst

Hydrocele surrounds the testis

Cyst/Spermatocele displaces the testis
Extratesticular Benign Adenomatoid Tumor

- **DDx:**
  - Epididymal cyst/spermatocele with internal debris
  - Scrotal TB
  - Supernumerary testis
Varicocele

- More common on the left
- Dilated serpiginous pampiniform plexus veins > 2.5 mm
- Can accentuate with Valsalva or standing
Varicocele
Hernia

- Bowel, omental fat or both in the scrotal sac.
- Active peristalsis is a sign that the bowel is not presently strangulated.
- Dilated, aperistaltic bowel loop in hernia – over 90% sensitive and specific for strangulation.
Hernia

Omental Fat
Hernia

Herniated bowel

Testis
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Common Incidental Findings
Testicular Microlithiasis

- Testicular microlithiasis
  - Defined as greater than 4 bright foci in an imaging plane
  - Associated with testicular malignancy (association is not strong).
  - Clinical follow-up or ultrasound surveillance are options
Testicular Microlithiasis
Common Incidental Findings
Scrotolith (benign scrotal pearl)

- Bright echogenic focus in the potential space of the tunica vaginalis.
- Can calcify like this one
- Mobile within hydrocele fluid
Pretest Question 1

• A 22 year-old male presents after a straddle injury with acute scrotal pain. Ultrasound image of the affected testis is shown. What are some potential complications of testicular rupture?
  
  A. Arteriovenous malformation  
  B. Infertility  
  C. Testicular infarct  
  D. All of the above

Infertility can occur even if only one testis is ruptured due to formation of sperm autoantibodies
Pretest Question 2

- The lesion depicted to the right is most likely a malignant lesion. This statement is:
  
  A. True
  B. False
  C. Unable to determine, since it depends on patient age

Most likely benign – it is extratesticular. Can see it is arising at the level of the tunica albuginea (bright line).
4 year-old male presented with painless scrotal swelling. What is the diagnosis?

A. Varicocele
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Fluid surrounds the testis
Pretest Question 4

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Notice the relative paucity of calcifications centrally. Most of the microlithiasis has been pushed to the edge, which is due to a mass – seminoma.
Questions?

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