“Scrotal emergencies”
Clinical questions that can be addressed with imaging

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I have no conflict of interest related to this presentation
The acute (painful) scrotum

- Testicular torsion
- Torsion of appendages
- Epididymo-orchitis
- Other causes
- Trauma
The painful, non traumatized scrotum
presentation

- sudden onset of severe lower abdominal/scrotal pain
- nausea, vomiting, fever

- dramatically different management & prognosis
- imaging crucial for DD
Clinical questions

• intra-or extra-testicular cause of pain?
• increased or diminished flow on color Doppler US?
Testicular torsion and other vascular conditions
Testicular torsion

- Twisting of the testis around the spermatic cord → venous occlusion & cessation of arterial flow

- Intravaginal:
  - within the tunica vaginalis
  - all age groups (12-20)

- Extravaginal: Tunica vaginalis not adherent to dartos fascia
  - <10% of all torsions
    - 70% prenatally (intrauterine)
    - 30% postnatally (<1 month)

Predisposing anatomy: Bell Clapper deformity

- abnormal embryological fusion of tunica vaginalis with scrotal wall
- prevalence 1:125, typically bilateral
- testicle lacks normal attachment to vaginalis-joins high on the spermatic cord
- testis lies transversely, free to rotate
Testicular torsion

 acute scrotal pain, radiates to abdomen-groin
 swelling nausea and vomiting
 similar pain with spontaneous resolution
 sleep cold, rest, exercise

Physical examination not always reliable:
 ✓ Scrotal asymmetry - “High riding” testis
 ✓ Tender spermatic cord and testicle
 ✓ Prehn’s sign
 ✓ NO cremasteric reflex

* 40-50% cases of acute scrotum in children < 1 year & adolescents
Duration of pain is indicative

- 69% of torsion cases present at the A&E within 12 hours
- 31% for epididymitis
- those who present within 6 hours from onset of pain usually suffer from torsion

Diagnosis and management

- Definitive diagnosis: Surgical exploration

  *mandatory in cases of high suspicion even after successful manual detorsion
The clock is ticking

- **6 hours**: 80% salvage rate
- **Up to 12 hours**: 70% salvage rate
- **After 12 hours**: <20% salvage rate

Visser AJ and Heyns CF. BJU Int, 2003
Role of imaging in diagnosis

- Color Doppler US
  - waiting for results to confirm diagnosis is inappropriate
  - important in low suspicion cases
  - 95% - 97% accuracy for testicular torsion
Can Doppler US seal the diagnosis?
Color flow doppler US in suspected torsion

• absence of intratesticular flow = “sine qua non” for testicular ischemia

• ? a diffusely hypoechoic testis with little or no flow on US non salvageable ?

• ? early torsion or spontaneous detorsion present with merely reduced or even increased vascularity ?

US findings in spontaneous detorsion

- increased testicular or paratesticular flow in the clinical setting of torsion
- non-specific findings - may be seen in cases of epididymitis and/or orchitis.
US of spermatic cord and epididymis

- can be more accurate in some cases of torsion, especially if testicular blood flow is preserved or mildly diminished

- 61 cases of complete torsion that demonstrated the "whirlpool sign" of the spermatic cord.


Torsion of testicular/epididymal appendages

- the most common cause of acute scrotum in prepubertal boys
- frequently misdiagnosed as testicular torsion
- does not need surgical treatment

- conservative management with bed rest and NSAIDs
Torsion of testicular/epididymal appendages

- Testicular appendage, Mullerian duct remnant (76-83%)
- Epididymal appendage, Wolffian duct remnant (22-28%)
- Vas aberrans and paradidymis, Wolffian duct remnants (1-3%)

Clinical examination

- tender upper pole nodule in only 6.9% of children
- the classic “blue dot” sign (bluish discoloration of scrotal skin superficial to infarcted appendage) is seen in only 0-23% of cases

US findings

- enlarged, hypoechoic, or heterogeneous upper pole extratesticular nodule seen in only 31% of 29 children (7 months to 14 years).

- inflammatory signs
  - hydrocele (76%)
  - enlarged epididymis (76%)
  - scrotal wall edema (55%)
  - swollen testicle (31%)

...were present in 50% of children lacking the extratesticular nodule.

Can we safely diagnose torsion of scrotal appendages with US and avoid an unnecessary trip to the operating room?
19 boys (age 3-14) with diagnosed torsion of intrascrotal appendages

- ZERO had “blue dot” sign
- color Doppler US
  - round/oval avascular lesion with heterogeneous echotexture (n=18),
  - posterior enhancement (n=13)
  - hyperemia of surrounding structures (n=15)

Baldisseroto et al, 2005, Yang et al, 2005

no internal flow, median diameter 3.1mm.

enlarged >5mm appendix & hypervascular epididymis
Segmental testicular infarction

- rare, 70% of cases no underlying cause
- blood flow through end artery interrupted & insufficient collateral blood supply
- small vessel ischemic disease (vasculitis, SCD, hypercoagulable states).
- complication of epididymoorchitis, trauma, inguinal hernia repair
- Diagnosis crucial to prevent unnecessary orchiectomy.
testicular infarction on US

- Color Doppler US: poor or absent flow in a focal mass.
- Diagnostic finding: avascular or low blood flow in wedge-shaped lesions.
- Challenge: a more rounded and less well-defined lesion (DD from intratesticular tumor)


Fernandez-Perez GC, et al. AJR Am Roentgenol 2005
Clinical question

- Is further imaging indicated to rule out a hypovascular tumor?

  - Some testicular tumors smaller than 1.6 cm are hypovascular on color Doppler US

Smets T, Journal of Medical Case Reports 2017
Infectious scrotal conditions
Epididymitis

- painful scrotum and along the spermatic cord
- mean age 41 years vs 14 years for testicular torsion.
- tender and swollen epididymis on palpation
- DD: torsion, trauma, parotidic orchitis
- Treatment: Abx, bed rest, scrotal support, NSAIDs
US findings

• epididymis enlarged and acutely hypoechoic.
• testis enlarged and hypoechoic
• Color Doppler:
  • hypervascularity (epididymis less vascular than testis).
  • reactive hydrocele
  • pyocele (complex or echogenic fluid)
Epididymo-orchitis

- Extension of epididymal infection to the testis (approximately 20%)
- Abnormal hyperemia on color flow Doppler
- Challenge: severe infection - intratesticular arterial flow diminished or absent - testicular infarction.
  - DD from testicular torsion
  - Evaluation of the spermatic cord may help distinguish between the two.
Testicular abscess

- untreated or persistent infection
- epididymal or testicular abscess
- surgical debridement – orchidectomy

low-vascularity intratesticular mass in acute epididymo-orchitis.
Fournier’s gangrene

- Polymicrobial infection - vascular thrombosis - necrotic fasciitis
- 1-2% of urological admissions, 20-30% mortality
- Background: DM, liver cirrhosis, HIV, alcoholism, malnutrition, poor hygiene

- Management:
  - Broad-spectrum ABx
  - Aggressive resuscitation
  - Prompt surgical debridement
The traumatized scrotum
### Scrotal trauma

- **<1% of all injuries**
- **peak age 15 – 40 years**

#### Blunt trauma
- 85% of cases
- Sports injuries >50%
- Road traffic accidents 5-17%

#### Penetrating trauma
- 15% of cases, stabbing or gunshot wounds.

#### Degloving or shearing injuries
- Very rare, while operating heavy machinery.

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presentation

• straightforward history of injury
• present soon after the event
• very severe pain in the scrotum, often nausea and vomiting
• scrotal swelling & haematoma, perineal bruising
• associated injuries to the perineum, thigh and pelvis.
When should we operate?

- History and physical
  - Type of injury
  - Other injuries
  - Urine analysis

  If presence of hematuria, consider urethral injury

Blunt

- Scrotal ultrasonography with Doppler

Penetrating

- Immediate surgical repair with goal of testis salvage

Presence of:
- Testicular fracture
- Inhomogeneity of testicular parenchyma
- Disruption of tunica albuginea
- Testicular torsion
- Intratesticular hematoma
- Large or expanding hematocoele
- Physical exam suggestive of testicular injury with equivocal results

Gomella L. “The 5’ Minute Urology Consult” 2nd Edition 2010
Clinical questions

- hematoma of the scrotal wall or intratesticular hematoma?
- Rupture of the testis (tunica albuginea) is the most important question to be answered in scrotal trauma.
Scrotal hematoma

- Thickening of the scrotal wall due to haematoma and edema.
- Hematoma can become large due to scrotal elasticity and lack of fascial planes to tamponade bleeding.

extra-testicular space occupied by haematoma
Color Doppler US

- Sonography is accurate in assessing
  - parenchymal disruption
  - extratesticular hematoma.
- focal disruption or alterations in echogenicity often indicate acute hemorrhage or infarction (may be present with intact tunica)

a clearly defined fracture line on US is visible in < 20% of patients.

suspected rupture
- disruption of the normal testicular architecture
- ill-defined testicular outline
- impaired or absent flow on color Doppler

absence of flow
- torsion
- complete avulsion of testicular artery
Clinical question

- How to differentiate between testicular rupture and complex extratesticular hemorrhage?

✓ **Color Doppler:** Hematomas are avascular vs prominent intraparenchymal flow if testis is viable.
post-trauma testis

- Hx of testicular trauma or orchitis might result in testicular atrophy.
- small, heterogeneous testis in texture.
- US: “zebra testis” = hypoechoic bands across the testis.
Trauma or tumor?

- abnormal US with minimal trauma, or history of trauma weeks ago.
  - Testicular injury = reason for men to self-examine
  - allows men who are embarrassed to find excuse to seek medical opinion.

Red herring!

Testicular seminoma
Late complications

- Delay in repair may impair spermatogenesis and hormonal function
- Testicular salvage rate drops from 80% to 20% after 12 hours
- Testicular atrophy
  - 50% reduction in testicular volume in 1:2 men with ipsilateral testicular injury
  - 20% of conservatively treated testicular injuries resulted in atrophy and late orchidectomy

Lee SH et al, BJU Int. 2008
Thank you for your attention