Objectives

- Identify the most common disease processes which affect the scrotum
- Understand the ultrasound techniques needed to diagnose scrotal pathology

Etiologies of Acute Scrotal Pain

- Epididymitis/Orchitis
- Testicular Torsion
- Trauma
- Tumor
- Scrotal Disease

Epididymitis

- Gray scale findings - Enlarged epididymis (How much? I use head >2 or body or tail >head. Normal head =1.2cm)
- May be localized to the tail- don’t just examine the head.
- Reactive hydrocele
- Skin thickening
- Heterogeneous echo-pattern of testis-concomitant orchitis occurs in 20-40%

Dogra, Rubens et al Radiology Apr 2003

CLASSIC EPIDIDYMITIS COLOR FLOW DOPPLER
Deborah J. Rubens, MD
The Acute Scrotum: Case Based Review

**WHY DO WE NEED DOPPLER?**

- To identify subtle cases of epididymitis
- To identify concomitant orchitis (gray scale usually normal)
- To monitor for complications of epididymo-orchitis
  - Abscess
  - Infarction

**Right sided pain**

**TESTICULAR ABSCESS**

- Most commonly a complication of epididymo-orchitis
- Also may result from infected hematoma (trauma, torsion) or tumor
- US shows hypoechoic mass with debris

*Initial orchitis, did not take oral antibiotics, developed abscesses.*

**Day 1 Left Sided Pain**

**Dx?**

**Day 2**

**Day 3**

**Venous Infarct**

At initial presentation

Three months later
LEFT TESTICULAR PAIN
"R/O TORSION"

Your diagnosis now?

7 day hx of pain. UTI on urinalysis. Works as heavy lifter. Color Doppler subtly asymmetric.
Spectral Doppler shows diastolic flow reversal. Your therapy?

Epididymitis from urine reflux. Given oral antibiotics x 3 weeks and sent home. FU exam showed decreased size of testis, UA clear, persistent pain.

15 yo with 1 day left sided swelling

Chronic torsion with preserved epididymal flow

Testicular Torsion

- Clinical presentation includes:
  - Acute onset of scrotal pain
  - Anorexia, nausea and/or vomiting
  - Lack of urinary symptoms or fever
- As many as 35-50% of patients experience gradual onset of pain, similar to epididymitis
- Pain may be intermittent (detorsion)


4 WEEKS LATER: PERSISTANT PAIN

FINAL DIAGNOSIS: “Testis, left, orchiectomy: - Abscess formation with acute and chronic orchitis and infection. The portion of testicular parenchyma is almost entirely replaced by what grossly appears to be a soft gray-green abscess.”

23 yo 1 day rt scrotal pain/swelling
Dx: Acute torsion with viable testis

- Important imaging findings:
  - Note grayscale symmetry on transverse images
  - Color Doppler flow is absent in the affected testis, but not in the epididymis
  - The epididymis has alternate blood supply and may be perfused even if the testis is not.

Testicular Torsion: Grayscale Patterns

- Viable testis: normal
- Infarction: hypoechoic, either total or partial
- Hemorrhagic infarction: hyperechoic and heterogeneous pattern.
- Chronic: hypoechoic with small testis.


Testicular Torsion: Doppler Patterns

- Absent arterial and venous flow
- Increased Resistive Index on affected side (diminished or reversed diastolic flow)
- Decreased flow velocity: small low amplitude flow on symptomatic side or tardus parvus waveforms

References:

Torsion with preservation of Doppler flow

- Torsion is not an all or none phenomenon
- Venous obstruction occurs first and is indicated by a high-resistance arterial spectral Doppler waveform.
- Flow may still be present even if the testis is twisted up to 720 degrees.
- More flow will be detected with power Doppler and probably also with US contrast.
- **THE PRESENCE OF FLOW DOES NOT EXCLUDE TORSION!**

Reference:
14 yo male with severe left sided pain several days ago now improved but with swelling and pain on left

Dx? Partial torsion with ischemia

Note in ED chart from Urology Resident

- Assessment:
  - E.Y. is a 14 y.o. male p/w 7 day h/o intermittent left scrotal pain w/ associated swelling. U/S negative for torsion, although possible torsion-detorsion vs. epididymitis. +Prehn's sign on hx c/w epididymitis, although cannot definitively exclude torsion-detorsion. Hydrocele likely reactive regardless. No evidence of hemias. No acute torsion requiring operating intervention. Pain has been gone for 24hrs and testicle viable w/o evidence of ischemia on U/S. Torsed appendix epididymis or appendix testis also possible.
  - Plan: We recommend the following:
    - No need for acute urologic intervention.
    - Supportive care for pain at this time, given likely epididymitis and possible torsed appendix epididymis/testis. NSAIDs, ice, scrotal support, abstinence from vigorous physical activity for few days.
    - Although cannot definitively exclude torsion-detorsion, no evidence of acute torsion at present and no indication for emergent orchiopexy. Patient may ultimately benefit from elective orchiopexy if intermittent torsion is in fact present. Patient to f/up with Dr. R. Rabinowitz.
    - Please call if ?'

11 days later
43 yo male with right testicular pain

Differential Diagnosis

- Epididymo-orchitis with decreased perfusion
- Partial testicular torsion/detorsion
- Technical variability
- Trauma

19 yo with pain after jumping into a swimming pool

PARTIAL TESTICULAR TORSION/DETORSION

TORSION/DETORSION

- History is critical-classically that of intermittent acute and sharp pain with long symptom-free intervals
- Know which side hurts and if it still hurts during the examination.
- If scanned immediately after detorsion, the affected testis may show increased blood flow.

19 yo with pain after jumping into a swimming pool Dx: Contusion?

2 questions: How cold was the pool? Is he currently in pain?
Torsion/detorsion with infarction

- Focal hypoechoic areas with concave margins are typical of infarcts.
- Focal infarcts when associated with normal or increased flow should alert you to the possibility of intermittent torsion.
- Frequently the epididymis is enlarged and hyperemic in torsion/detorsion and can be mistaken for epididymitis.
- Careful surveillance of the testis for focal infarction may lead to the correct diagnosis.

Doppler Technical Considerations

- Always use the highest frequency Doppler which will yield a signal without attenuation.
- Initial examination was performed at Doppler frequency of 5 MHz, repeat examination at 10 MHz.
- Always confirm a true arterial spectral waveform. The waveform on the initial examination was noise, and could have been interpreted as no flow.

4 Day Old with a Large Left Hydrocele
Pediatric Torsion?

55 yo male with right sided scrotal and penile pain

Dx: Normal testes

Spectral Doppler 10 hours later. What is your diagnosis?

Torsion Take Home Messages

- Torsion may be present despite testicular flow.
- Diminished or high resistance flow should suggest torsion in the proper setting.
- A history of intermittent symptoms should suggest detorsion, and corresponding hyperperfusion should not be confused with epididymo-orchitis.
Testicular Trauma

- Sonographic findings include
  - Interruption of tunica albuginea
  - Heterogeneous testis with irregular borders
  - Hematocele
  - Direct visualization of fracture line is rare and seen in 17% of cases
  - Interruption of Tunica vasculosa

HEMATOCELE

- Usually from trauma
- Other causes include torsion, tumor.
- Contain internal septations and loculations and debris.

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SCROTAL TRAUMA

Multiple images show flow to testis and epididymis, but continuity of the testis is not established.

Hematocele demands surveillance of testis for rupture

Basketball injury 3 days ago, now presents with swelling.

Testicular Trauma

Color Doppler US is extremely useful to identify devascularized, extruded testicular tissue which may appear normal by grayscale.
**TESTICULAR TRAUMA**

18 yo male with right scrotal pain following basketball injury

Traumatic epididymitis
Managed with pain meds and outpatient f/u

**INTESTICULAR TUMORS**

- Often painless masses (65% or more)
- 4-14% present with metastases
- May present with epididymitis
- May present with pain (infarction and hemorrhage)
- May present with torsion

**Testicular Trauma**

- Hematocele may be secondary to intra or extra testicular injury and may occur without testicular rupture.
- All intratesticular abnormalities should be followed if no surgical intervention performed
- 10 - 15% of testicular tumors first present after an episode of scrotal trauma

**EPIDIDYMO-ORCHITIS?**

Nov 9th Dec 11th

Seminoma. Orchitis does not distort the gray scale this much. c/o l scoutt
SEMINOMA
- Most common single cell type tumor
- 40-50% of all germ cell tumors, common component of mixed tumors (30%)
- Occurs after puberty, mostly in age 40-50
- AFP not elevated, HCG elevated in 10% (contained) and 25% (metastatic)
- 2 types
  - Classical (40-50%)-bilateral in 1-2.5%
  - Spermatocytic (1-2%)-bilateral in 9%

NON-SEMINOMATOUS GERM CELL TUMORS
- Young men 20-40
- Most often mixed from types below
  - Embryonal
  - Yolk sac (endodermal sinus tumor)
  - Choriocarcinoma
  - Teratoma
- More aggressive than seminoma
- Heterogeneous on US with cysts and calcification
- Often present with adenopathy or distal metastases

SEMINOMA
- Favorable prognosis
- 25% with metastases at presentation, 20% nodal and 5% extranodal
- Chemo and radiation-sensitive
- Tend to have homogenous cells, and thus a uniform appearance on imaging, though may undergo infarction and necrosis.

15 YO: LEFT FLANK PAIN
Dx “hematoma,” drainage attempted
Embryonal carcinoma
MR shows enhancing margin and necrotic center.
Tumor suggested and biopsy performed.

36 yo hospital engineer presents with 8 hours of excruciating pain
Infarcted hemorrhagic mixed germ cell tumor

MIXED GERM CELL TUMORS
- Most common NSGCT (32-60% of all GCT’s)
- Embryonal carcinoma most common component
- Average age is 30 yrs
- Less radiation sensitive than seminoma
- Elevated AFP in 60% and HCG in 55%
19 yo with purpura and swelling 3 weeks post bowel surgery

Note the cystic spaces, calcification and internal flow. Dx: Immature Teratoma

TERATOMA

AFP and HCG are negative. Cysts common as well as calcium, scar, cartilage.

Classified as mature, immature, and teratoma with malignant transformation
- Immature teratoma contains neural elements, mature does not
- "Mature" teratoma in infant and young child is commonly benign.
- "Mature" teratoma in adult is NOT equal to benign.

1/3 teratomas in adults metastasize within 5 years.

TERATOMA-WHICH TYPE?

• 25 yo with acute left painful scrotal mass
• US to exclude torsion
• Path=mature teratoma both locations.
• T1N3M0

35 yo with hemoptysis and back pain

• Choriocarcinoma
• Widespread hemorrhagic and vascular metastases
• Often involves the brain
• Elevated HCG in 100%

Other Intratesticular Masses

• Tunica Cyst
• Epidermoid Cyst
• Dilated Rete Testis
TUNICA CYST
- Relatively common
- 2-30 mm in size
- Arise in the tunica albuginea
- Often asymptomatic but may present with palpable firm nodule
- Histologically simple cysts
- May calcify

DILATED RETE TESTES: TUBULAR ECTASIA
- Epididymal obstruction from inflammation or trauma
- Dilated tubules in mediastinum
- Often bilateral
- Spermatocele associated

EPIDERMOID CYST
- 1% of tumors
- Keratinizing squamous epithelium within a fibrous wall.
- Filled with cheesy laminated material
- May be calcified
- Characteristic layers or rings on US
- Avascular

Extratesticular Pathology
- Hernia
- Hydrocele
- Infection

15 yo with palpable masses

55 yo male with right sided scrotal and penile pain
**HERNIA**

- May contain omentum or small bowel
- Omentum may be difficult to distinguish from lipoma.
- Continuity with the inguinal canal may be useful.

**HYDROCELE: ACQUIRED**

- Idiopathic, trauma, torsion, epididymitis
- Due to excess fluid production or impaired resorption.
- Small amount of fluid (2-3mm) on US is normal.
- Usually anechoic but may contain fibrin or cholesterol crystals.

**22 yo with palpable mass**

Omental hernia

**48 hours increasing right sided pain**

Note reversed diastolic flow on the symptomatic side.

**INGUINAL HERNIA**

Bowel may be difficult to differentiate from a solid paratesticular mass unless you can identify valvulae conniventes or haustra, or see peristalsis or luminal gas motion in real-time.
Post-operatively after the hydrocele is eliminated, the flow returns to normal.

56 yo s/p heart surgery 3 months ago with new scrotal mass

PYOCELE
- Indistinguishable from hematocoele
- Clinical difference includes fever, elevated WBC and/or erythema.
- Usually a result of epididymitis with abscess rupture.

Scrotal Infection
- May involve the wall
- Requires drainage

Paraplegic with 4 days Scrotal Swelling, elevated WBC

Fournier’s Gangrene
- Necrotizing fasciitis
- Mixed aerobic and anaerobic infection
- CT to map extent for surgical debridement
- Surgical emergency

PYOCELE

Fournier’s Gangrene
Conclusions

- US is the primary imaging modality to evaluate the acute scrotum.
- Doppler US is essential to diagnose torsion and epididymo-orchitis.
- Grayscale and Doppler discriminate tumor from abscess or hematoma, and triage patients to operative or non-operative management, especially in trauma.
- Other causes for acute scrotal pain, such as cellulitis, infarcts, hernias, and thromboses may be rapidly identified and appropriate therapy instituted.

THANK YOU