An Anthology of Pain: Sonographic Findings of the Acute Scrotum

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Overview

- Anatomy
- The Acute Scrotum
  - Initial Evaluation
  - Differential Diagnoses
- Ultrasonography and Scrotal Imaging
- 3 Cases of Left Testicular Pain

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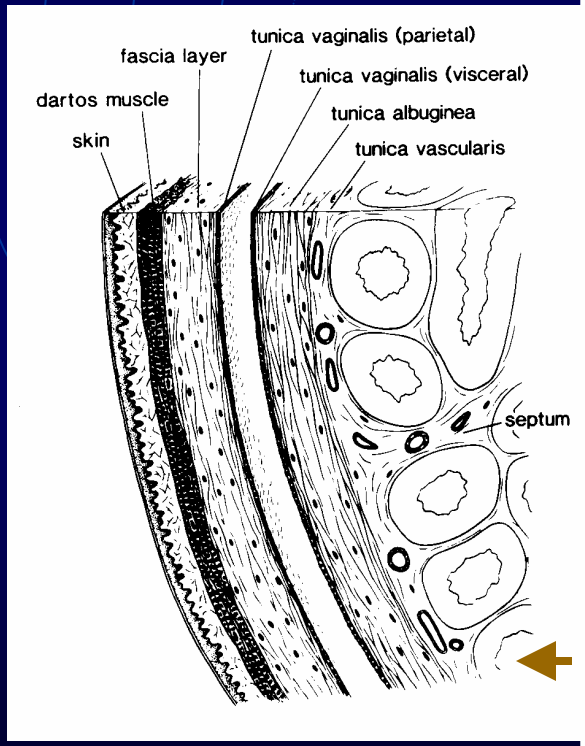
Anatomy of the Scrotum



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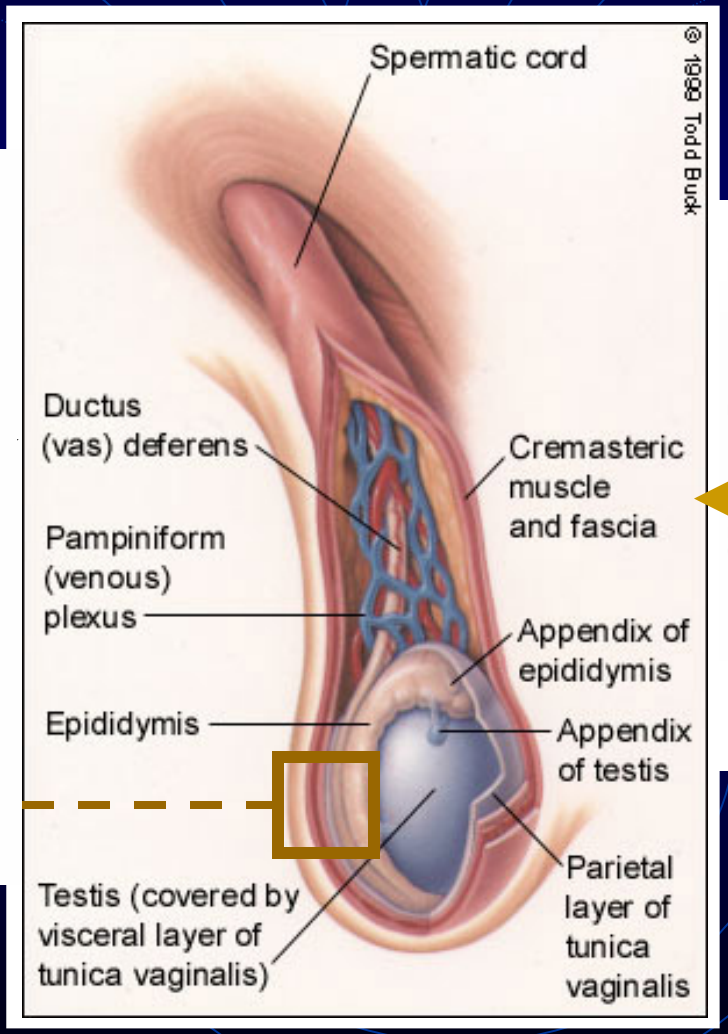

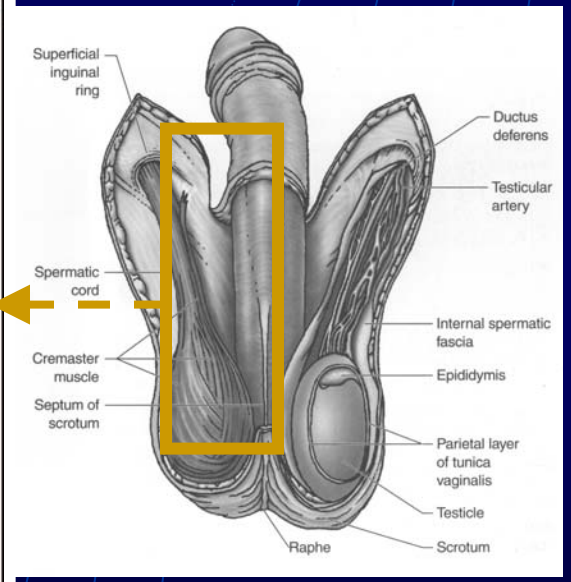

Novelline RA. Squire's Fundamentals of Radiology

http://www.aafp.org/afp/990215ap/817.html

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Anatomy of the Scrotum

- Anatomic structures include
  - Testis
  - Epididymis
  - Vas deferens
  - Venous plexus
  - Testicular artery
  - Appendix of epididymis (remnant from embryogenesis)
  - Appendix of testis (remnant from embryogenesis)

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Anatomy of the Scrotum

- Layers include
  - (Testis: Seminiferous tubules)
  - Tunica albuginea
  - Visceral layer of Tunica vaginalis
  - Parietal layer of Tunica vaginalis
  - Fascia
  - Dartos muscle
  - Skin

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The Acute Scrotum

- The ***Acute Scrotum*** refers to the acute onset of scrotal pain with or without swelling, often seen in an emergent setting.

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The Acute Scrotum

- Signs of Inflammation
  - Tumor/Swelling
  - Rubor/Redness
  - Calor/Heat
  - Dolor/Pain

http://www.nhsdirect.nhs.uk/SelfHelp/gfx/photos/_im023.jpg

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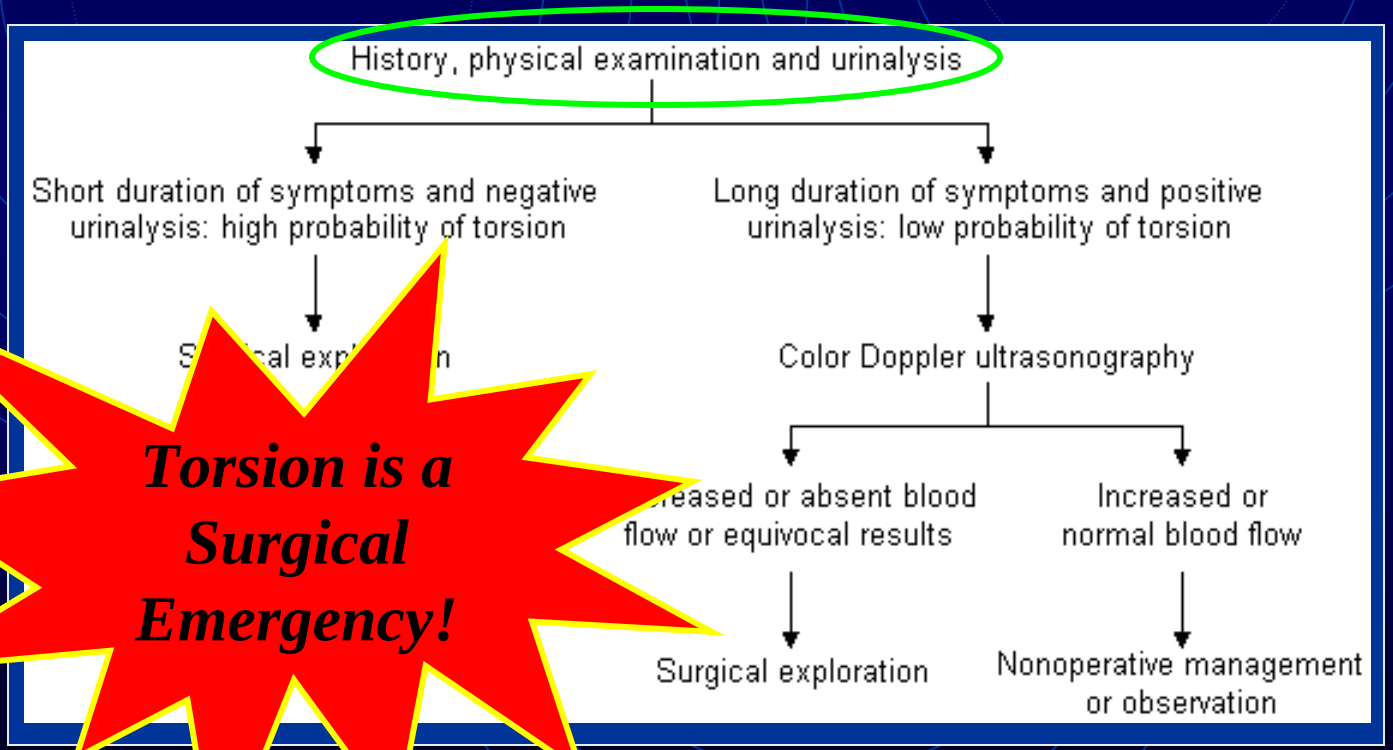
The Acute Scrotum

- Initial Evaluation



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The Acute Scrotum

- Initial Evaluation
  - A pertinent history, physical examination, and urinalysis are often sufficient to make a diagnosis.
  - Imaging can be used to clarify diagnoses.

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The Acute Scrotum

- Differential Diagnoses
  - Separated into 4 general groups for ease of memorization.

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The Acute Scrotum

- Differential Diagnoses
  - (1) Pain as primary symptom
    - Inflammation
      - Epididymitis
      - Epididymo-orchitis
      - Orchitis
    - Torsion
      - Testicular
      - Appendiceal

Surgical Emergency!

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The Acute Scrotum

- Differential Diagnoses
  - (2) Pain with history of trauma
    - Contusion
    - Rupture
    - Hematoma

Also a Surgical Emergency!

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The Acute Scrotum

- Differential Diagnoses
  - (3) Palpable mass, classically painless
    - Intratesticular (usually malignant)
      - Seminoma (40-50%)
      - Mixed (40%)
      - Germ cell tumor
      - Teratoma
      - Choriocarcinoma
      - Metastases (kidney, prostate, lung, pancreas, bladder, thyroid, melanoma, GI)
      - Non-Germ Cell (Sertoli, Leydig, Mesenchymal)
    - Extratesticular (usually benign)
      - Adenomatoid Tumor of the Epididymis (30%)
      - -omas: Leiomyoma, Fibroma, Lipoma
    - Varicocele
    - Cyst/Abscess

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The Acute Scrotum

- Differential Diagnoses
  - (4) Visible swelling, usually painless (unless co-presenting with painful pathology as stated above)
    - Fluid collection
      - Hydrocele
      - Hematocele
      - Pyelocele
    - Scrotal hernia

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Imaging the Scrotum

- Ultrasound in the Emergent Situation
  - Fast and relatively inexpensive compared to CT, MRI
  - Blood flow
    - Torsion (decreased flow) v. Inflammation (increased flow)
    - Fluid Collection (avascular) v. Soft Tissue (vascular)
  - Anatomic deformities
    - Trauma
    - Tumor
  - Characterization of fluid collections
  - Real-time peristaltic bowel movements
    - Hernia

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Imaging the Scrotum

- The following slide shows the technique of scrotal ultrasound. The transducer is placed on top of the scrotum, which rests on the patient or is supported by the physician doing the study.

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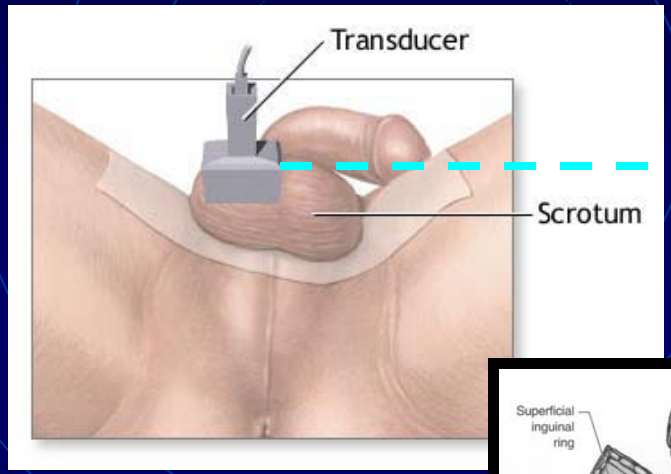
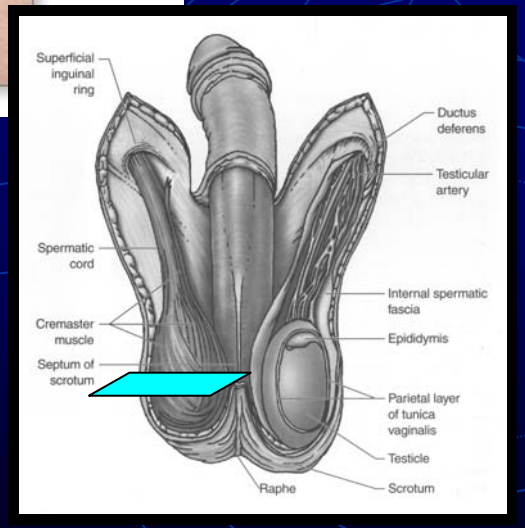
Imaging the Scrotum

http://health.allrefer.com/pictures-images/tesitcular-ultrasound.html





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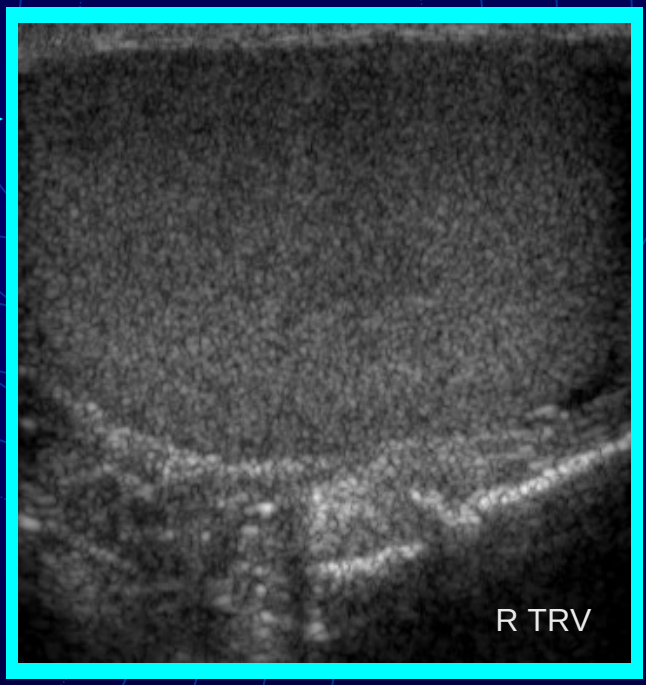

courtesy of Dr. Kane, BIDMC

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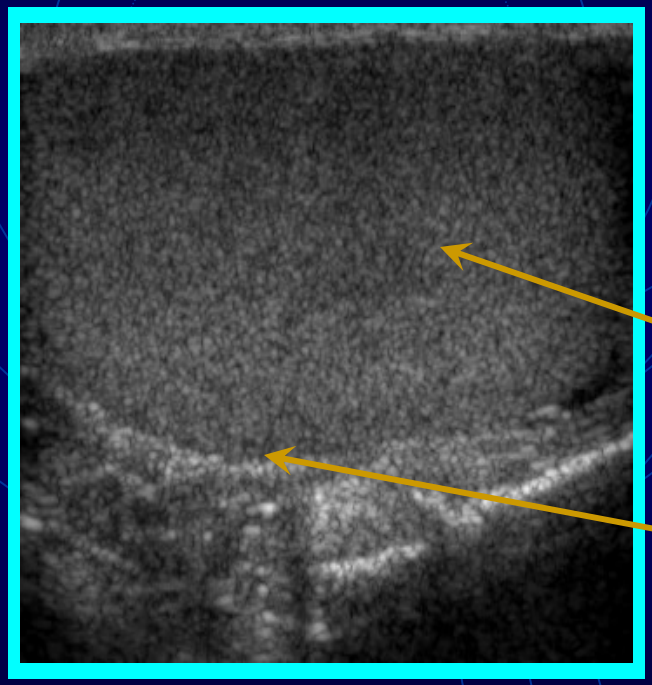
Imaging the Scrotum



courtesy of Dr. Kane, BIDMC

- This image is a normal ultrasound of the R testicle, transverse view. Note:
  - Homogeneous echogenicity
  - Clear, smooth testicular boundary

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Meet the Patients

- Patient A
  - 20 year old man with acute onset L testicular pain of 4-5 hours duration.
- Patient B
  - 17 year old man with L testicular pain after being struck with a hockey puck.
- Patient C
  - 33 year old man with acute onset L testicular pain of 48 hours duration.

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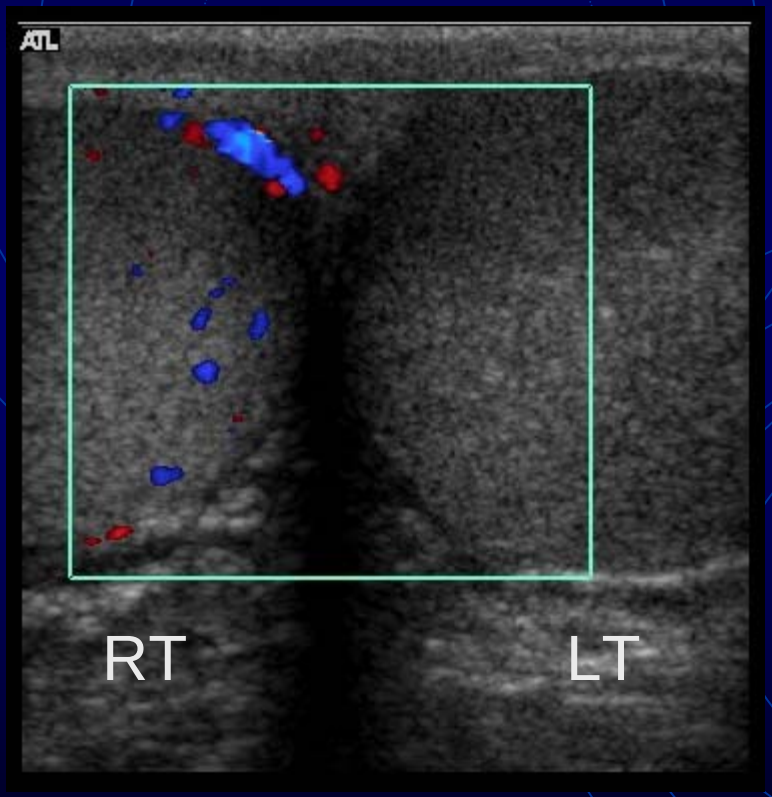
Patient A
(20 yo acute pain 4-5 hr)



courtesy of Dr. Kane, BIDMC

- L Testicle
  - Decreased flow
  - Heterogeneous
  - Relatively hypoechoic
  - Slightly enlarged when measured at widest diameter

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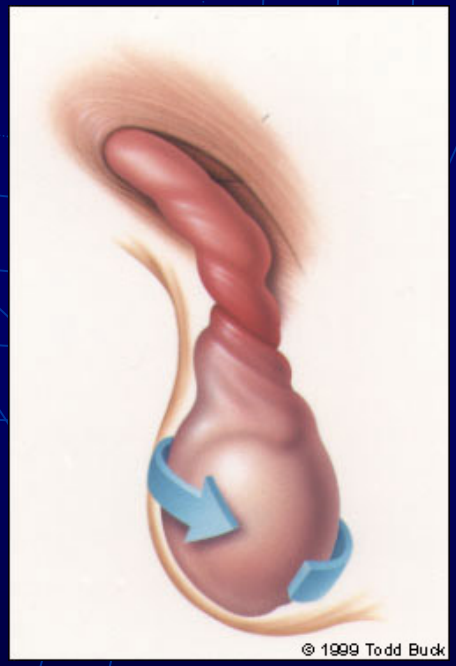
Patient A
Testicular Torsion

- These findings are classical for Testicular Torsion.
- Testicular Torsion involves rotation of the testicle around itself, leading to disruption of blood flow to the organ, and if left untreated, ischemia and necrosis.
- Usually ideopathic, though risk is increased with trauma and congenital poor fixation of testicle to scrotal wall ("bell-clapper deformity")



http://www.aafp.org/afp/990215ap/817.html

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Patient A
Testicular Torsion

- Doppler Ultrasound has sensitivity of 86-100% and specificity of 100% in 2 different studies.
- Clinical suspicion often sufficient for diagnosis: short duration of symptoms in a peri-adolescent
- Testicular salvage rate in surgery:
  80-100% within 5 hours of onset of pain
  70% within 7-12 hours
  20% after 12 hours
- Thus, important to catch early and send to OR

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Patient A Resolution

- The patient went to surgery 5-6 hours after onset of pain; surgeons were unable to reestablish blood flow in the ischemic L testicle, and the patient underwent L orchiectomy.

Be Careful: Spontaneous detorsion increases blood flow, which can mimic hyperemia of inflammation!

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Patient A
Spontaneous Detorsion

- Manual manipulation during clinical examination can lead to spontaneous detorsion of torsed testicle. In this instance, restoration of vascular patency to previously ischemic organ leads to increased flow, which can mimic hyperemic conditions such as orchitis.

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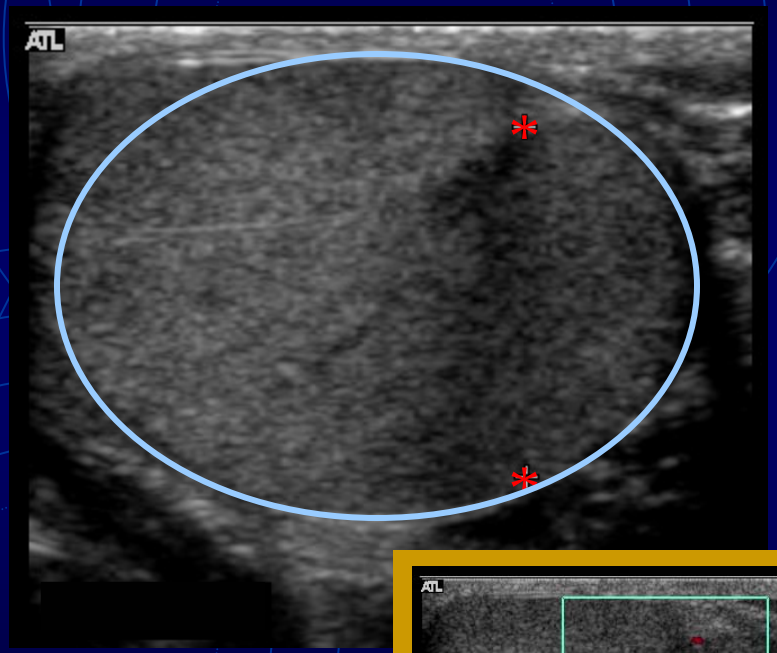
Patient B
(17 yo h/o L testicular trauma)

- Intratesticular region of hypoechoic signal = Contusion
- Normal flow = Viable tissue, r/o Torsion
- Testicular margin intact on multiple views, without evidence of extratesticular hydrocele or hematoma.



courtesy of Dr. Kane, BIDMC

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Patient B
Testicular Trauma

- This is a routine evaluation of Testicular Trauma using Ultrasonography.
- Risk of testicular rupture due to blunt trauma is 50%, caused by severe crushing injury against pubic bone.
- Rupture of Tunica Albuginea leads to extravasation of the Seminiferous Tubules, causing ischemia or infection.

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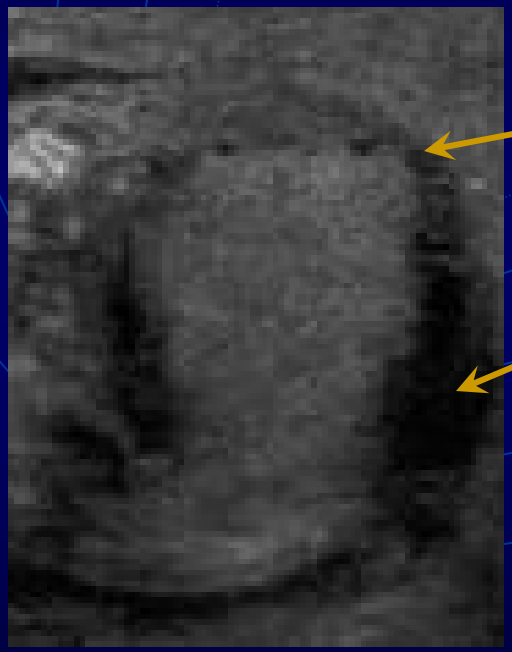
Patient B
Testicular Trauma



http://rad.usuhs.mil/medpix/medpix.html?mode=single&recnum=4560&th=-1#top

- Example of Rupture
  - Discontinuous boundary of testicle
  - Hydrocele or Hematocele
- Testicular Salvage Rate in Surgery:
  80% within 3 days of trauma
  33% within 9 days of trauma

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Patient B
Resolution

- Radiology was comfortable with negative findings (regular testicular margins, absent fluid collection). Patient was discharged with pain medication.

Be Careful: Ultrasound can miss minor tears in tunica albuginea! Nondiagnostic or suspicious ultrasounds should be followed with MRI or surgical exploration.

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Patient B
Nondiagnostic Imaging

- If there continues to be doubt, remember that surgical exploration with negative findings is much more acceptable for the patient than missed rupture leading to ischemia, infection, and ultimately, infertility.

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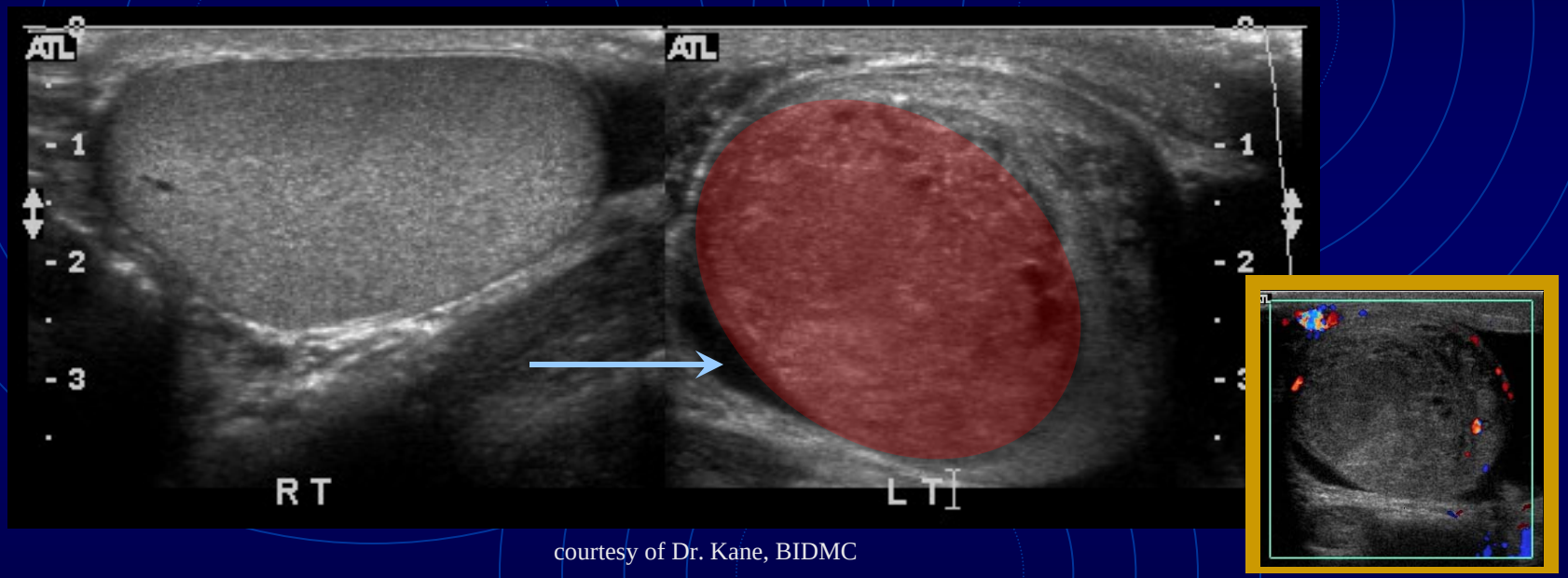
Patient C
(33 yo acute pain 48 hr)



courtesy of Dr. Kane, BIDMC

- Heterogeneous mass in the enlarged L Testicle
- Hydrocele (nonspecific inflammation)
- Hypovascular

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Patient C
Testicular Tumors

http://www.macmed.ttuhsc.edu/Tran/kidneys/pages/newpage48.htm

- This patient has a Testicular Tumor.
- 20% present with pain (though tumors are classically painless palpable masses).
- Can be found incidentally during work-up for testicular trauma or other pathology.

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Patient C
Testicular Tumor

- Usually hypervascular, as tumor growth requires increased blood flow; this also means tumors must be distinguished from inflammation (orchitis).
- Requires surgery/pathology workup for staging and diagnosis.
- May be associated with increased levels of HCG.

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Patient C
Resolution

- Surgeons resected the L testicle. Pathology identified a Mixed Germ Cell tumor with clean margins. Patient has been free of tumor for 15 months, with follow-up every 2-4 months (watchful waiting). There is no single protocol for testicular tumor; the patient's preferences should be taken into account when deciding course of treatment.

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Patient C
Vascularity and Tumors

- Be Careful: Vascularity is related to Tumor Size; so small tumors (<1.5 cm) can appear hypovascular, rather than hypervascular, on Doppler Ultrasound. As you can see, however, even large tumors do not always follow the rules.

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Summary

- Ultrasound imaging can help differentiate among diagnoses in the setting of Scrotal Pain: We saw 3 cases of left testicular pain with different diagnoses based on imaging and history.
- Doppler ultrasound is used to distinguish between Torsion, a low-flow state which is a surgical emergency, and Inflammation, a high-flow state which is medically treated.

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Summary

- Ultrasound can be used in the setting of Trauma to evaluate damage to scrotal contents, but should be followed with MRI if nondiagnostic.
- Masses can be identified with ultrasound even when clinical suspicion is low; surgery/pathology is required for further work-up. Rule-out inflammation first.

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Special Thanks

- Robert Kane, MD
- Gillian Lieberman, MD
- Pamela Lepkowski
- Larry Barbaras, our webmaster

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The End