Lumps, Bumps, and Hernias

Jason Wagner, MD

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Objectives

- Classify superficial soft-tissue masses based on patient history and ultrasound findings.
- Describe the optimization of Doppler settings to evaluate potential soft-tissue neoplasms for internal flow.
- Recognize the overlap in imaging findings between intramuscular hematomas and neoplasms.
- Identify ventral abdominal wall and groin hernias using dynamic maneuvers and anatomic landmarks.

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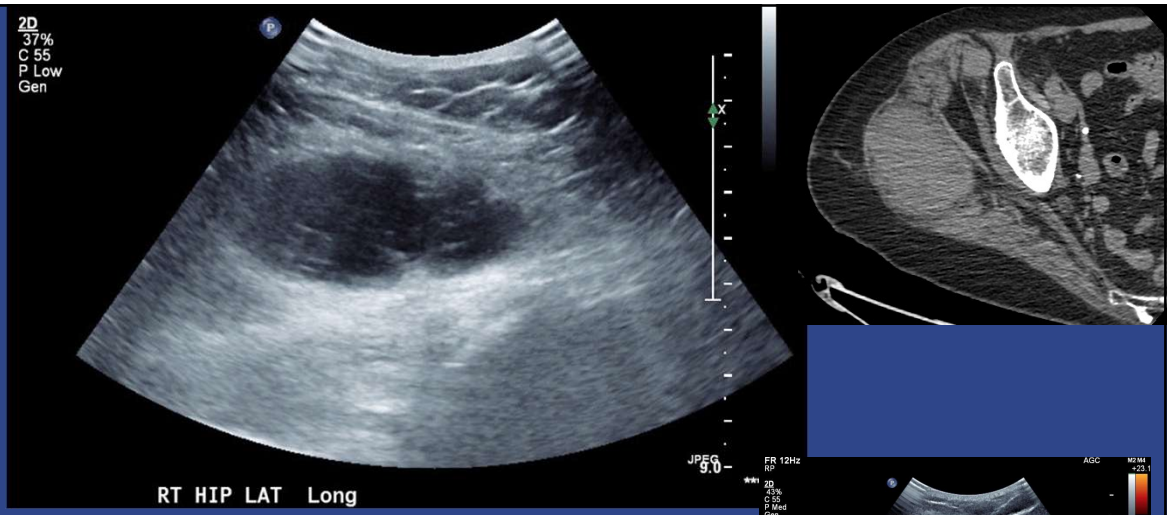

76 y/o woman with new gluteal mass. History of minor trauma. Diagnosis?

A. Hematoma
B. Sarcoma
C. Lipoma
D. Desmoid

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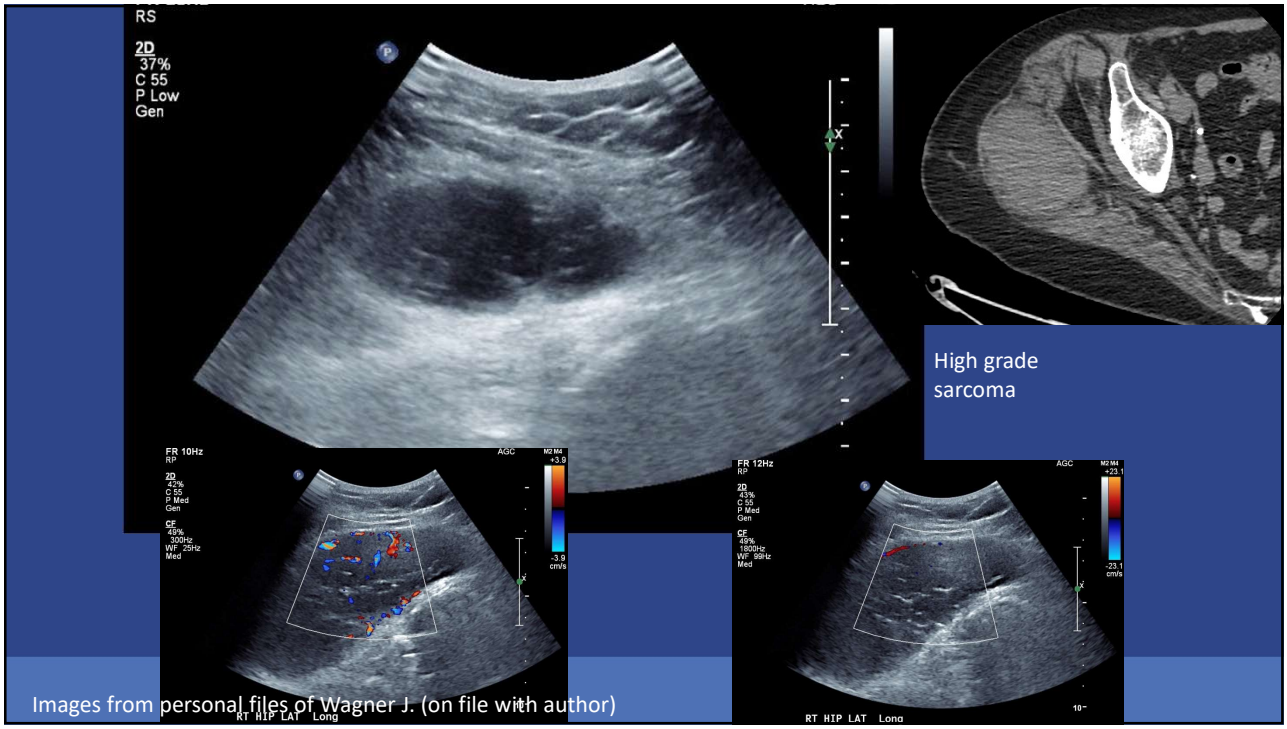

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Superficial Scanning Technique

- Patient history – chronicity, growth, pain, skin changes, drainage, history of malignancy or trauma
- Lots of gel – light contact
- Highest frequency that will see the entire lesion
- Establish location (dermis, subcutaneous, deep)
- Doppler – sensitive settings, light pressure
- Special maneuvers – compression, extremity motion, Valsalva, extended field of view, contralateral comparison images

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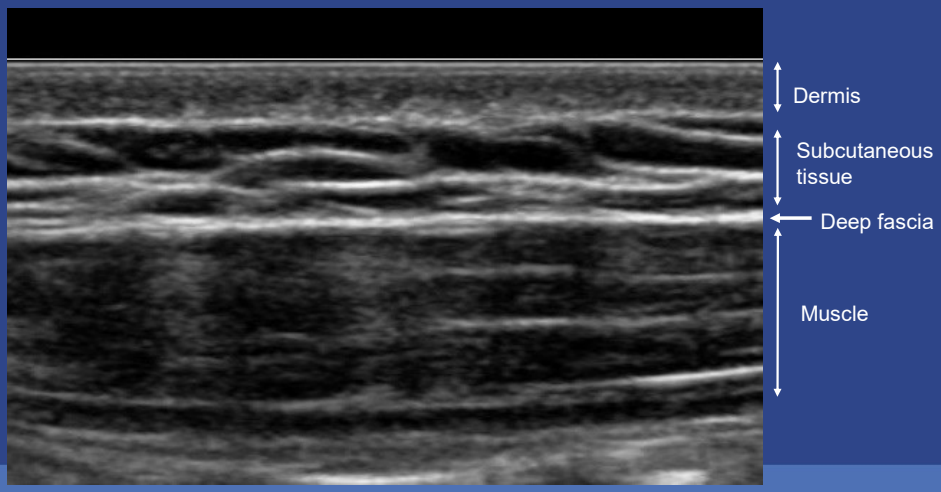
Anatomy of Superficial Tissues



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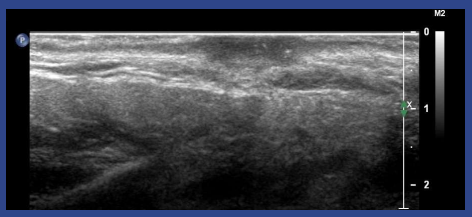
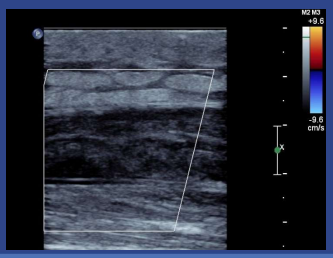
Lesion Localization



Intradermal

Subcutaneous



Intrafascial

Intramuscular

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Pressure from the Transducer

- Blood flow can be obscured in a superficial lesion by too much pressure from the transducer
- Rest 4th & 5th fingers on the patient to support the weight of the transducer

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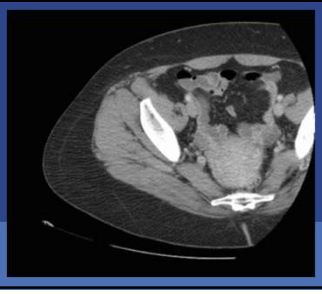
Don't Forget to Look Deep



SARCOMA

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SRU Consensus: US of SUPERFICIAL Soft Tissue Masses

- Applies to SUPERFICIAL masses – subcutaneous or dermal
  - Deeper masses generally require MRI for characterization
- Four diagnostic categories
  - Reliably benign masses
  - Pseudomasses
  - Lymphadenopathy
  - Nonspecific neoplastic masses

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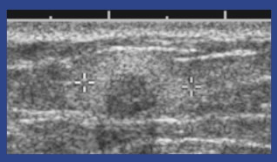
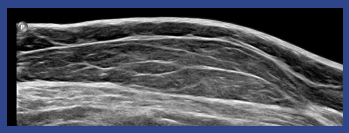
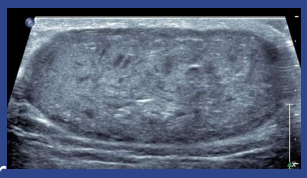
SRU Consensus: Reliably Benign Masses

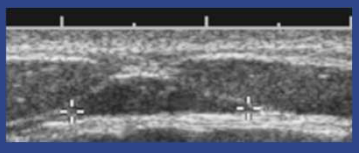




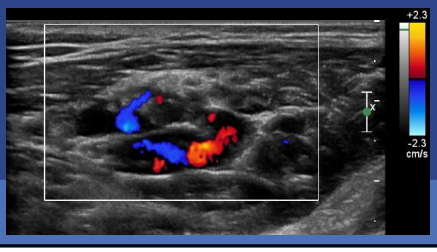
- Lipoma
- Fat Necrosis

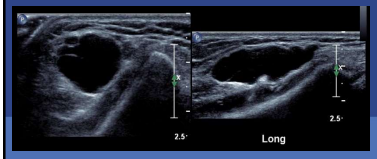


- Epidermal Inclusion Cyst



- Peripheral Nerve Sheath Tumor
- Vascular Malformation





- Ganglion

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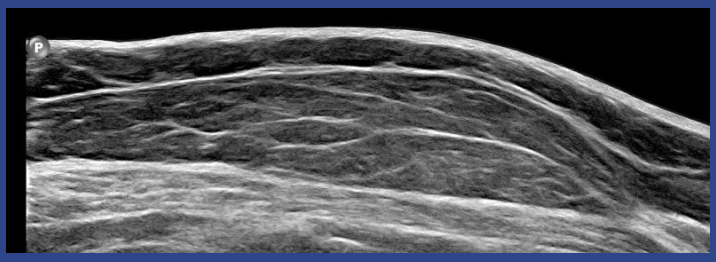
Lipoma



- Lipoma is the most common soft tissue tumor
  - Estimated 300,000 lipomas come to clinical presentation each year
  - 10,000 soft tissue sarcomas present each year
- Most lipomas are subcutaneous
- Most common at ages 40-60, rare in children
- Multiple in 5% of patients

- Smooth borders (better seen on real time imaging)
- No refractive or edge shadowing
- No deep shadowing
- May have deep acoustic enhancement
- Minimal or no color Doppler signal
- Wavy echogenic internal lines – otherwise uniform echogenicity
- Wider than tall (height <60% of width)
- Partially compressible

Balach Rad Clin N Am 2011, Wildmann Skel Rad 2009, Nielsen IARC 2002

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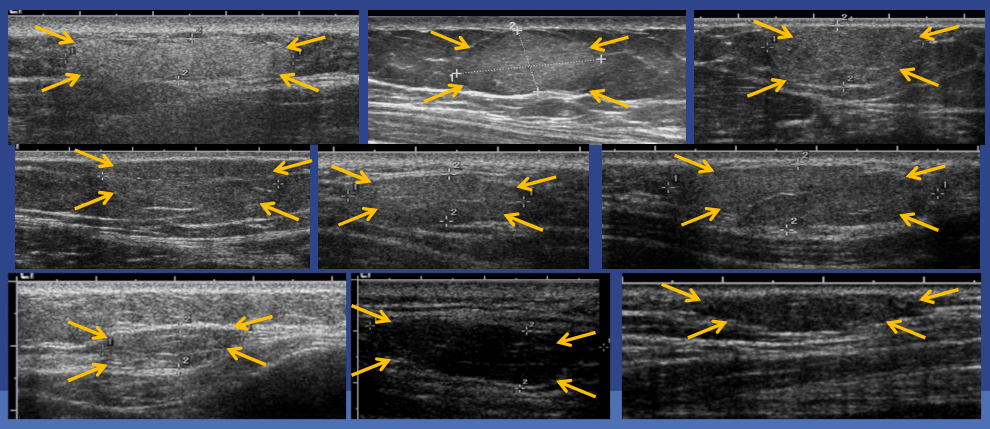
Lipomas – Range of Echogenicity

- **10/39 (26%) hyperechoic**
- **23/39 (59%) isoechoic**
- **6/39 (15%) hypoechoic**



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Wagner JUM 2013

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What About Liposarcoma?

- **Most cases of liposarcoma occur in the deep tissues of the extremities and the retroperitoneum**
- **Subcutaneous liposarcoma is a rare disease**
- **Case series (3) with a total of 73 subcutaneous/dermal liposarcomas…**
  - **Both well differentiated liposarcoma/atypical lipoma and pleomorphic liposarcoma**
  - **Occasional local recurrence but no distant metastasis**
- **Subcutaneous liposarcoma is a rare disease with an indolent course.**

Gardner Am J Surg Pathol 2012, Allen Pathology 1998, Del Tos Am J Dermatopathology 1998

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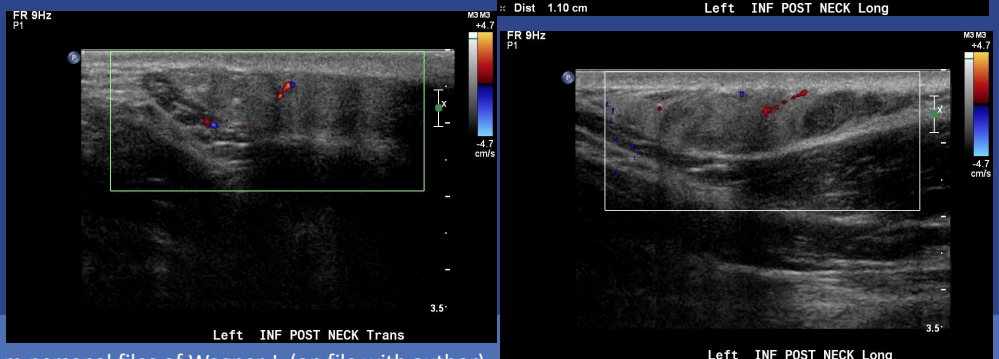
The one case of subcutaneous liposarcoma I have seen. 35 y/o woman with palpable mass. Did have a local recurrence.



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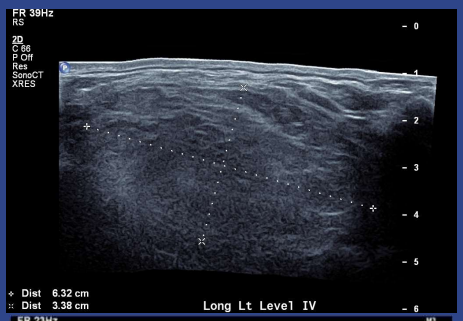
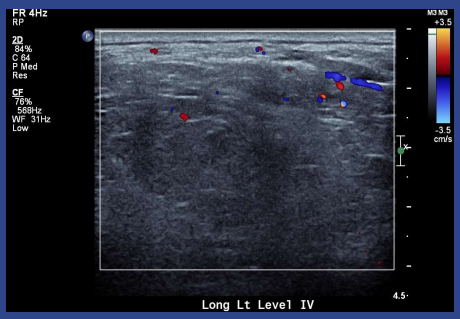
Deep liposarcoma extending into subcutaneous tissues





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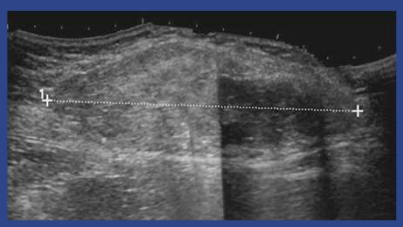
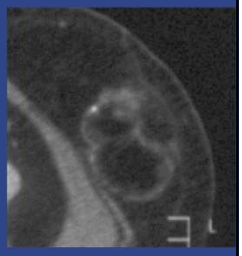
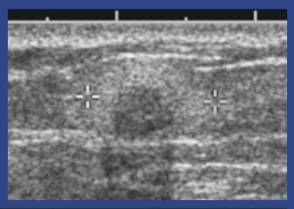
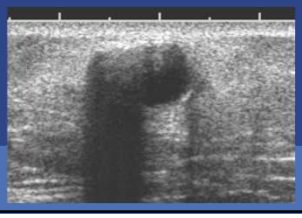
Fat Necrosis

- Non-neoplastic, self-limited
- Usually caused by trauma or vascular impairment
- Typical findings: hyperechoic, ill-defined, avascular
- Atypical findings: hypoechoic, calcification, well-defined
- US appearance often nonspecific









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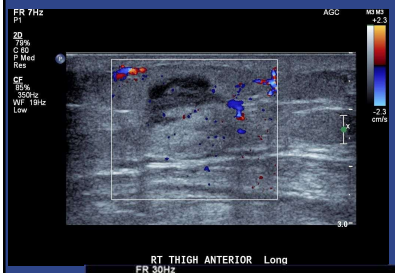
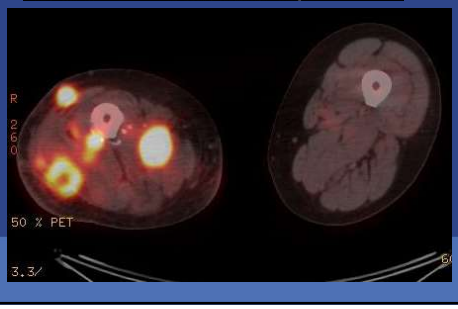
Extranodal Lymphoma Can Mimic Fat Necrosis





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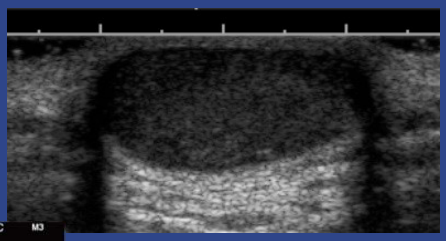
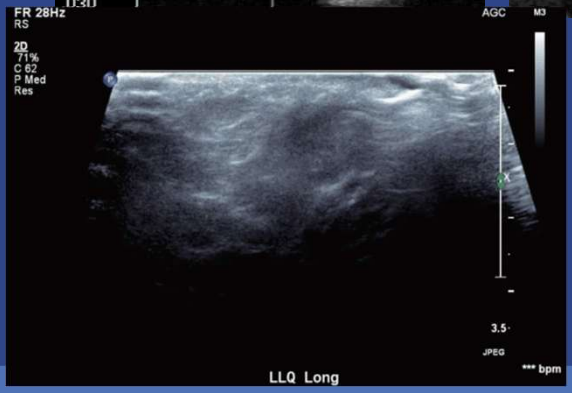
Epidermal Inclusion Cysts





- Hair-bearing skin
- Contains keratin debris
- Pseudotestis pattern
- Dermal attachment
- Deep acoustic enhancement
- No internal flow

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Huang JUM 2011

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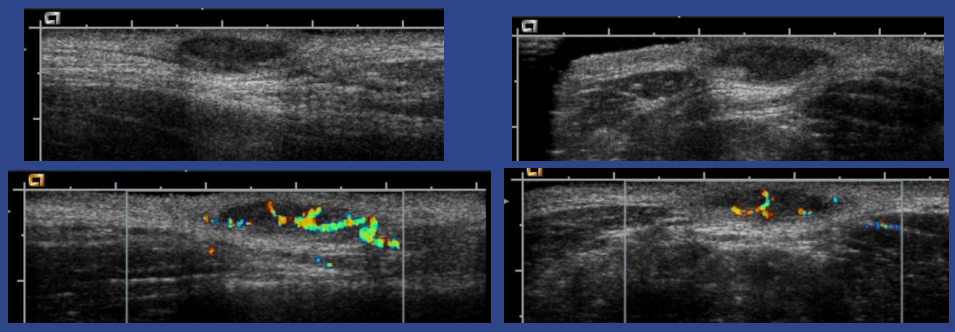
Ruptured Epidermal Inclusion Cyst with Inflammation



- **May be painful**
- **Lobulated or irregular border**
- **Pericystic inflammation / hypervascularity**
- **May be confused for a more aggressive lesion**

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Jin JUM 2008

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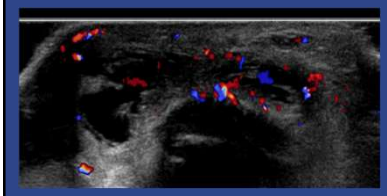
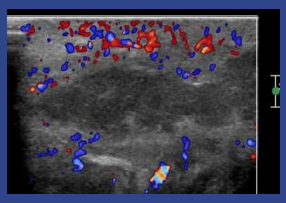
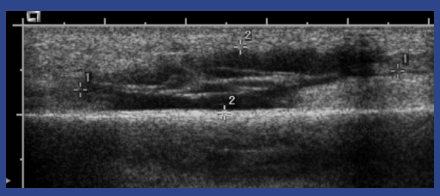
SRU Consensus: Pseudomasses





- Bursal disease
- Foreign Body
- Abscess
- Hematoma



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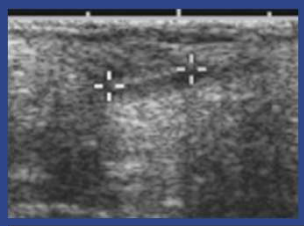
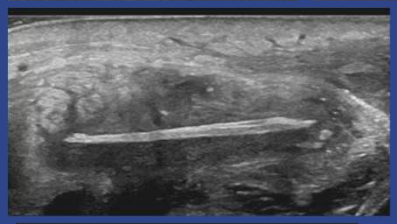
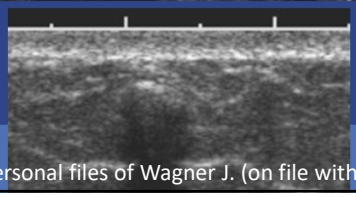
Foreign Bodies



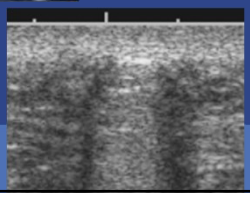
Wood



Wood



Metal



Glass

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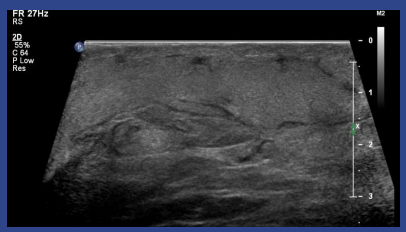
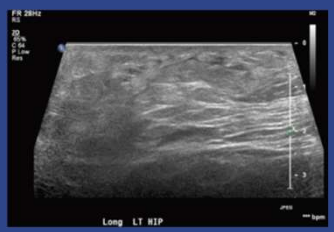
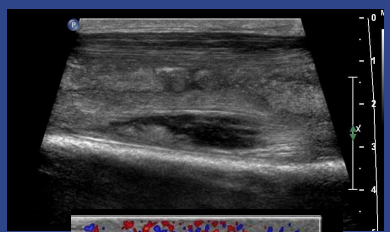
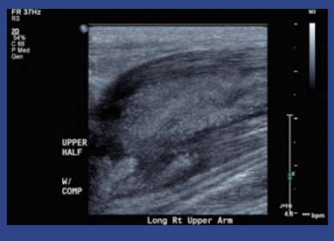
Abscess

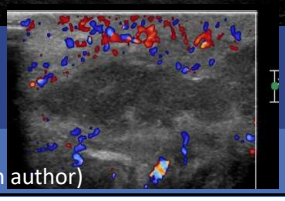
- Purulent fluid can range from hyperechoic to nearly anechoic
- Compression and release of compression cine images are helpful to find mobile fluid
- Surrounding hypervascularity and edema











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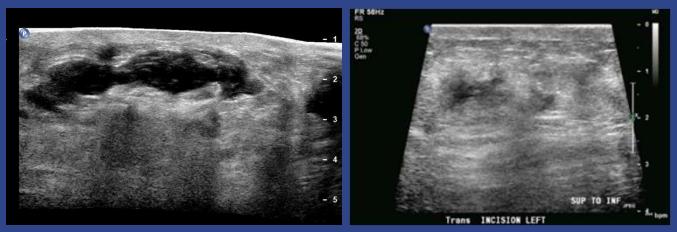
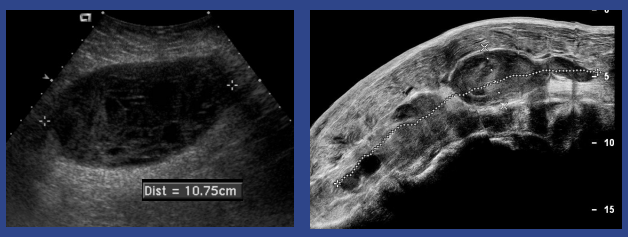
Hematoma

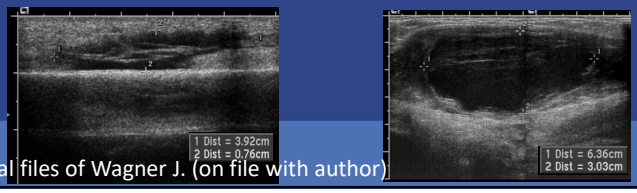


Post - op



2 Post – op hematomas

Dropped 45lb weight on shin



INR >8 and minor trauma

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Hematoma - compression

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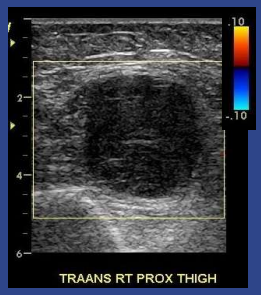
56 y/o healthy female with a painless firm thigh mass and recent minor trauma



Color Doppler not optimized for low flow and her trauma story was unconvincing.

Fortunately, it was a benign myxoma.

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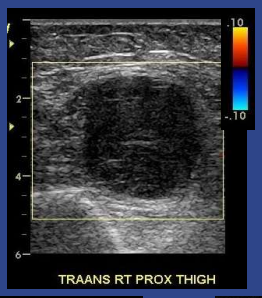
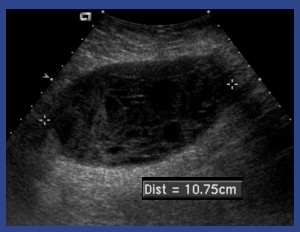
56 y/o healthy female with a painless firm thigh mass and recent minor trauma





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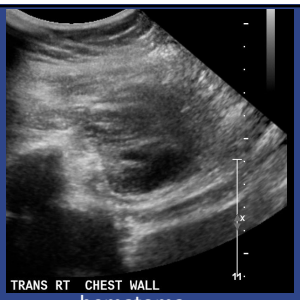
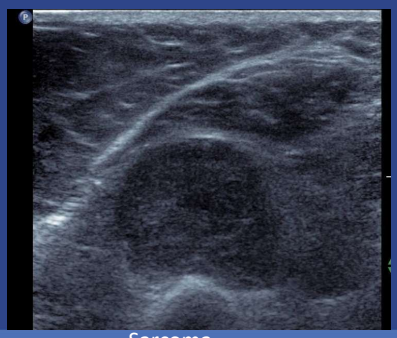
sarcoma



hematoma


hematoma


Sarcoma

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Intramuscular Hematomas Give Me Heartburn

- When ultrasound misdiagnosis is the cause of delayed diagnosis of sarcoma, muscle hematoma/muscle tear is the most common misdiagnosis
  - 11/14 cases reported in 2 articles
  - Other incorrect diagnoses were abscess and pseudoaneurysm.
- Hematomas require an explanation – significant trauma and/or anticoagulation
- Many sarcoma patients report noticing a mass after a trauma
- If any doubt, follow or biopsy a hematoma

Doyle Australasian Radiology 2000, Brouns European Journal of Surgical Oncology 2003

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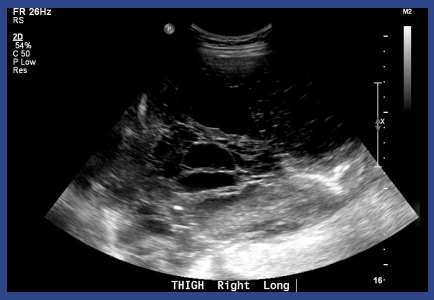
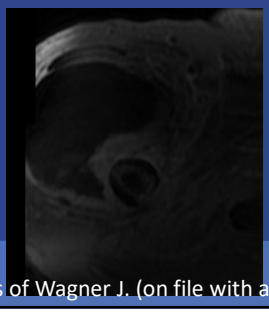
76 y/o male with a spindle cell sarcoma of the thigh with extensive internal hemorrhage





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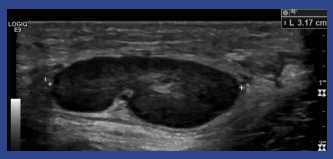
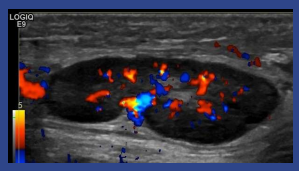
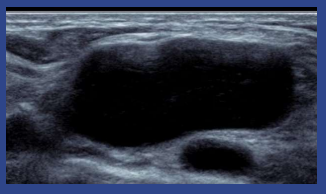
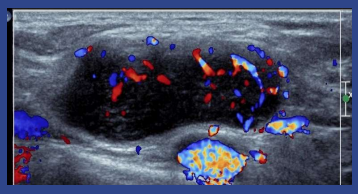
SRU Consensus: Lymphadenopathy

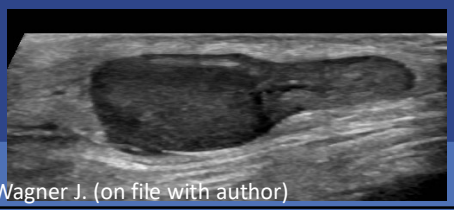
- Reactive
- Lymphoma / Leukemia
- Metastatic disease

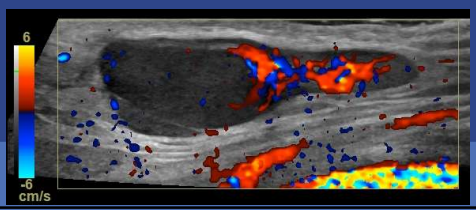












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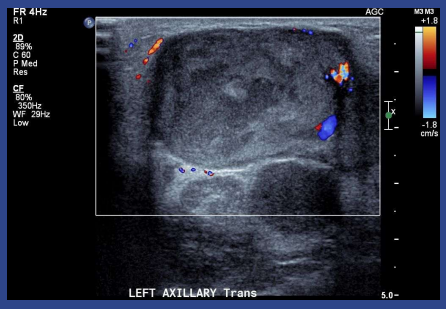
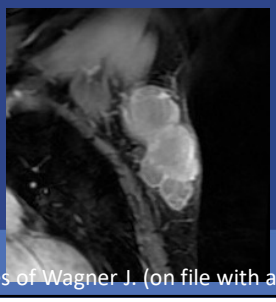
54-year-old male with metastatic melanoma in the axilla





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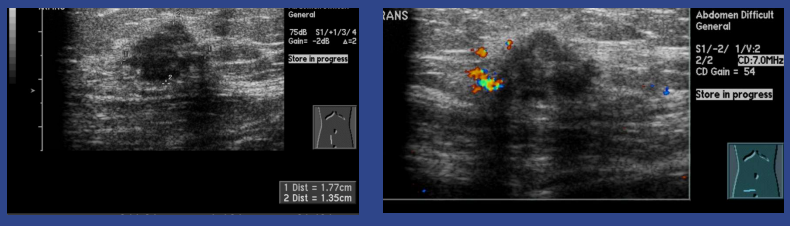
SRU Consensus: Nonspecific Neoplastic Masses

- Typically, hypoechoic and solid
- Often have internal blood flow, but lack of detectable blood flow does not prove a lesion is non-neoplastic
- History and location may narrow the differential diagnosis

Synovial Cell Sarcoma



Endometrioma

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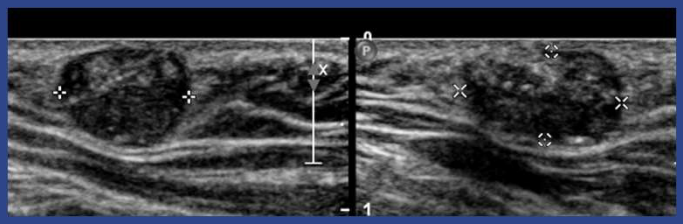
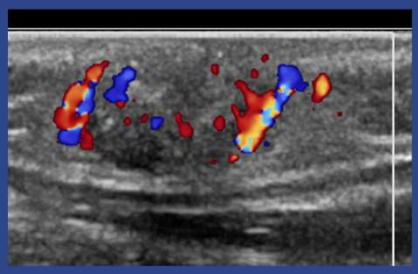
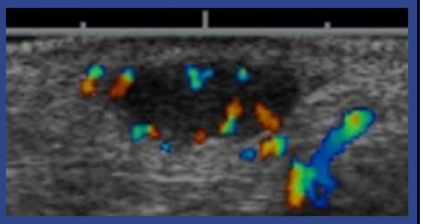
Pilomatricoma

- Common benign hair matrix tumor
- Often has target-like appearance with hypoechoic periphery and more hyperechoic center with calcification
- Hyperechoic dots are a characteristic sign







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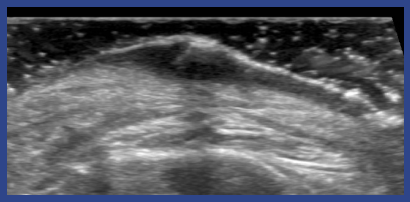
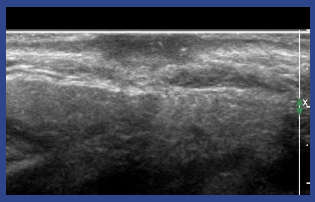
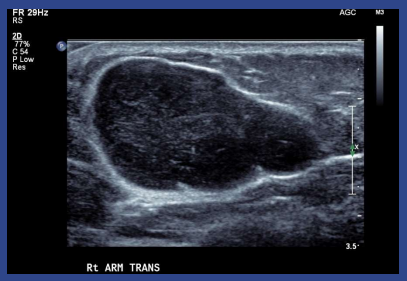
Skin Malignancy

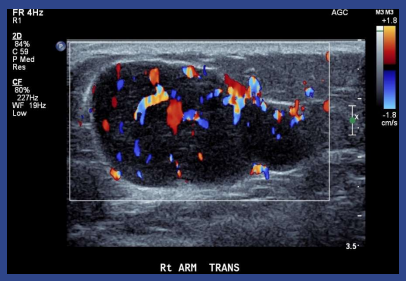


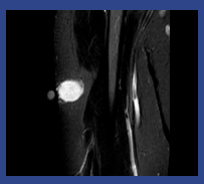
Squamous Cell Carcinoma



Squamous Cell Carcinoma







Dermatofibrosarcoma protuberans

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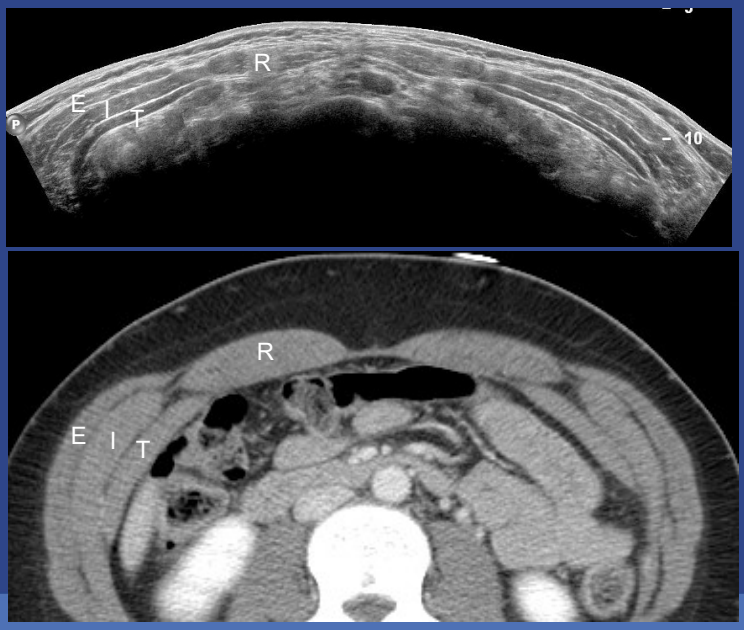

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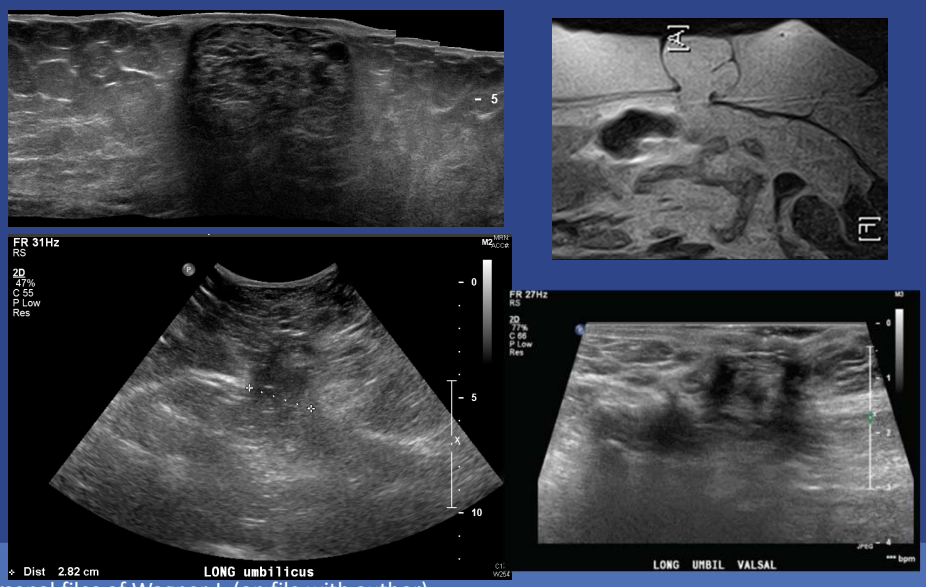
Hernia - Umbilical



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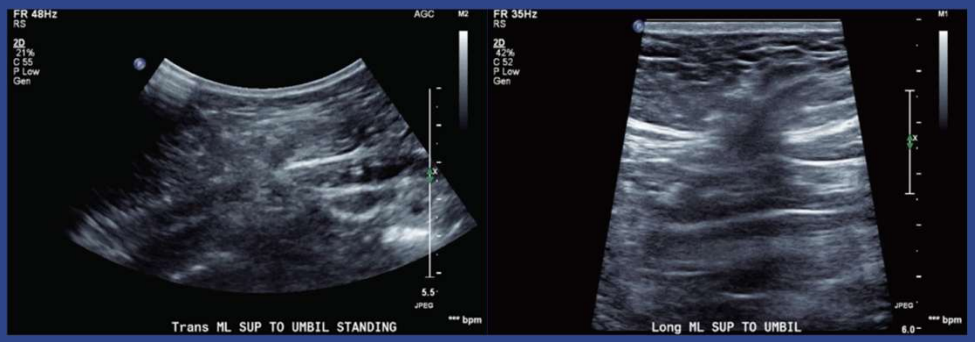
Ventral Hernia



Ventral hernia – contains bowel while patient is standing

Ventral hernia – contains only fat and is reducible while patient is supine

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Diastasis of the rectus abdominus muscles with a midline bulge

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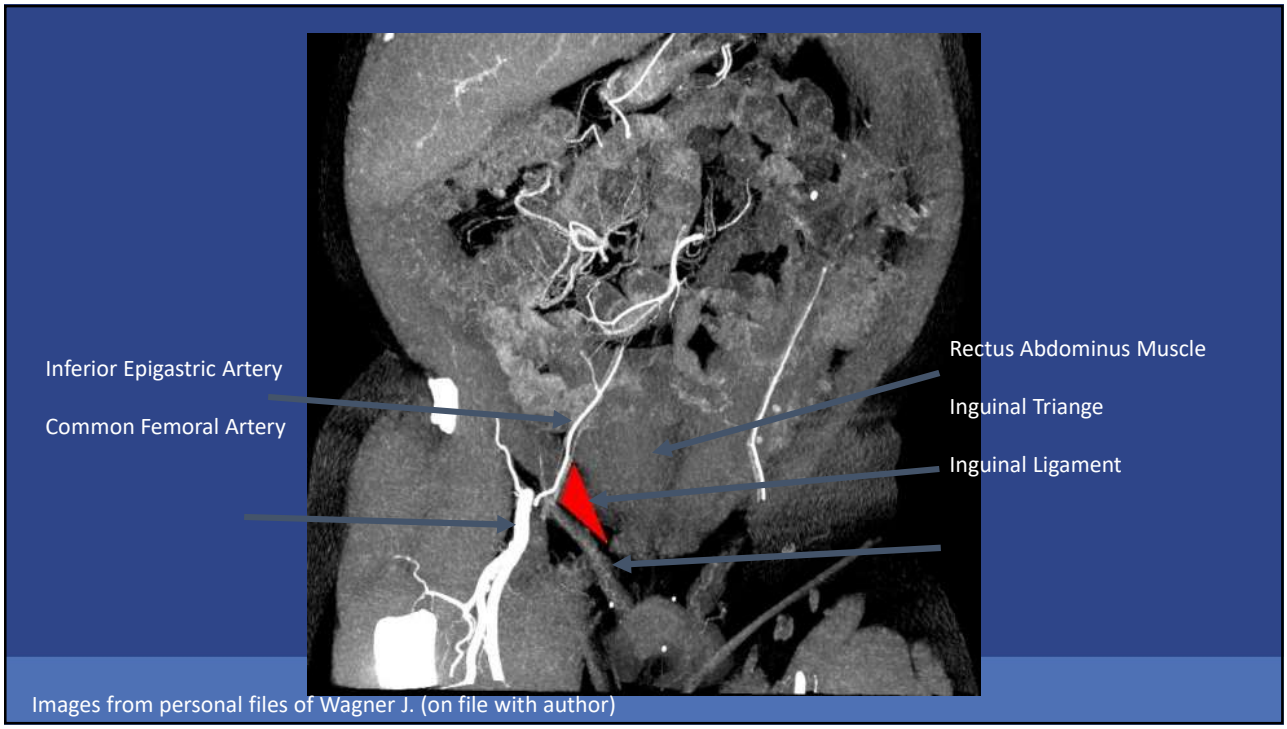

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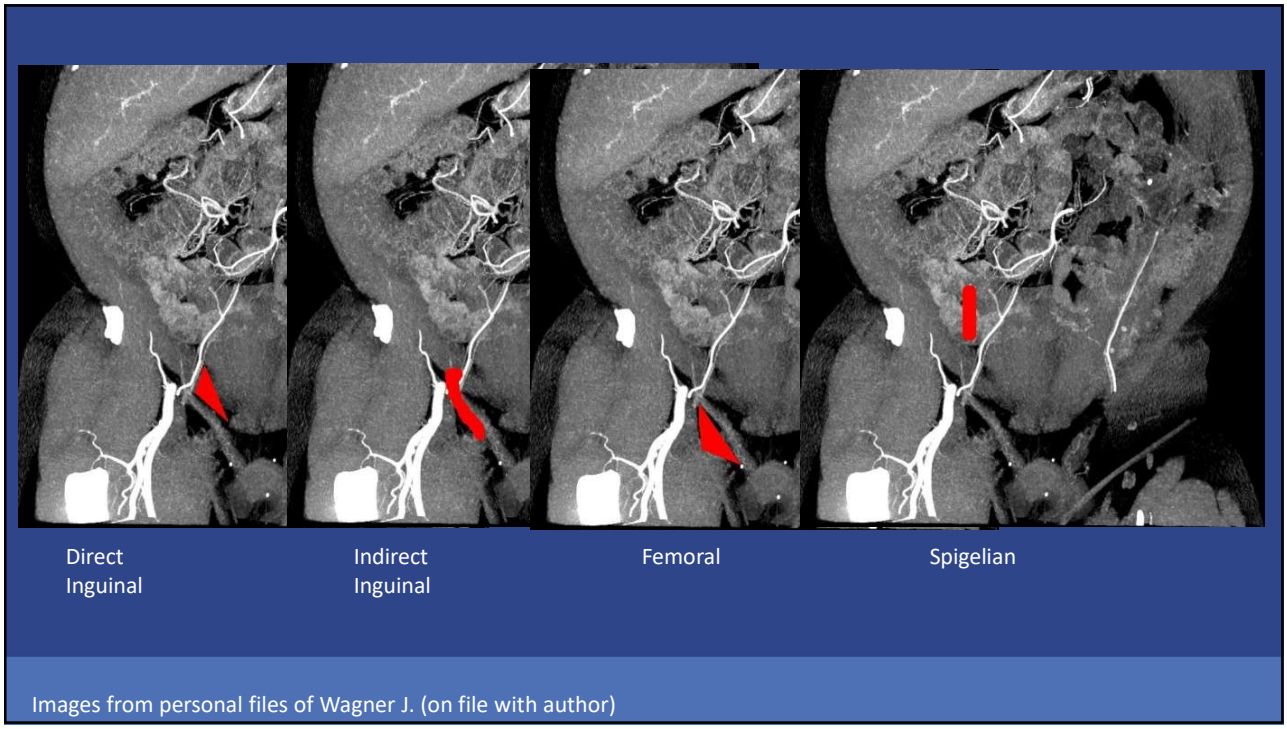

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Steps of groin hernia US exam
1. Medial to femoral vein
2. Find inferior epigastric artery and trace down to external iliac artery
3. Deep inguinal ring trans
4. Deep inguinal ring long
5. Mid inguinal canal and inguinal triangle
6. Linea semilunaris
7. Repeat in upright position

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50

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Steps of groin hernia US exam
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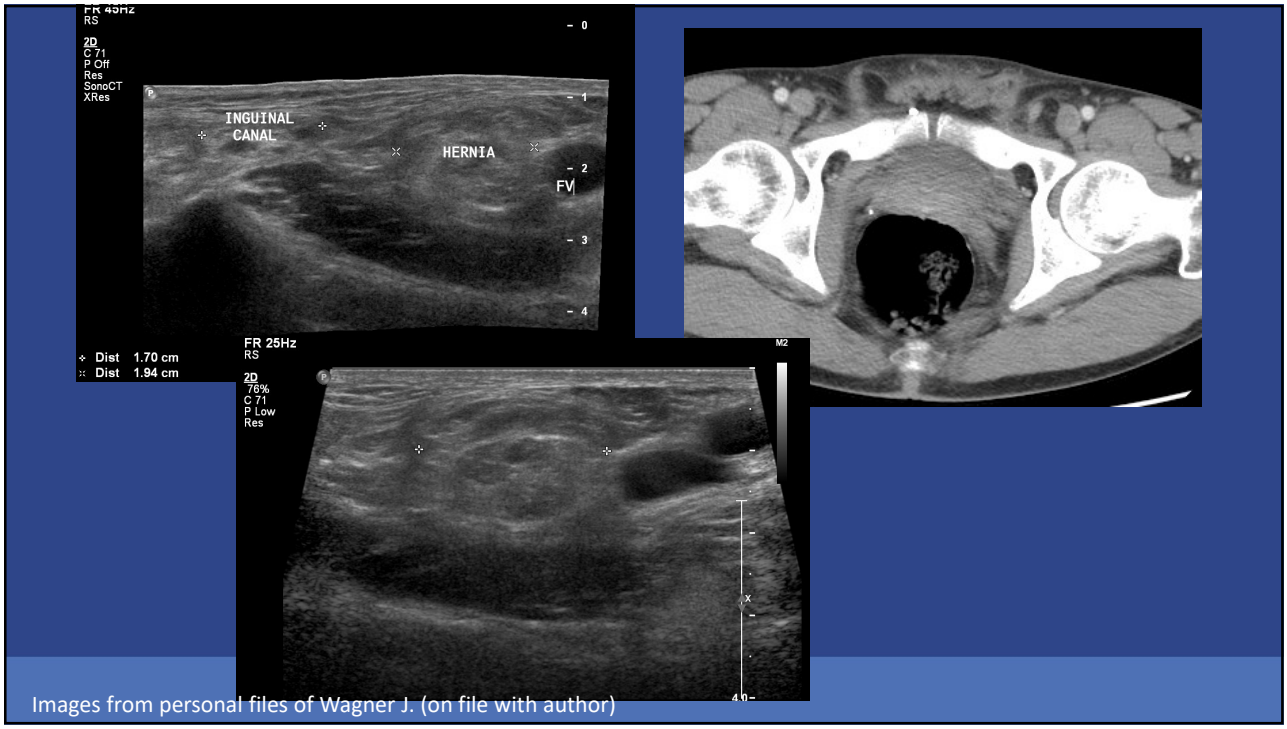
52



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54

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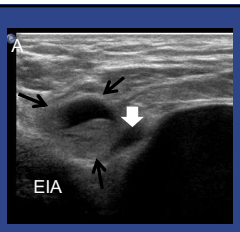

Indirect hernia, lateral and superior to inferior epigastric artery

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Steps of groin hernia US exam

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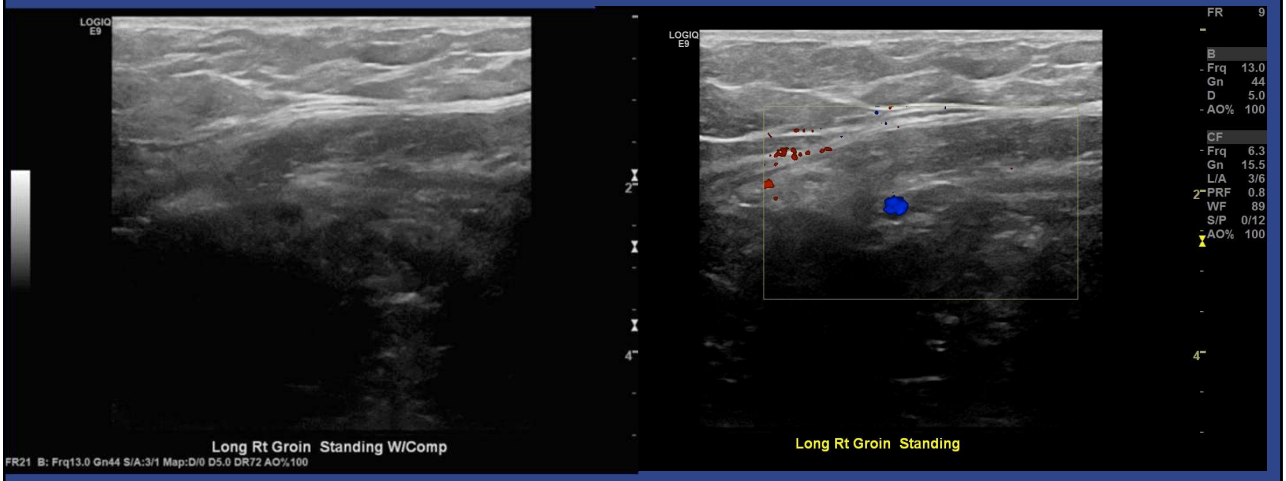

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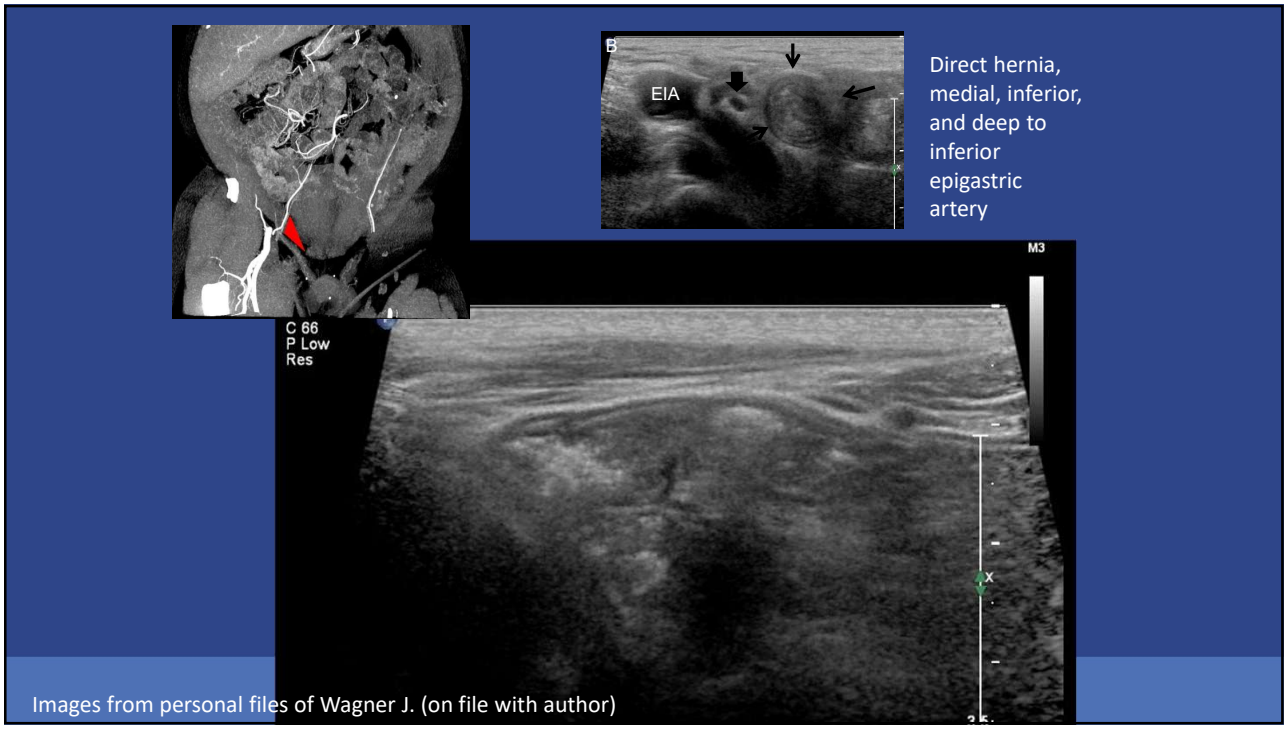

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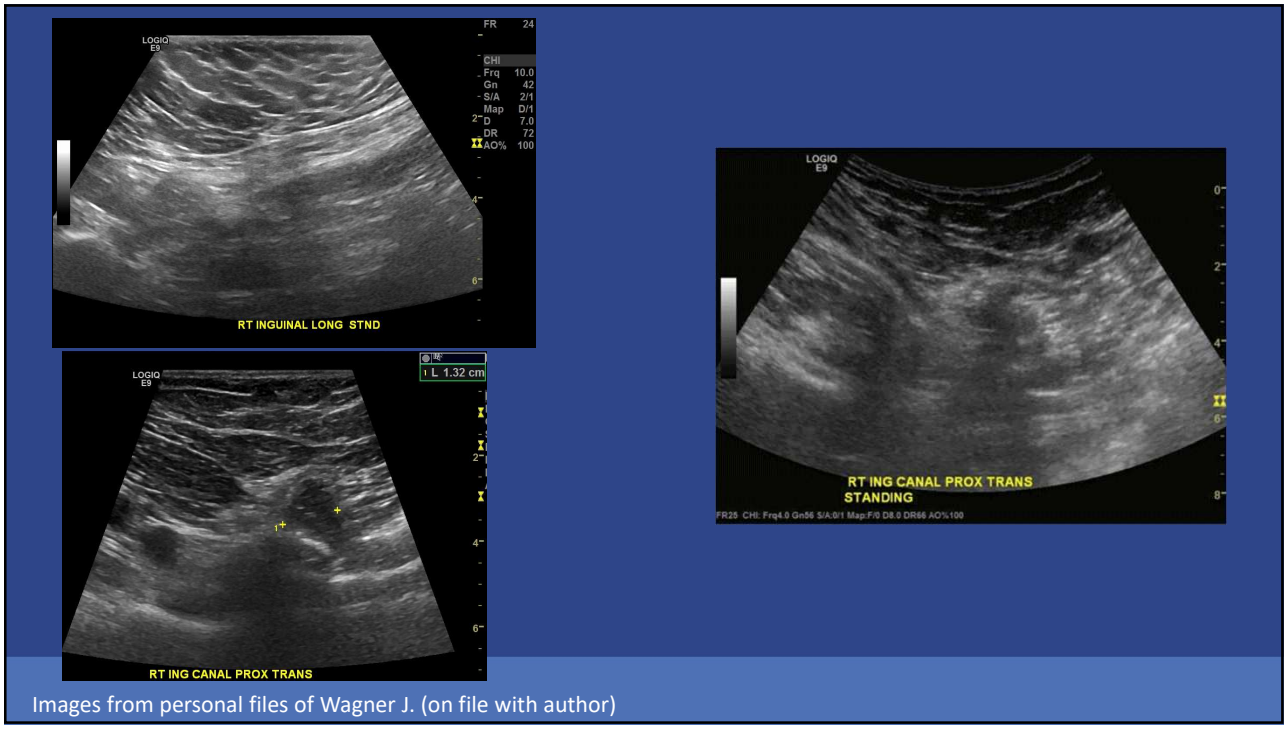

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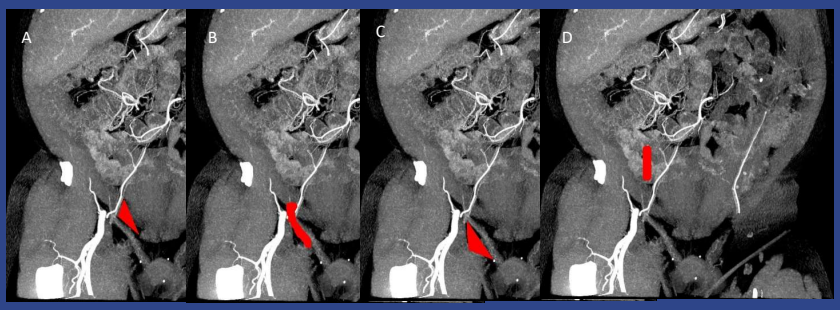
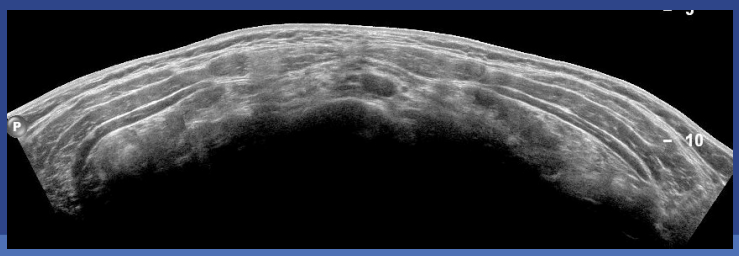


Direct Inguinal | Indirect Inguinal | Femoral | Spigelian



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Wagner. Ultrasound Clinics 2014

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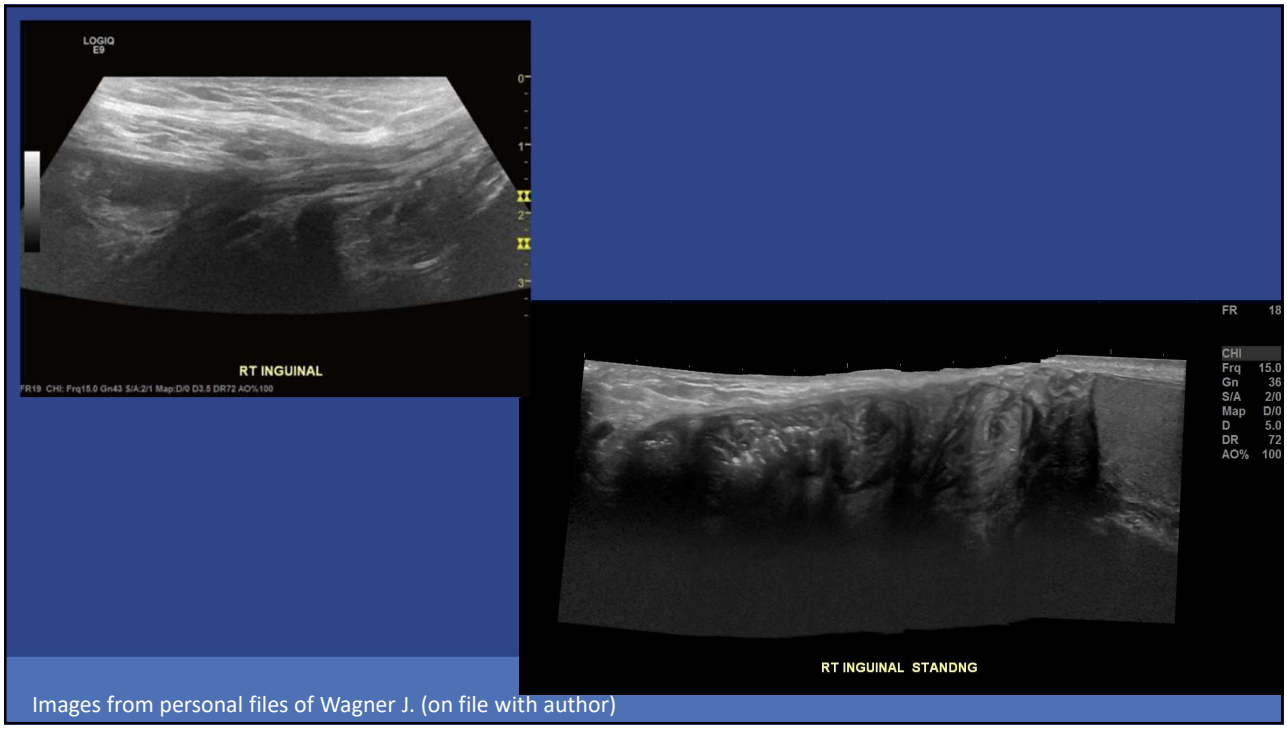

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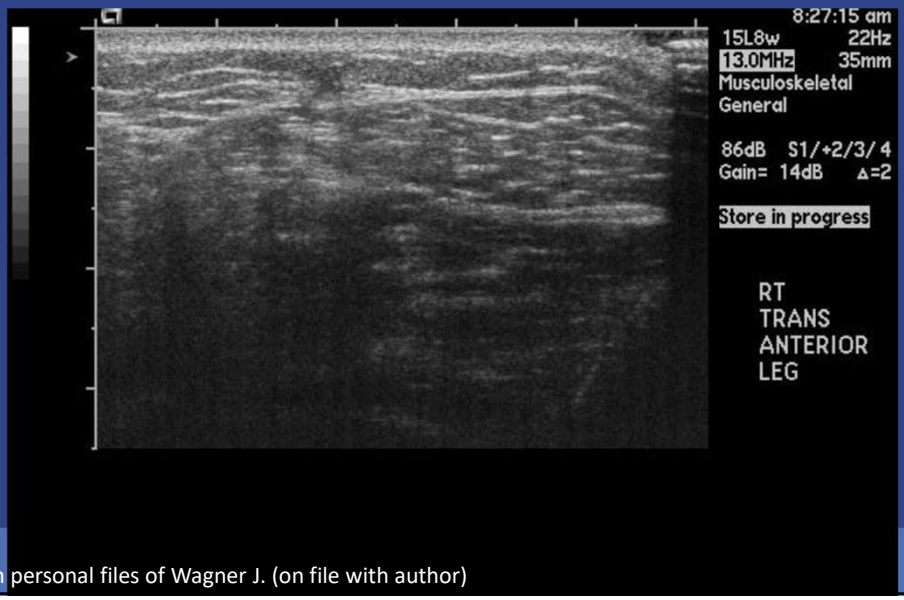
Muscle Hernia – Tibialis Anterior



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Take home points

- Many superficial soft-tissue masses can be confidently diagnosed based on history and ultrasound findings.
- Deep masses generally require MR image or other investigation.
- Many soft tissue neoplasms have difficult to detect internal flow. Doppler settings must be optimized. The absence of Doppler signal does not prove that a lesion is benign.
- Real-time imaging with compression is helpful in detecting soft-tissue abscesses.
- Make the diagnosis of intramuscular hematoma with caution.
- Hernia imaging should include both supine and upright images.
- Evaluate for hernia motion with Valsalva and compression.

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