

# Ultrasound of Soft Tissue Masses

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## Disclosures

- Consultant: Bioclinica
- Advisor: Philips
- Book Royalties: Elsevier
- Not relevant to this lecture

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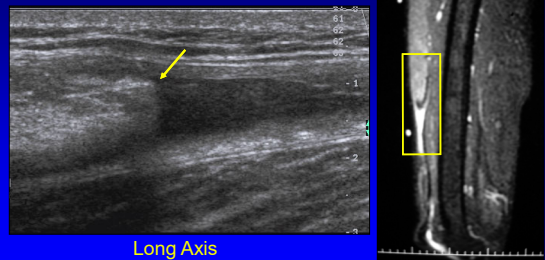
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## Question: tumor or pseudotumor?

- Pseudotumors:
  - Tendon tear with retraction:
    - Rectus femoris, tibialis anterior
  - Muscle hernia
  - Anomalous muscle:
    - Accessory soleus
    - Extensor digitorum brevis manus
  - Rheumatoid nodule

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## Rectus Femoris Tear: full tear, pseudomass



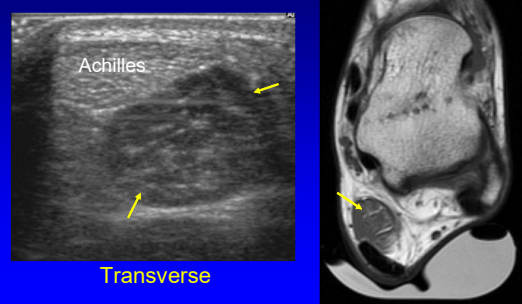
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## Muscle Hernia: anterior tibialis



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## Accessory Soleus Muscle



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### Question: anatomic location?

- Joint, tendon sheath, or bursal origin
  - Synovial: benign
- Tendon
  - Gout
- Osseous origin
  - Aggressive: infection or malignancy
- Soft tissue origin
  - Variable etiology

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### Outline:

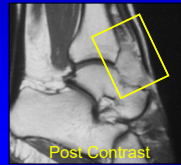
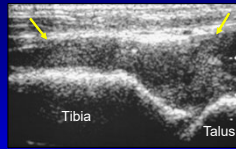
- Joint recess
- Bursa
- Tendon
- Lymph Node
- Ganglion
- Subcutaneous
- Other

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### Joint Recess

- Mass arising from a joint is a benign synovial process:
  - Rheumatoid arthritis
  - Tenosynovial giant cell tumor (pigmented villonodular synovitis)
- Synovial sarcoma: very rarely involves a joint

Tenosynovial Giant Cell Tumor



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### Outline:

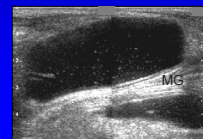
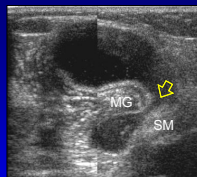
- Joint recess
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### Bursa

- Mass arising from a bursa
  - Benign synovial process
  - Know locations of normal bursa
  - Anechoic or hypoechoic
  - Compressible
  - May be complex
  - Example: Popliteal (Baker) cyst

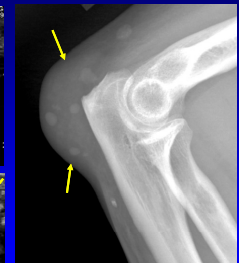
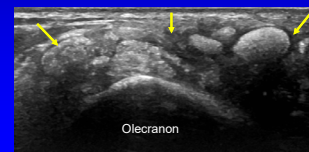
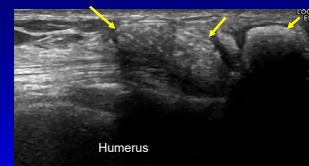
Popliteal Cyst



Note: characteristic "neck" between MG and SM tendons (yellow arrow)

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Gout: olecranon bursa



Note: characteristic echogenic foci

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### Outline:

- Joint recess
- Bursa
- **Tendon**
- Lymph Node
- Ganglion
- Subcutaneous
- Other

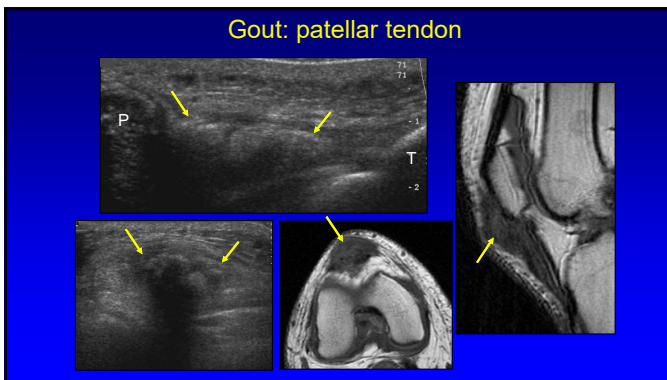
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### Tendon

- Gout
  - Popliteus tendon: knee
  - Patellar tendon
  - Quadriceps tendon
- Tenosynovial giant cell tumor
- Pseudotumor:
  - Tendon tear and retraction
  - Rectus femoris, tibialis anterior

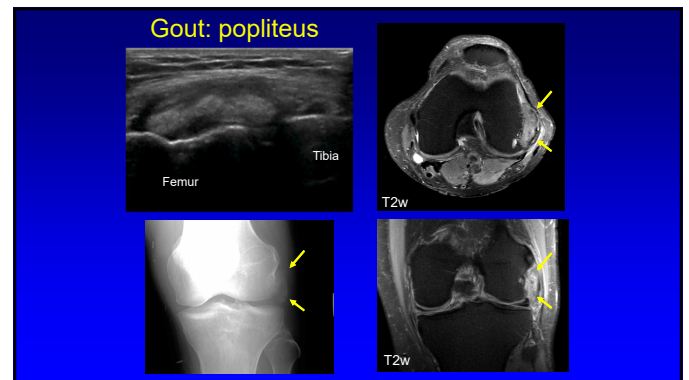
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### Gout: patellar tendon



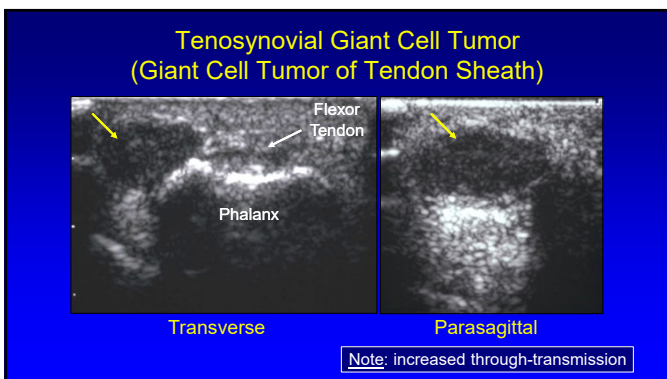
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### Gout: popliteus



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### Tenosynovial Giant Cell Tumor (Giant Cell Tumor of Tendon Sheath)



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### Outline:

- Joint recess
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- **Lymph Node**
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- Other

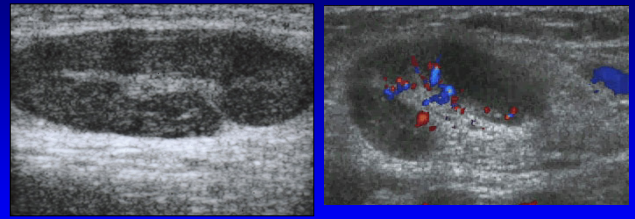
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## Lymph Node

- Hyperplastic:
  - Oval, hyperechoic hilum
  - Hilar vascular pattern
- Malignant:
  - Asymmetric thick cortex
  - Round
  - Loss of hyperechoic hilum
  - Variable vascular pattern

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## Lymph Node: reactive

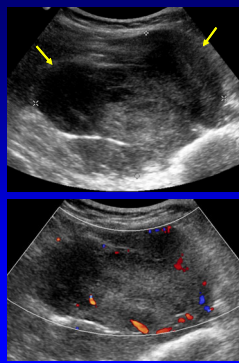


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## Lymphoma: nodal

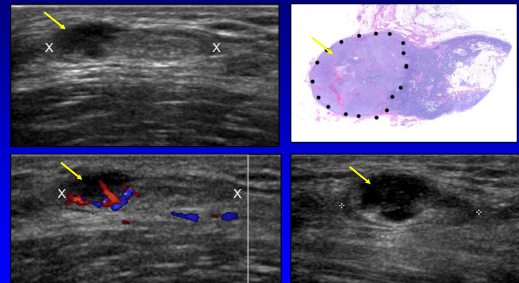
- Hypoechoic enlarged lymph node mass
- Malignant:
  - Round shape
  - Absence of echogenic hilum
  - Irregular vascular pattern

Vassallo et al. Radiology 1992;  
183:215



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## Lymph Node: angiosarcoma metastasis



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## Outline:

- Joint recess
- Bursa
- Tendon
- Lymph Node
- **Ganglion**
- Subcutaneous
- Other

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## Ganglion

- Ultrasound features:
  - Hypoechoic or anechoic
  - **Multilocular**
  - **Not compressible**
- Specific locations
- Differential: paralabral, parameniscal cysts

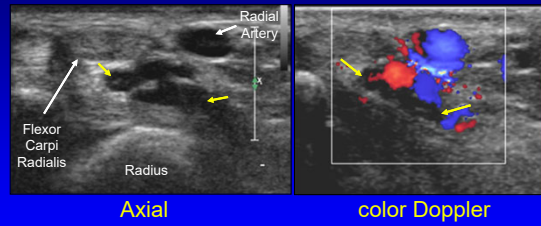
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## Ganglia

- Wrist:
  - Volar: between radial artery and FCR
    - Most common site (69%)
  - Dorsal: over scapholunate ligament
- Knee:
  - Cruciate ligaments, gastrocnemius tendon
  - Hoffa fat pad
- Ankle: tarsal tunnel

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## Ganglion: volar wrist



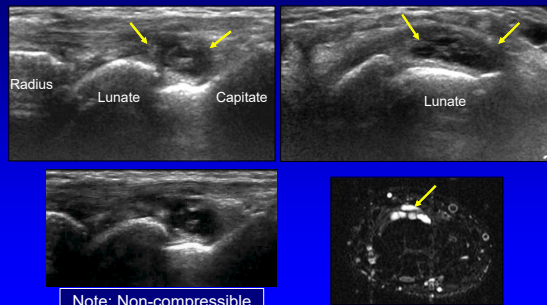
Axial

color Doppler

Zhang A et al. J Ultrasound Med 2019; 38:2155

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## Ganglion: dorsal wrist

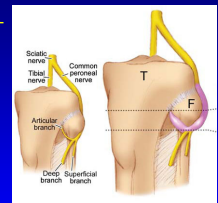


Note: Non-compressible

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## Peroneal Intraneural Ganglion

- Up to 22% of patients with foot drop
- Patients have high body mass index
- Joint fluid from proximal tibiofibular joint
  - Enters peroneal nerve via articular nerve branches
  - Shown at MR arthrography after exercise
  - Extends proximal via epineural sheath<sup>1</sup>

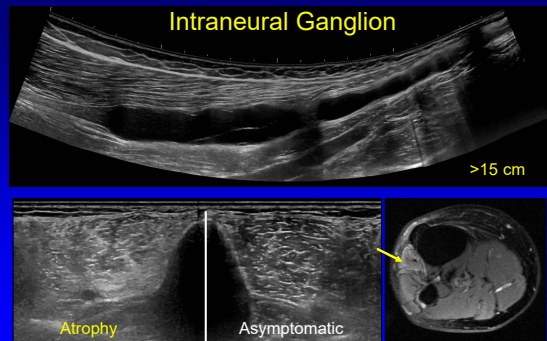


From: Spinner et al. Skeletal Radiol 2008;37:1091

<sup>1</sup>Spinner et al. Clin Anatomy 2007; 20:826

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## Intraneural Ganglion

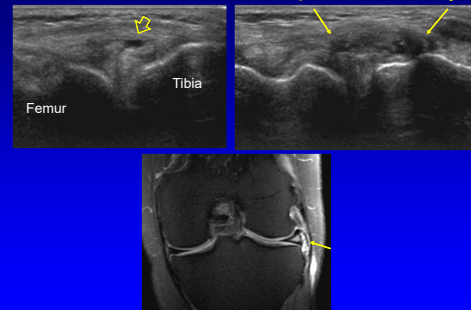


Atrophy

Asymptomatic

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## Lateral Meniscus: tear and parameniscal cyst



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### Outline:

- Joint recess
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- **Subcutaneous**
- Other

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### Subcutaneous Masses

- Lipoma
- Fat necrosis
- Epidermal inclusion cyst
- Other: benign versus malignant

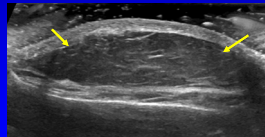
\*Note: subcutaneous masses that are hyperechoic are almost certainly benign

Jacobson JA et al. Radiology 2022; 304:18

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### Lipoma: subcutaneous

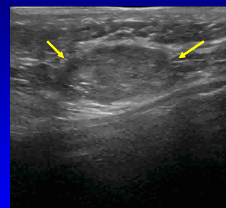
- Oval or oblong
- Homogeneous
- Isoechoic to adjacent fat
- Hyperechoic:
  - With increased fibrous tissue components
- No internal vascularity
- Compressible
- Clinically benign



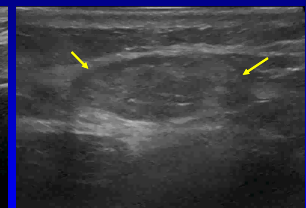
Inampudi et al. Radiology 2004; 233:763

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### Lipoma: subcutaneous



Sonopalpation

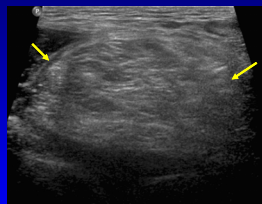


Compressible

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### Lipoma: deep

- Variable echogenicity
- Often ill-defined
- Often difficult to assess
- Cannot reliably differentiate from low-grade liposarcoma!
- Need MRI



Paunipager et al. Insights Imaging 2010; 1:149

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### Liposarcoma: *well-differentiated*

- Also called atypical lipomatous tumor
- Hypoechoic
- Looks like a lipoma
- Need MRI with any suspected deep lipoma!



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### Fat Necrosis

- Pain, palpable, focal
- Thigh, women
- No erythema
- Normal WBC

T1w      T2w+ FS      Gado

J Ultrasound Med 2008; 27:1751

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### Epidermal Inclusion Cyst

- Etiology: implantation of epithelium, congenital, squamous metaplasia, hair follicle obstruction
- US findings:
  - Low level echoes and hypoechoic halo
  - Through transmission
  - Hypoechoic clefts
  - Periscope sign: extension to skin

Kim et al. Skeletal Radiol 2011; 40:1415

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### Outline:

- Joint recess
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### Synovial Sarcoma

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### Tumor

Metastasis: Renal Cell Carcinoma      Sarcoma: high grade

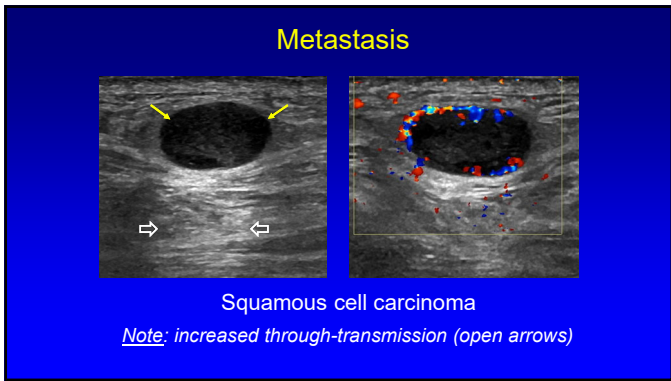
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### Melanoma

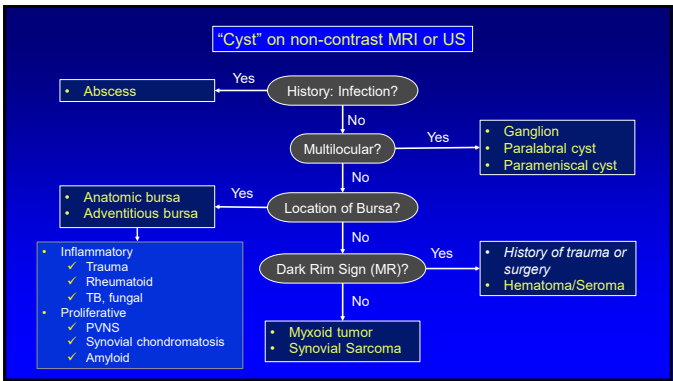
- Hypoechoic mass
- Usually increased flow on color Doppler
- Lymph node:
  - Focal cortical enlargement
  - Diffusely abnormal

Nazarian et al. AJR 1998; 170:459

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- ### Take Home Points
- Key to differential diagnosis:
    - Specific anatomic location
  - Joint and tendon: benign
  - Bursa: key location, unilocular, compressible
  - Ganglion: location, multilocular, not compressible
  - Lipoma: subcutaneous, oval, compressible
  - Malignancy: hypoechoic, heterogeneous

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