

# Ultrasound of Soft Tissue Masses

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Syllabus PDF

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## Disclosures

- Consultant: Bioclinica
- Contractor: POCUS PRO
- Advisory Board: Philips
- Book Royalties: Elsevier
- Not relevant to this lecture

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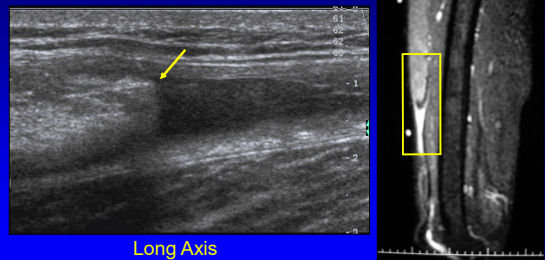
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## Question: tumor or pseudotumor?

- 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



Long Axis

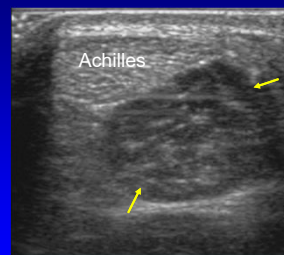
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## Muscle Hernia: anterior tibialis

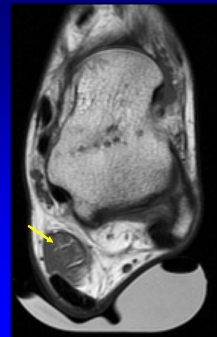


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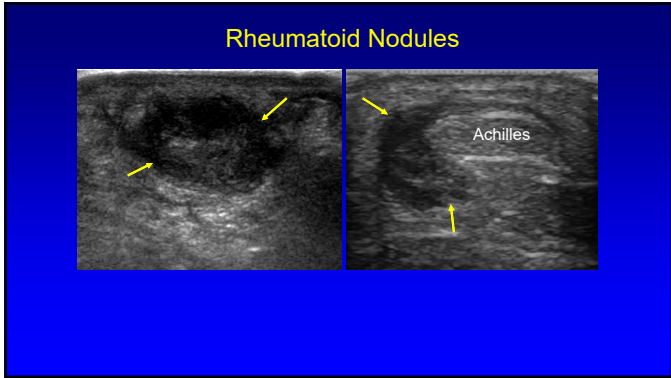
## Accessory Soleus Muscle



Transverse



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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

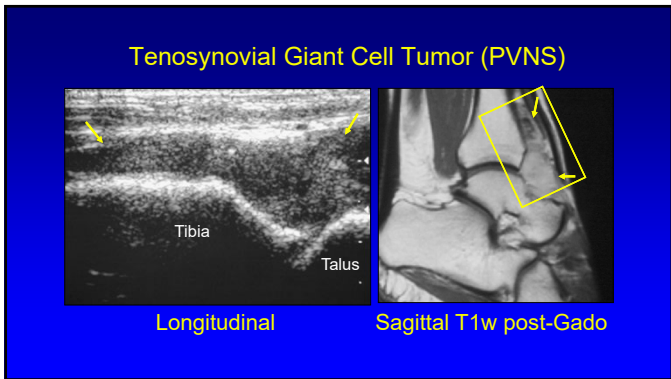
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- ### Outline:
- 
- Joint recess
  - Bursa
  - Tendon
  - Lymph Node
  - Ganglion
  - Subcutaneous
  - Other

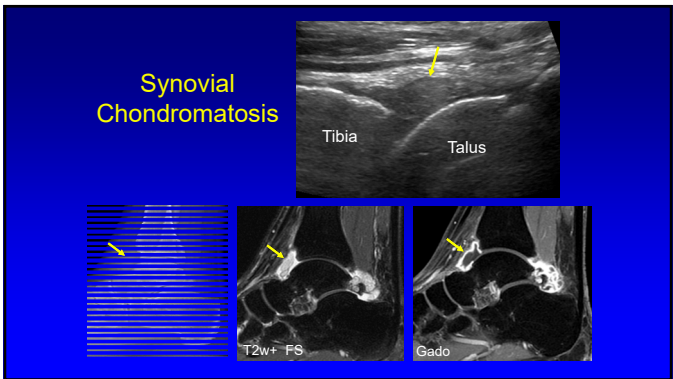
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- ### Synovial Disorders
- 
- Inflammatory:
    - Atypical infection, gout, rheumatoid arthritis
  - Proliferative:
    - Tenosynovial giant cell tumor
      - (pigmented villonodular synovitis)
    - Localized nodular synovitis
    - Synovial chondromatosis
    - Lipoma arborescens
  - Synovial sarcoma rarely involves a joint

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**Outline:**

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

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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: Baker cyst

**Baker Cyst**

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

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**Bicipitoradial Bursitis**

**Note:** characteristic "U" shape of bursa

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**Gout: olecranon bursa**

**Note:** characteristic echogenic foci

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**Outline:**

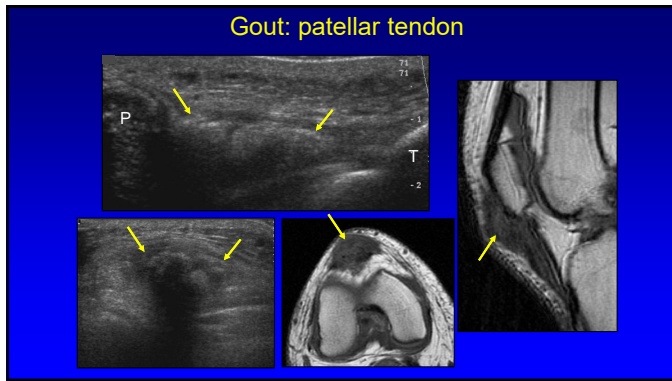
- Joint recess
- Bursa
- **Tendon**
- Lymph Node
- Ganglion
- Subcutaneous
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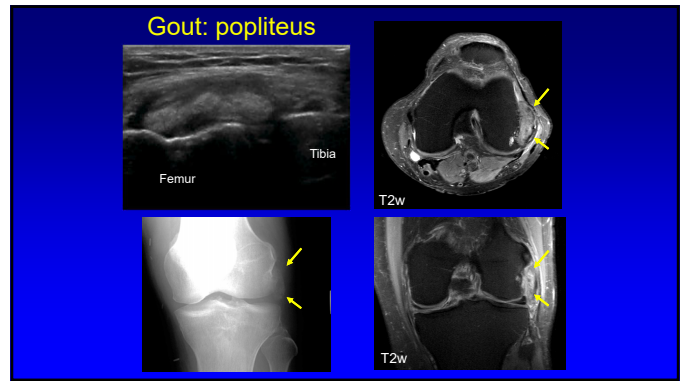
**Tendon**

- 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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### Tenosynovial Giant Cell Tumor

- (Giant cell tumor of tendon sheath)
- Hypoechoic mass
- In contact with tendon sheath
- Does not move with tendon
- Increased through-transmission (open arrows)
- Possible hyperemia

Note: increased through-transmission

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### Outline:

- Joint recess
- Bursa
- Tendon
- **Lymph Node**
- Ganglion
- Subcutaneous
- 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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**B cell Lymphoma : axillary**

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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**

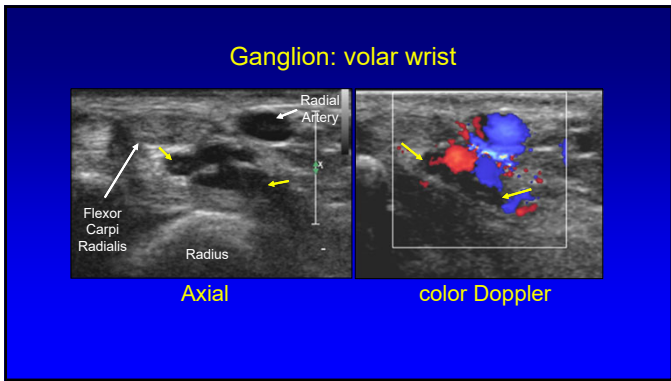
- Ultrasound features:
  - Hypoechoic
  - **Multilocular**
  - Not compressible
- Specific locations
- Differential: paralabral, parameniscal cysts

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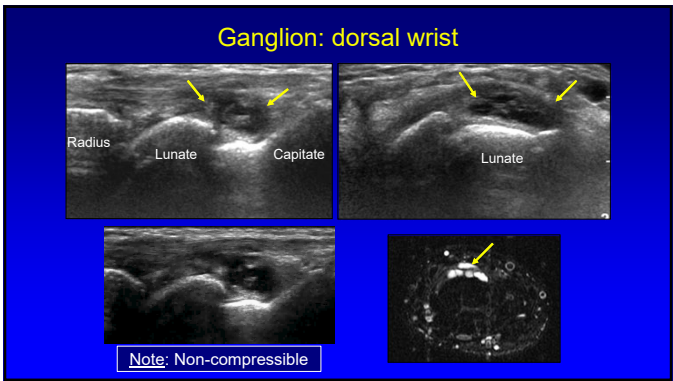
**Ganglia**

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

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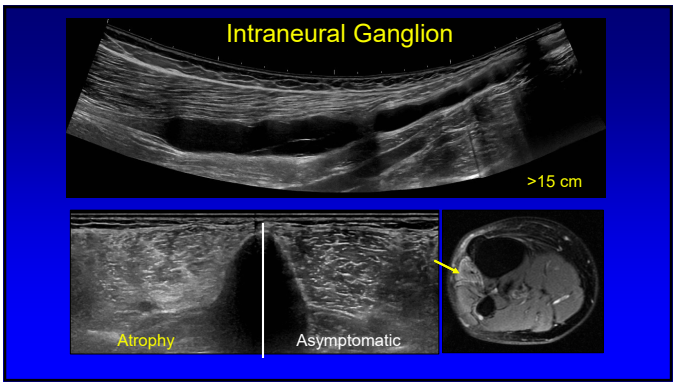
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### Peroneal Intra-neural Ganglion

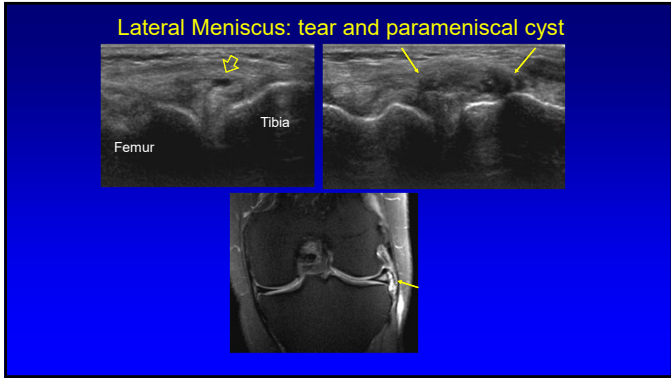
- Up to 22% of patients with foot drop
- Patients have high body mass index
- Joint fluid from proximal tibiofibular joint
  - Enters peroneal nerve via articular nerve branches
  - Shown at MR arthrography after exercise
  - Extends proximal via epineural sheath<sup>1</sup>

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

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- ### Outline:
- 
- Joint recess
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  - Tendon
  - Lymph Node
  - Ganglion
  - **Subcutaneous**
  - Other

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## Subcutaneous Masses

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

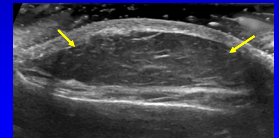
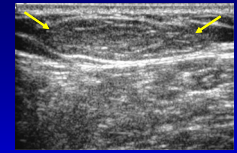
\*Note: subcutaneous masses that are hyperechoic are almost certainly benign

Jacobson JA et al. Radiology 2022; 304:18

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## Lipoma: subcutaneous

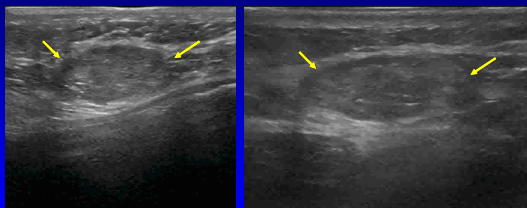
- Oval or oblong
- Homogeneous
- Isoechoic to adjacent fat
- Hyperechoic:
  - With increased fibrous tissue components
- No internal vascularity
- Compressible
- Clinically benign



Inampudi et al. Radiology 2004; 233:763

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## Lipoma: subcutaneous

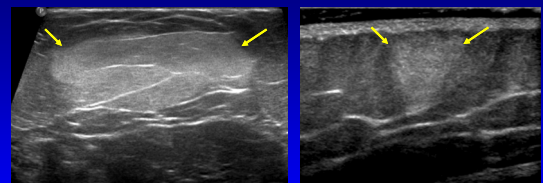


Sonopalpation

Compressible

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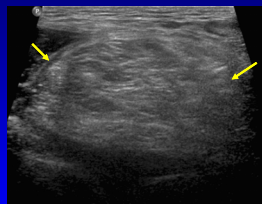
## Lipoma: subcutaneous



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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

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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- Lymph Node
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- Subcutaneous
- Other

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### Synovial Sarcoma

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### Tumor

Metastasis: Renal Cell Carcinoma      Sarcoma: high grade

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### Peripheral Nerve Sheath Tumors

- Schwannomas and neurofibromas appear similar at ultrasound
- Well-defined fusiform mass
- Hypoechoic, internal low level echoes
- Peripheral nerve: entering and exiting
  - Split fat sign
  - Schwannoma: may be eccentric to nerve

Reynolds et al. AJR 2004; 182:741

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## Peripheral Nerve Sheath Tumors

- Increased posterior through-transmission:
  - Simulate a complex cyst
- Hyperemia (unlike a cyst)
- Schwannomas may be heterogeneous:
  - Cystic: “ancient schwannoma”
- Target appearance:
  - Echogenic fibrous center
  - Peripheral hypoechoic mucinous rim

Reynolds et al. AJR 2004; 182:741

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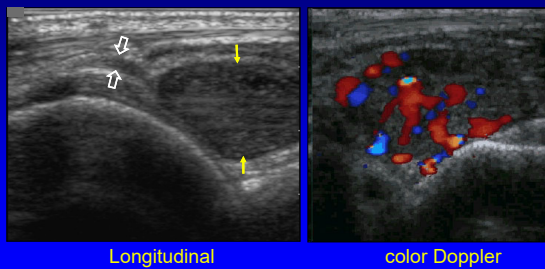
## Schwannoma

- Benign peripheral nerve sheath tumor
- Presents: ages of 20 – 30 years
- Usually solitary
- Multiple: schwannomatosis
- Associated with neurofibromatosis Type I
- Histology: Antoni A and B regions

Murphey et al. Radiographics 1999; 19:1253

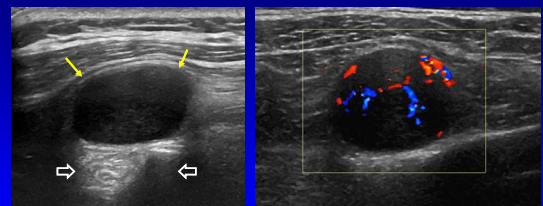
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## Schwannoma: deep peroneal nerve branch



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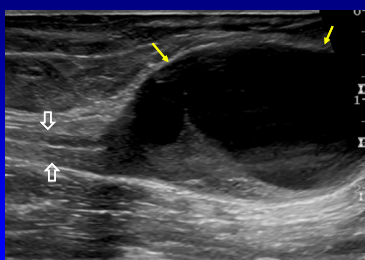
## Schwannoma



*Note: increased through-transmission*

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## Ancient Schwannoma



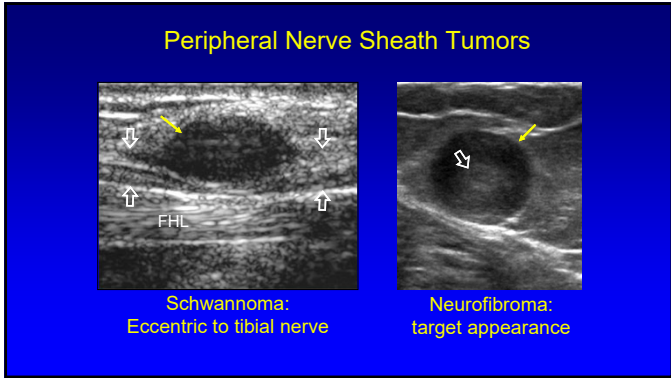
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## Neurofibroma: 3 forms

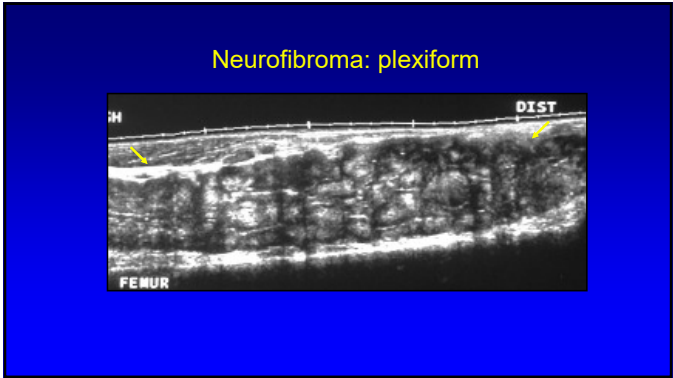
- Localized:
  - Less than 5 cm, painless
- Plexiform:
  - Diffuse nerve trunk involvement
- Diffuse:
  - Dermal and subcutaneous thickening
- Neurofibromatosis Type I:
  - Dermal neurofibromas, café-au-lait spots

Murphey et al. Radiographics 1999; 19:1253

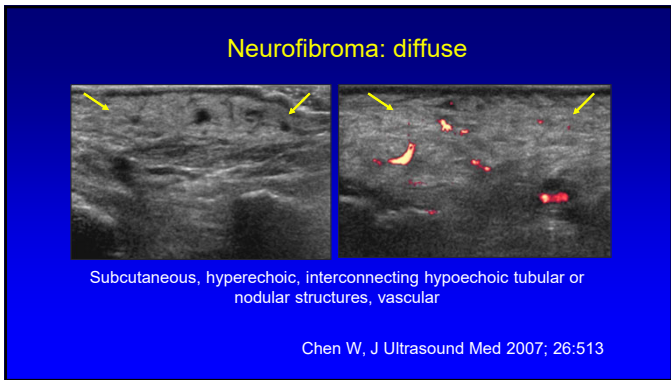
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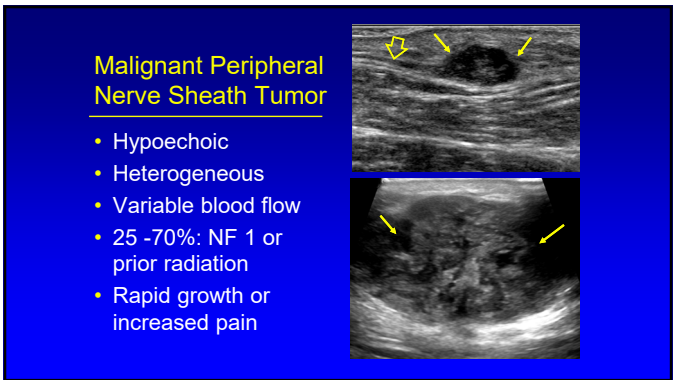
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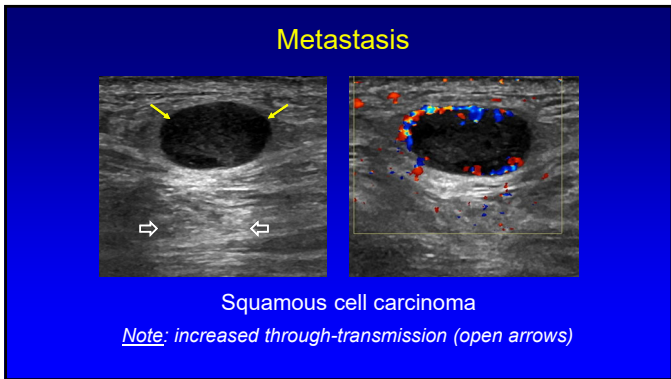
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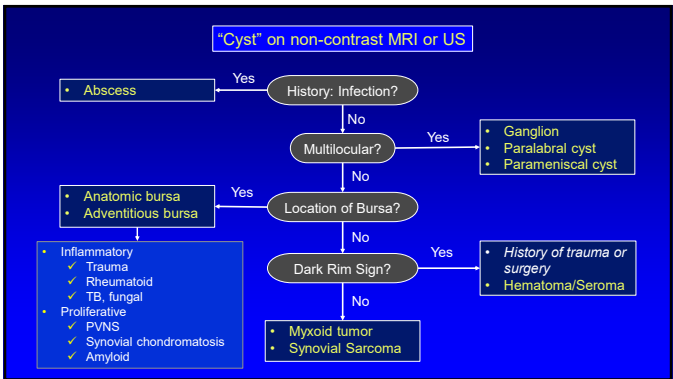
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### Liposarcoma: myxoid

- Hypoechoic
- May look like a cyst
- Not a ganglion:
  - Not multilocular
  - Not a good location
- Not a bursa:
  - Not correct location

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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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REVIEWS AND COMMENTARY • STATEMENTS AND GUIDELINES

Radiology

### Ultrasonography of Superficial Soft-Tissue Masses: Society of Radiologists in Ultrasound Consensus Conference Statement

Jan A. Jacobson, MD<sup>1</sup> • William D. Middleton, MD<sup>2</sup> • Sandra J. Alliman, MD<sup>3</sup> • Nivetha Dattajay, MD<sup>4</sup> • Kenneth S. Lee, MD<sup>5</sup> • Benjamin D. Levine, MD<sup>6</sup> • David E. Lucas, MD<sup>7</sup> • Mark D. Morley, MD<sup>8</sup> • Levan N. Nazarian, MD<sup>9</sup> • Geoffrey W. Siegel, MD<sup>10</sup> • Jason M. Wigman, MD<sup>11</sup>

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Conflicts of interest are listed at the end of this article.

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The Society of Radiologists in Ultrasound convened a panel of specialists from radiology, orthopedic surgery, and pathology to arrive at a consensus regarding the management of superficial soft-tissue masses (skeletal and US). The recommendations in this statement are based on analysis of current literature and consensus practice strategies. This statement reviews and discusses the US features of common superficial soft-tissue lesions that may manifest as a soft-tissue mass and suggest guidelines for subsequent management.

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Thank you!

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Twitter handle: @jjacobsn

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