

## Assessment of lumps and bumps

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## Outline

- Reasons for ordering ultrasound
- Some common causes
  - Non-neoplastic
  - Neoplastic
    - Benign
    - Malignant

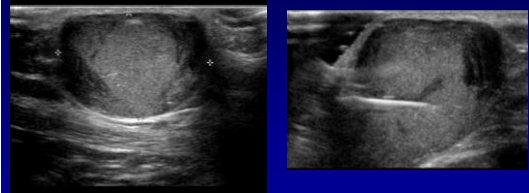
## Reasons for ordering ultrasound

- Assess an area of localized soft tissue swelling
  - Is it a mass?
  - Where is it coming from?
  - Can we characterize it?
    - Cystic versus solid
  - Does it require further work-up or an intervention?



62 y/o female with bump on knee

## Epidermoid inclusion cyst

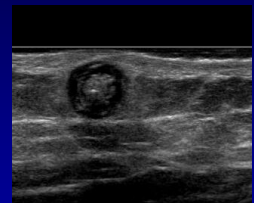


## Non-neoplastic Masses

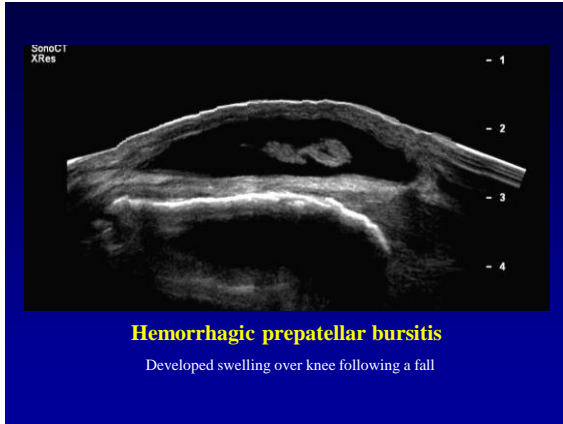
- Cystic/cyst-like:
  - Epidermoid inclusion cyst
  - Ganglion/paralabral cyst
  - Bursae
  - Hematoma (sometimes)
  - Abscess

## Epidermoid inclusion cyst

- Epithelial lined
- Etiology
  - Secondary to puncture
  - Developmental
- Contents
  - Keratin
  - White paste-like material
- Sonography
  - Well circumscribed
  - Lamellar
  - Variable echogenicity with hypochoic halo
  - Avascular on color flow imaging
    - Ruptured cysts produce inflammatory response and hyperemia



74 y/o male with lump on back


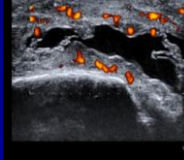


**Hemorrhagic prepatellar bursitis**

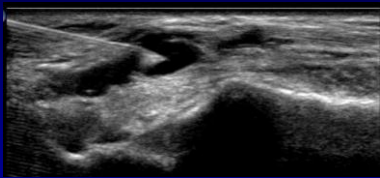
Developed swelling over knee following a fall

### Bursa

- Synovial lined structures
- Location
  - Joints, tendons, ligaments
- Ultrasound
  - Variable amounts of fluid and nodular debris.
  - Septations
  - Osteochondral bodies
  - Vascularity may indicate inflammation/infection
- Amenable to guided aspiration and injection

### Dorsal wrist pain




Aspiration/injection

Ganglion cyst

### Patient with pulsatile mass radiovolar aspect of the wrist

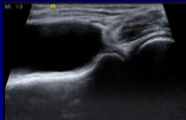
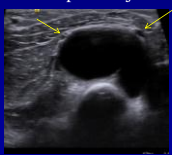
**Radiovolar ganglion cyst**  
 Second most common location for ganglion in the wrist  
 Arises from volar joint capsule  
 May see thin connecting neck



Adler RS, Hwang S. Ultrasound Quarterly Volume 21, Number 4, December 2005

### Ganglion cysts

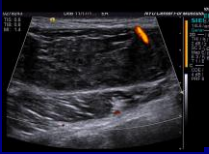
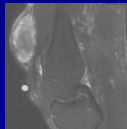
- Pseudocysts filled with clear gelatinous material
- Location
  - Most often dorsal SL ligament or radiovolar wrist, fingers> dorsal ankle
  - Can occur anywhere.
- Ultrasound
  - Anechoic/hypochoic
  - Uni- or multilocular
- Amenable to aspiration and injection

Radiocapitellar joint

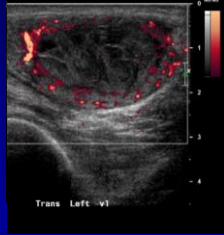
### Middle aged male with medial right knee swelling

- No history of trauma
- Well-encapsulated, heterogeneous, soft tissue mass with minimal internal vascularity
- **Organized hematoma**

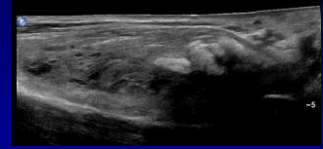
## Hematoma

- Age
  - Early
    - Echogenic
  - Intermediate
    - Progressively hypoechoic
  - Chronic
    - Centripetal healing with granulation tissue and scar remodelling
    - Chronic seroma
    - Myositis ossificans
    - Encapsulated with internal septations and cyst formation



## Solid non-neoplastic Masses

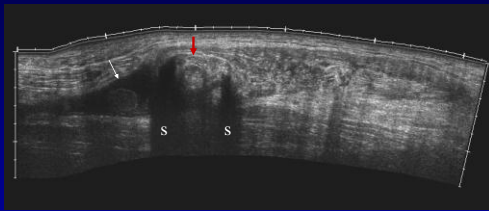
- Reactive/inflammatory /traumatic
  - Hematoma/thrombus
  - Muscle/tendon injury
  - Muscle hernia
  - Fat necrosis
  - Phlegmon/Granuloma
  - Neuroma



80 y/o F with arm swelling and history of Alzheimer's ds

Myositis ossificans

Acute buttock pain followed by new palpable mass over the back of the thigh



Hamstring muscle is ruptured and retracted.

50 y/o with fluctuant mass on leg, more pronounced with standing

- Muscle herniation through fascial defect
- More pronounced with provocative maneuvers
- Ultrasound
  - Focal contour deformity in fascia with interposed muscle
  - Sites of perforating neurovascular structures



Standing

Middle aged male with tender chest wall swelling



Fat necrosis

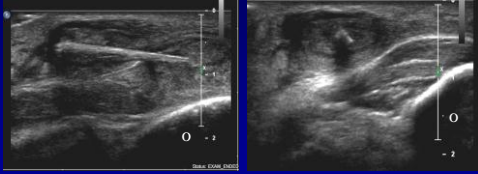
## Fat necrosis



10 y/o with swelling over pretibial soft tissues persisting for weeks following injury

- May or may not give history of trauma
- Variable appearance
  - Ill-defined focal edema in sub-Q fat
  - Hyperechoic with echogenic halo within adjacent fat
  - May have cyst formation or calcification
  - Hypo/avascular
  - Should diminish over time

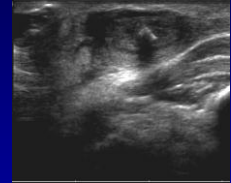
## Foreign body granuloma



Pt had hx of scraping elbow on tree 3 mos prior to US. Sent to r/o olecranon bursitis

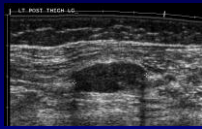
## Foreign body granuloma

- Linear, echogenic structure
  - May have acoustic shadow
- Surrounding hypoechoic halo due to inflammatory tissue
  - May be hyperemic on color flow imaging

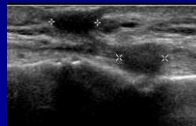


## Developed painful nodules following amputation

- Ultrasound
  - Ovoid, hypoechoic nodules
- Stump/post-traumatic/post-surgical
  - Schwann cell and fibroblast proliferation and axonal overgrowth producing cellular mass
  - Contains fine neuronal sprouts



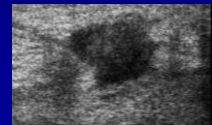
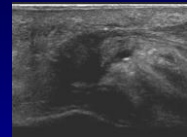
Sciatic nerve stump s/p AKA



Small stump neuromas s/p BKA

## Morton Neuroma

- Reactive pseudotumors that form about the interdigital nerves in foot
- Patient often complains of palpable nodule, swelling, feels like walking on marble
- 3rd > 2nd Web Space
- Sonography
  - Hypoechoic nodules
  - May see thickened nerve
  - May have associated bursa



## Benign neoplasms

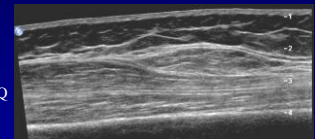
- Frequently present as palpable lump
- Lipoma
  - Subcutaneous
  - Intra/intermuscular
- Fibromatoses
  - Superficial
    - Plantar/Palmar
  - Desmoid tumor
- Giant cell tumor
- Nerve sheath tumors
- Vascular



Lipoma

## Lipoma

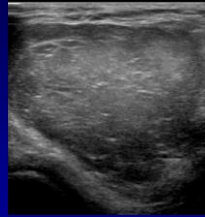
- One of the most common soft tissue mass (50%)
- Often encapsulated, elliptical
- May be mobile
- Soft to palpation
- Sonography
  - 2/3 iso/hyperechoic to subQ fat
    - Hypoechoic nodules require biopsy or further imaging
  - May have thin septations
  - Hypovascular



Paramuscular lipoma, anterior thigh

## Intramuscular lipoma

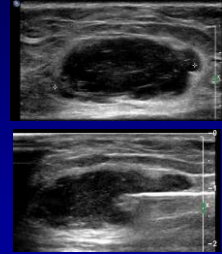
- Ultrasound
  - Well-marginated
  - Echogenic
  - Soft
  - Hypovascular
- Clinical
  - <3cm (benign)
  - Slow growth
  - Infiltrative
- DDx: well-diff Liposarc
  - >10 cm worrisome
  - atypical appearance
  - get MR



Pt sent to r/o popliteal cyst

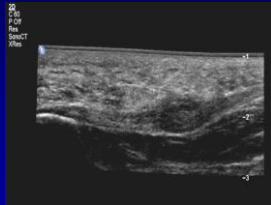
## Fatty tumor with atypical features

- Palpable soft mass left anterior chest wall
- Hypoechoic mass with internal septations and hypovascular on PDS
- Dx: Liposarcoma



## Superficial Fibromatoses

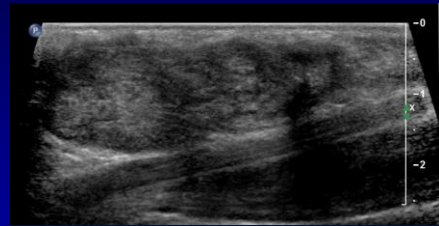
- Types
  - Plantar (Lederhose ds)
  - Palmar (Dupuytren's ds)
- Clinical
  - Benign fibrous proliferation
  - Assoc Peyronie's ds, knuckle pads
  - Can produce contractures
- Ultrasound
  - Mostly single hypoechoic nodules
  - May be multiple and become confluent
  - Frequently bilateral



Plantar fibroma

Griffith, B, Wong, TY, Wang, SM, et al. Sonography of plantar fibromatosis. AJR 2002;179:1167-1172

## Plantar fibromatosis



Pt with multiple palpable nodules along plantar aspect of both Feet, palmar nodules and Dupuytren's contracture.

## Palmar fibroma

- Superficial fibromatosis
- Benign fibrous proliferation
- See along volar surface
- Can produce contractures (Dupuytren's)



## Nerve sheath tumors

- Definitive dx requires visualization of nerve
  - Split fat sign
- Types
  - Neurofibromas
    - Neural elements
    - Target sign (echogenic center)
  - Schwannoma
    - Schwann cells
  - Ultrasound
    - Eccentricity
    - Cyst formation
    - Acoustic enhancement



Schwannoma of tibial nerve

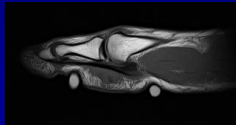
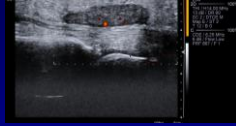


Halo sign

Ref: Lin, et al. JUM, 1999

## Giant cell tumor of tendon sheath

- Ultrasound
  - Hypochoic
  - Variable vascularity
  - Firm
- Most common soft tissue mass in the hand > wrist, foot and ankle
  - Synovial proliferation which outgrows confines of sheath (neoplastic)
  - Multinucleated giant cells,
  - Hemosiderin deposition in Xanthoma cells.

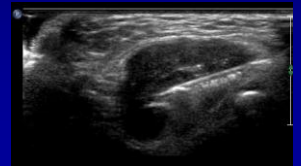


24 y/o female with nodule on great toe

## PVNS

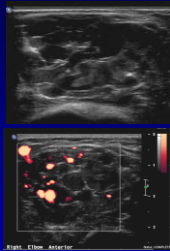
Same histology as GCT of tendon sheath

Most common in lower Extremity (knee, ankle)



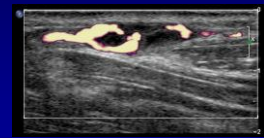
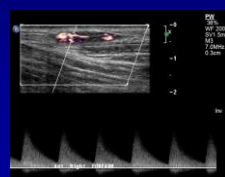
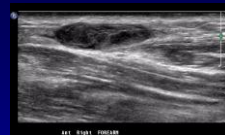
## Vascular malformations

- Types (vascular proliferative disorder)
  - Capillary
  - Cavernous
  - Venous
  - Mixed
- Variable appearance
  - Can contain fat
  - Prominent vascular channels
  - phleboliths
- AVM
  - High flow, low resistance
    - Spectral broadening
  - Arterial/venous flow
  - Hypochoic on US



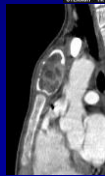
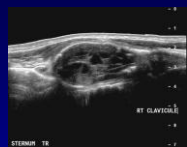
Cavernous vascular malformation of the forearm

## Ateriovenous malformations



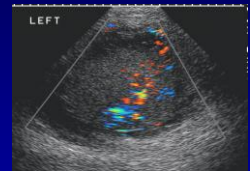
## Bone tumor

- A 14 year-old female with a painless palpable mass in the anterior chest wall.
  - Aneurysmal bone cyst
- Clinical
  - Cortical expansion and thinning produce soft tissue swelling
- Ultrasound
  - Thin echogenic rim
  - Variable internal appearance
  - Soft tissue mass if associated fracture



## Malignant Neoplasms

- Mets/lymphoma
- Primary tumors
- Ultrasound
  - Hypochoic
  - May be well margined
  - Often hypervascular
  - Cyst formation
  - Calcifications, ossification
  - May violate fascial boundaries



Leiomyosarcoma

