Assessment of lumps and bumps

Ronald S. Adler, PhD, MD
Department of Radiology

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?

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 hypoechoic halo
  - Avascular on color flow imaging

62 y/o female with bump on knee

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

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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/hypoechoic
  - Unilocular or multilocular
- Amenable to aspiration and injection

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

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

Fat necrosis

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

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

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

Lipoma

- Paramuscular lipoma, anterior thigh
**Intramuscular lipoma**

- **Ultrasound**
  - Well-margined
  - Echogenic
  - Soft
  - Hypovascular
- **Clinical**
  - <3 cm (benign)
  - Slow growth
  - Infiltrates
- **DDx:** well-diff Liposar
  - >10 cm worrisome
  - atypical appearance
  - get MR

Pt sent to r/o popliteal cyst

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**Fatty tumor with atypical features**

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

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**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

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**Plantar fibromatosis**

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

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**Palmar fibroma**

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

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**Nerve sheath tumors**

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

Schwannoma of tibial nerve
Halo sign
Ref: Lin, et al. JUM, 1999
Giant cell tumor of tendon sheath

- Ultrasound
  - Hypoechoic
  - Variable vascularity
  - Firm
- Most common soft tissue mass in the hand > wrist, foot and ankle
  - Synovial proliferation which outgrows confines of sheath
  - 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
    - Hypoechoic 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
    - Hypoechoic
    - May be well marginated
    - Often hypervascular
    - Cyst formation
    - Calcifications, ossification
    - May violate fascial boundaries

Leiomyosarcoma
Two different patients with high grade pleomorphic liposarcomas

Lymphoma
Elderly pt with left groin pulsatile swelling. Sent to US to r/o aneurysm
Enlarged, hypoechoic, loss Of hilum, peripheral vascularity

Schwannoma
Bone tumor with soft tissue mass
Third trimester pregnant woman with left forearm mass.
Soft tissue extension of tumor with displaced periosteum and new bone formation
Periosteal osteosarcoma

Summary
- Screen patients with localized soft tissue swelling
  - Allows characterization of mass
  - Separate benign non-neoplastic causes from neoplasm
    - Sometimes provides a definitive diagnosis
    - Know when to suggest additional imaging and/or biopsy
    - Guided interventions may be readily performed (injection, aspiration, biopsy)

Thank you