Imaging of Soft Tissue Tumors

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Objectives

1. Apply understanding and awareness of the role imaging and image-guided intervention play to improve the interdisciplinary diagnosis of musculoskeletal tumors.

2. Develop open lines of communication between Pathology and Radiology to optimize diagnostic sensitivity and accuracy.
Objective 1
Apply understanding and awareness of the role imaging and image-guided intervention play to improve the interdisciplinary diagnosis of musculoskeletal tumors.
• Choices of imaging modalities are increasing, each with its own unique advantages and disadvantages
  - plain film/CT: calcifications, PNB
  - MR: tissue of origin
  - US: cystic vs. solid
  - PET: metabolic activity
• Percutaneous image-guided biopsy now commonplace
Modalities for biopsy
- CT: deep soft tissue, bone
- US: superficial soft tissue, small parts, lesions near vital structures
Use of imaging for biopsy planning

- avoid cystic or necrotic areas
- avoid vital structures (vessels, nerves, joint)
“The ISSUE is TISSUE” (SDN)

• Core, not FNA
  - 11 G outer cannula
  - 14 G automated biopsy gun with 2 cm throw

• Samples in both formalin & saline (routine cytogenetics)
Anesthesia
- local: vast majority
- conscious sedation: intact cortex
- general anesthesia: pediatric patients
• Risks
  - bleeding
  - infection
  - nondiagnostic sampling
• Alternative: open biopsy
How useful is percutaneous biopsy?

444 biopsies between 2005-2008
• **diagnostic**: definitive pathology or clinically useful information

• **accurate**: concordant with final diagnosis w.r.t. malignancy, grade and histopathological features

• **successful**: both diagnostic and accurate
444 biopsies between 2005-2008

- **diagnostic:** 71%
- **accurate:** 86%
- **successful:** 70%

In press: AJR
Hazards of biopsy: MTS (% referring, treating) 1982

- major errors in diagnosis (30, 9)
- inadequate (20, 3)
- wound problems (31, 7)
- altered treatment plan (32, 8)
- prognosis,outcome adversely affected (13, 5)
Hazards of biopsy revisited: MTS (% referring, treating) 1992

- major errors in diagnosis (27, 12)
- wound problems (36, 4)
- altered treatment plan (19, 4)
- prognosis/outcome adversely affected (17, 4)
All factors are optimized if biopsy is undertaken at the treating institution
Objective 2

Develop open lines of communication between Pathology and Radiology to optimize diagnostic sensitivity and accuracy.
This one is up to you…
Multidisciplinary conferences

- Pathology
- Radiology
- Medical oncology
- Surgical oncology
- Radiation oncology
Clinical presentation

• incidental
• swelling
• mass
• pain

Not every “mass” is abnormal...
Accessory soleus muscle
Rectus fascia tear
Clinical questions

• is it neoplasia?
• is it benign or malignant?
Limitations of imaging

- fairly good at benign tumors
- cannot differentiate benign from low grade malignancy
- high grade malignancies look alike
Helpful criteria: location

• around or within joint
  - PVNS
  - cyst, ganglion
• around neurovascular bundle
  - neurogenic tumor
  - lymphoma
Proximal T/F
joint ganglion
Lymphoma
Origin of mesenchymal tumors
• osteoid
• cartilage
• fat
• fibrous
• neural
• vascular
Osteoid, calcification

- MR: low signal (black) on all pulse sequences
- Radiographs/CT: high density (white)
HADD biceps tendon
Extraosseous osteosarcoma
Extraosseous osteosarcoma
Extraosseous osteosarcoma (subdeltoid bursa)
Cartilage

- lobulated
- MR: T2' cartilage very high and calcification very low signal
- CT: cartilage lower density than muscle, calcifications dense
ST chondroma
Hoffa’s fat ST chondroma
Massive synovial osteochondromatosis
Fat

- MR: high signal T1, uniform fat suppression
- CT: low density
Lipoma
Spindle cell lipoma
Hibernoma
Hibernoma
Lipoblastoma
Lipoma

Liposarcoma
Liposarcoma
Fibrous

• low signal T2
• signal varies depending on amount of fibrous tissue, hemosiderin, foamy histiocytes
Nodular fasciitis
Desmoid tumor
Elastofibroma dorsi
DFSP
Neural

- ST mass at nerve or neurovascular bundle
- often smoothly elongated, “comet-tail” at ends
- often painful to palpation and biopsy
Neurofibromatosis
Plexiform neurofibroma
Schwannoma
(degenerated)
Malignant schwannoma
Vascular

- areas of fat
- infiltrative
- serpiginous vessels
- may invade bone
- look for phleboliths
Hemangioma
Hemangioma
Hemangioma
Mafucci’s syndrome
Hemangioendothelioma
Myxoid

- MR: lower signal than muscle on T1, very high signal on T2
- CT: lower density than muscle
Myxoma
Myxoma
Fibromyxoid sarcoma
Mazabraud’s syndrome

- fibrous dysplasia (often polyostotic)
- soft tissue myxomomas (often multiple)
  - large muscles of thigh, buttock, shoulder
  - often asymptomatic
Mazabraud syndrome
Mazabraud syndrome
Conclusions

1. Imaging plays an important role in diagnosis and treatment planning of soft tissue tumors
2. A close working relationship between Pathology and Radiology will optimize patient care
Conclusion

3. Benign lesions cannot be differentiated from low grade malignancy with imaging