1 **Musculoskeletal Masses: Imaging Evaluation to Tissue Sampling**

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Imaging
- plain film (always for bone)
- bone lesion: CT
- soft tissue lesion: MRI
- role of US
  - confirm presence of mass
  - cystic vs solid

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Gadolinium
- MSK system has no BBB
- enhancement pattern and/or intensity cannot differentiate benign from malignant
- possible role in identifying site for biopsy
- if used, FAT-SUPPRESS

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Bone pseudotumor
- humerus greater tuberosity
- radial tuberosity

10 **MSK image-guided percutaneous biopsy**
- **safe**
- **reliable**
- **cost saving**
- **minimally invasive**

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- **444 biopsies over 4 year period**
  - **71% diagnostic (definitive diagnosis)**
  - **86% accurate (concordant with final diagnosis)**
  - **70% successful (both diagnostic and accurate)**

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- **no difference in success rates by location, use of sedation, biopsy equipment**
- **biopsy of bone more successful than soft tissue**
- **biopsy of malignant more successful than benign**

13 **MSK biopsy requested**
- **request goes to scheduling**
- **scheduler sends out e-mail to all MSK radiologists**
- **radiologist reviews prior imaging (REQUIRED, usually CT or MRI)**
- **radiologist determines**
  - **appropriateness**
  - **imaging modality for guidance**
  - **method for anesthesia/sedation**

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- occasionally "CT with possible biopsy" is appropriate
- same-day add-on for local anesthesia only

15 Image guidance
- CT: bone, deep soft tissue
- US: superficial soft tissue, small parts

16 Sedation
- local anesthesia: radiologist
- conscious sedation: IR nurse
- MAC (monitored anesthesia care, minimal alveolar anesthetic concentration): anesthesiologist
- general anesthesia: anesthesiologist

additional local anesthesia used for all

17 Local anesthesia
- adult, soft tissue
- adult, bone with cortical destruction

Conscious sedation
- adult, bone with cortex intact

18 MAC
- under 13 yo, soft tissue or bone with cortex destroyed

General anesthesia
- under 13 yo, bone with intact cortex

19 Patient position
- maximize patient comfort
- avoid NV structures, major tendons
- shortest safe distance to lesion

20 **Myth**
- percutaneous biopsy leads to seeding of the biopsy tract
  - tract may violate only one compartment
  - tract must be excised at the time of definitive surgery

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- 363 consecutive CT guided LE biopsies (08/02 – 08/08)
- 67% ST, 33% bone
- 52% malignant, 48% benign
- violations
  - 4% anatomic compartment
  - 12% "vital structures" (joint)
  - 68% needle path for bone tumors
- no recurrence could be contributed to seeding

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- co-axial systems
  - biopsy needle passes only through outer cannual
- neoadjuvant chemotherapy

23 **Biopsy technique**
- co-axial system
- core (never FNA), 11g outer, 14g inner
- sample different parts of lesion
  - formalin (H & E)
  - normal saline (cytogenetics, histocompatibility)
- pathologist present only for suspected lymphoma (flow cytometry)

24 **Where to aim**
- mixed lesions: highest grade
- avoid necrotic areas (go peripheral)
- adequate sampling: look at the cores

25 **Post-procedural disposition**

- local only: discharge home
- conscious sedation, MAC, general: post-procedural observation unit

26 Keys to success

- oncology referral center
- multidisciplinary subspecialists (especially pathologist)
- regular (weekly) tumor conference

27 Conclusions

- percutaus image-guided biopsy is safe
- anesthesia type depends on lesion location and age of patient
- imaging guidance depends on lesion location