Primary Bone Lymphoma

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Our Patient AA: History

– 58 year old female

– Left knee pain for 2 weeks

– Previously healthy with NO significant past medical history or past surgical history

– Active, walks a lot during work, goes running twice a week (Approximately 2 miles)

– HISTORY OF TRAUMA: misstep 2 weeks ago
Our Patient AA: Plain Films

AP X-ray of left knee:

- Aggressive appearing lesion on plain film
- Moth-eaten lesion in proximal tibia
- Bone cortex appears intact
- No apparent stress fractures
Anterior and posterior whole body bone scan:

- Increased radiotracer uptake in the left proximal tibia
- No other bone lesions
Our Patient AA: DDx At This Point

SUMMARY:

– 58 yo F w/ knee pain for 2 weeks
– Aggressive appearing lesion on plain film
– Increased uptake on bone scan

DIFFERENTIAL DIAGNOSIS AT THIS POINT:

– Osteomyelitis
– Stress fracture: Ruled out
– Bone tumor (benign and malignant)
Our Patient AA: $^{111}$Indium WBC SCAN

**Anterior and posterior WBC scan:**

- No uptake in the left proximal tibia, which discards infectious process
Our Patient AA: Narrowing The DDx

SUMMARY:
- 58 yo F w/ knee pain for 2 weeks
- Aggressive appearing lesion on plain film
- Increased uptake on bone scan
- No uptake in WBC scan

DIFFERENTIAL DIAGNOSIS AT THIS POINT:
- Osteomyelitis: Ruled Out
- Stress fracture: Ruled Out
- Bone tumor (benign and malignant)
MALIGNANT BONE TUMORS

– Ewing Sarcoma: Less likely
  • Younger age (peak: 15 years)
  • Location: Diaphysis of long bones
  • More systemic symptoms
– Chondrosarcoma: Less likely
  • Location: Flat bones

– Metastasis – SYSTEMIC
– Lymphoma – LOCAL vs. SYSTEMIC
– Osteosarcoma -LOCAL
– Fibrosarcoma – LOCAL
Our Patient AA: 4 Principal DDx

MALIGNANT BONE TUMORS

–Metastasis – SYSTEMIC

–Lymphoma – LOCAL vs. SYSTEMIC

–Osteosarcoma - LOCAL

–Fibrosarcoma – LOCAL
Our Patient AA: PET

Whole body PET:

• Increased uptake in left proximal tibia
• No other lesions are seen in the rest of the body
Our Patient AA: PET-CT

Coronal view of whole body PET-CT shows NO other lesions
Our Patient AA: Axial PET-CT of LE

Axial PET-CT of LE shows increased uptake in left proximal tibia
Coronal PET-CT of LE shows increased uptake in left proximal tibia
Our Patient AA: Summary at this Point

**SUMMARY:**

- 58 yo F w/ knee pain for 2 weeks
- Aggressive appearing lesion on plain film
- Increased uptake on bone scan
- No uptake in WBC scan
- Increased uptake on PET-CT
- No other body lesions on PET-CT
Our Patient AA: Narrowing MORE the DDx

MALIGNANT BONE TUMORS

–Metastasis: Less likely
  • Solitary Metastasis is still an option, although very rare
–Secondary lymphoma: Ruled out

–Primary lymphoma-LOCAL
–Osteosarcoma - LOCAL
–Fibrosarcoma – LOCAL
Our Patient AA: Local Bone Tumors

MALIGNANT LOCAL BONE TUMORS

– Primary Lymphoma

– Osteosarcoma

– Fibrosarcoma: Less likely
  • Very rare
Differences Between 1ry Lymphoma and Osteosarcoma

<table>
<thead>
<tr>
<th></th>
<th>Lymphoma</th>
<th>Osteosarcoma</th>
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</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>20-70 yo</td>
<td>20-30 / 50-70 yo</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td>Anywhere</td>
<td>Metaphysis</td>
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</tbody>
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In our patient AA, this characteristics are not useful, now that her lesion involves the metaphysis of the left tibia, and her age is not specific for one of the two tumors…WE MUST LOOK FOR OTHER DIFFERENCES…

Malloy PC et al: Lymphoma of bone, muscle, and skin: CT findings Am J Roentgenol 160:1245-8, 1993
Other Differences Between Primary Lymphoma and Osteosarcoma

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<th>Osteosarcoma</th>
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<tr>
<td>Soft Tissue involvement and medullary extension</td>
<td>Large</td>
<td>Less; New bone formation</td>
</tr>
<tr>
<td>Cortex/Periosteum involvement</td>
<td>Late</td>
<td>Early</td>
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</table>

Malloy PC et al: Lymphoma of bone, muscle, and skin: CT findings Am J Roentgenol 160:1245-8, 1993
Our Patient AA: MRI

Cor T1 Post FS MRI of left knee

- Enhancing mass in the proximal tibia
- Soft tissue component medial to the tibia
Our Patient AA: CT

Axial CT of Left tibia

• Intact bone cortex
• Medullary lytic lesion in proximal tibia
Our Patient AA: Final DDx

#1 Primary Lymphoma
- LARGE SOFT TISSUE COMPONENT
- CORTEX RELATIVELY PRESERVED

#2 Osteosarcoma

#3 Fibrosarcoma
Our Patient AA: Biopsy

Axial image of CT guided needle biopsy of lytic lesion in left proximal tibia
Our Patient AA: Diagnosis

- Primary Large B-Cell Lymphoma

Example of Pathologic Image of a Primary Large B cell Lymphoma

Lytic permeative pattern. (a) Photomicrograph (original magnification, x200; hematoxylin-eosin stain) of an intramedullary lesion of primary bone lymphoma reveals diffuse replacement of marrow elements by large atypical lymphocytes with large nuclei and a small amount of eosinophilic cytoplasm. (b, c) Photomicrographs (original magnification, x100; immunoperoxidase stain) show that the atypical cells stain strongly for common leukocyte antigen (b) but negatively for cytokeratin stain (c). Further testing showed that the cells stained positively for B-cell antigen.

Primary Bone Lymphoma: Definition

- Lymphoma within medullary cavity of a single bone WITHOUT concurrent lymph node or visceral involvement
- Must be differentiated from skeletal involvement in systemic lymphoma

Our Patient AA: 1E on Ann Arbor Classification of Lymphomas

Stage I
- Single lymph node region or single extralymphatic site (Ile)

Stage II
- Two or more sites, same side of diaphragm or contiguous extralymphatic site (IIe)

Stage III
- Both sides of diaphragm or contiguous extralymphatic site (IIle)

Stage IV
- Diffuse involvement of extralymphatic sites ± nodal disease

Stage subdivision:
- A - asymptomatic
- B - unexplained weight loss > 10% in 6m and/or fever and/or night sweats

Extralymphatic = tissue other than lymph nodes, thymus, spleen, Waldeyer’s ring, appendix & Peyer’s patches
Primary Bone Lymphoma: Epidemiology

• 5% of all malignant bone tumors

• 90% are NHL, only 6% HD

• Secondary lymphoma much more common than primary:
  • 50% of patients with NHL have secondary involvement of bone

• Has a good overall prognosis; with chemotherapy and radiotherapy 5 year survival of 60-80%
Primary Bone Lymphoma: More Epidemiology

• Broad range of ages:
  – Peak prevalence 6th-7th decades of life

• More prevalent in males than females
  – Ratio of 1.8:1

• Femur is the most common site (25%)
Primary Bone Lymphoma: Clinical Characteristics

- Insidious or intermittent localized dull bone pain
- Local swelling
- Palpable mass
- Few systemic symptoms despite extensive disease

Primary Bone Lymphoma: Histopathologic Characteristics

• Primary bone lymphomas most commonly are large cell or mixed small and large cell lymphomas of the B-cell lineage

• T-cell primary bone lymphomas are rare

• There is NO reliable histologic or immunohistologic features to distinguish primary from secondary bone lymphoma

Primary Bone Lymphoma: Radiographic Characteristics

**XR:**
- Mottled, Permeative, mixed lytic, sclerotic lesions
- Long tubular bones: 48%
- Metadiaphysis

**CT:**
- Medullary involvement
- Cortex relatively well preserved

**MR:**
- Enhancing mass in T1 FS
- Large soft tissue component

**NM:**
- MDP and FDG uptake

BIDMC, PACS
Primary Bone Lymphoma: Treatment

- Medical treatment:
  - Chemotherapy with CHOP
  - Ajuvant Radiotherapy

- Surgery: Pathologic Fracture or imminence of pathologic fracture

Our Patient AA: Treatment

- Our patient underwent:
  - 5 cycles of R- CHOP
  - RADIATION
  - No surgery
Our Patient AA: PRE-Chemo vs. POST-Chemo PET

Whole body PET:

• No uptake in left proximal tibia after chemotherapy
Our Patient AA: PRE-Chemo vs. POST-Chemo PET-CT

Axial PET-CT of LE: Reduction of lytic lesion, with no uptake after chemotherapy
References


• Malloy PC et al: Lymphoma of bone, muscle, and skin: CT findings Am J Roentgenol 160:1245-8, 1993

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