12-year-old female with bilateral chest, back, and axillae pain

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Patient Presentation

- HPI: 12-year-old female with history of osteosarcoma of the left lower leg status post left above knee amputation performed at her home country without adjuvant chemotherapy. She initially presented to an outside hospital several months later in the US on a visit to her family with fever, cough, chest pain, back, and rib pain. She was found to have numerous calcifications on CXR and further imaging/lab workup compatible with metastatic disease. She was started on chemotherapy with minimal response and was referred to our hospital for a second opinion.
Patient Presentation

• Medical History: Osteosarcoma of the left lower leg, pulmonary embolism
• Surgical History: Left above knee amputation
• Medications: Bactrim 600-120 mg daily, Lovenox 120 mg BID, Gabapentin 50 mg TID, Ativan 1 mg q8h prn, Scopolamine patch q3 days, Zofran 8 mg q8h prn, Miralax daily prn, Tylenol 650 mg q4h prn, Marinol 2.5 mg daily,
• Allergies: No known drug allergies
• ROS: fever, cough, shortness of breath, chest pain, extremity pain
• Vitals: Afebrile, HR 120-140s, RR 20s
• Physical exam: Diminished breath sounds on the left. Large palpable masses in the right breast/axilla and left medial breast. Left above knee amputation.
Pertinent Labs

Hospitalization prior to referral to our institution:
• CBC: Hgb 7.1, WBC 8.6, Platelets 308
• BMP unremarkable
• Blood cultures +staph epidermidis with repeats negative (likely contaminant)
What Imaging Should We Order?
Select the applicable ACR Appropriateness Criteria

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Appropriateness Category</th>
<th>Relative Radiation Level</th>
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</thead>
<tbody>
<tr>
<td>Radiography chest</td>
<td>Usually Appropriate</td>
<td>☀</td>
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<tr>
<td>US chest</td>
<td>May Be Appropriate</td>
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<tr>
<td>CT chest with IV contrast</td>
<td>Usually Not Appropriate</td>
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<td>CT chest without and with IV contrast</td>
<td>Usually Not Appropriate</td>
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<tr>
<td>CT chest without IV contrast</td>
<td>Usually Not Appropriate</td>
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<tr>
<td>MRI chest without and with IV contrast</td>
<td>Usually Not Appropriate</td>
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<tr>
<td>MRI chest without IV contrast</td>
<td>Usually Not Appropriate</td>
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</table>
Findings (labeled)

- Calcified pulmonary nodule
- Calcified axillary mass
- Calcified lung or soft tissue mass
- Calcified liver lesion
- Complete opacification of the left hemithorax, including calcified soft tissue mass
- Sclerotic bone lesion
- Calcified axillary mass
Select the applicable ACR Appropriateness Criteria

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<tr>
<td>MRI chest without and with IV contrast</td>
<td>Usually Appropriate</td>
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<tr>
<td>MRI chest without IV contrast</td>
<td>Usually Appropriate</td>
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<tr>
<td><strong>CT chest with IV contrast</strong></td>
<td>Usually Appropriate</td>
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<tr>
<td>CT chest without IV contrast</td>
<td>Usually Appropriate</td>
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<tr>
<td>US chest</td>
<td>Usually Not Appropriate</td>
<td>O</td>
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<tr>
<td>Image-guided transthoracic needle biopsy</td>
<td>Usually Not Appropriate</td>
<td>Varies</td>
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<tr>
<td><strong>CT chest without and with IV contrast</strong></td>
<td>Usually Not Appropriate</td>
<td>🔴</td>
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<tr>
<td>FDG-PET/CT skull base to mid-thigh</td>
<td>Usually Not Appropriate</td>
<td>🔴</td>
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</tbody>
</table>
Findings (unlabeled)
Findings (labeled)

Left thyroid lobe metastasis
Findings (Unlabeled)
Findings (labeled)

Large left upper lobe metastasis encasing the large branching vessels of the aortic arch.
Findings (labeled)

Tumor thrombus versus external compression from adjacent tumor involving superior vena cava
Findings (unlabeled)
Findings (labeled)

Abrupt cutoff of the left IJ vein
Findings (unlabeled)
Findings (labeled)

- Left pulmonary artery narrowing (mid lung zone)
- Breast metastasis
- Right lung metastases
- Left lung metastases
Findings (unlabeled)
Findings (labeled)

- Breast metastasis
- Right lung metastases
- Left lung metastases
Findings (unlabeled)
Findings (labeled)

Right femur metastasis
Findings (unlabeled)
Findings (labeled)

Right iliac sclerosis with extra-osseous soft tissue component in adjacent muscle.
Findings (unlabeled)
Findings (labeled)

Right kidney metastasis
Final Dx:

Metastatic Osteosarcoma
Case Discussion

• Etiology: Osteosarcoma is the third most common primary cancer in adolescence that most often affects the long bones of the upper and lower extremity. Osteosarcoma currently accounts for 20% of bone cancers while the five year survival rate for distant metastases of osteosarcoma is currently 24%. This case is consistent with significant and diffuse metastasis of an osteosarcoma originating in the left lower extremity.
Case Discussion

• Pathophysiology: Osteosarcoma primary tumors typically occur near the metaphysis of long bones of the appendicular skeleton. The most common locations include the femur, tibia, and humerus.

• Clinical features: bone pain and tenderness

• Primary vs. secondary tumors
  • Primary tumors usually occur in the metaphysis of long bones, the vast majority of primary tumors are seen in children and adolescents
  • Secondary tumors are more widely distributed and are commonly seen in flat bones, particularly the pelvis. Secondary tumors almost always occur in the adult population
Case Discussion

- Metastasis: classical high-grade osteosarcoma of the extremity is more likely to metastasize compared to low grade parosteal osteosarcomas.

- The lung is the most common site of metastasis, while metastasis to soft tissue and other solid organs is exceedingly rare.

- While 15% of patients will have detectable lung metastases at diagnosis, renal metastases usually go undetected.
Case Discussion

Diagnosis: Initially, radiography is used to identify osteosarcoma in the primary tumor site. Additionally, thoracic CT scan is used detect metastasis to pulmonary sites. Finally, biopsy of primary tumor confirms diagnosis and allows for grading of the lesion.

Differential diagnosis: Osteomyelitis, fibrosarcoma, giant cell tumor

Treatment: Combinatorial strategies employing methotrexate, doxorubicin, and cisplatin are currently used to treat osteosarcoma.
Significance

• The significance of this case is highlighting the diffuse osteosarcoma metastases to various tissues, including the exceedingly rare metastases to the liver and kidney.
References:


