

AMSER Case of the Month

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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

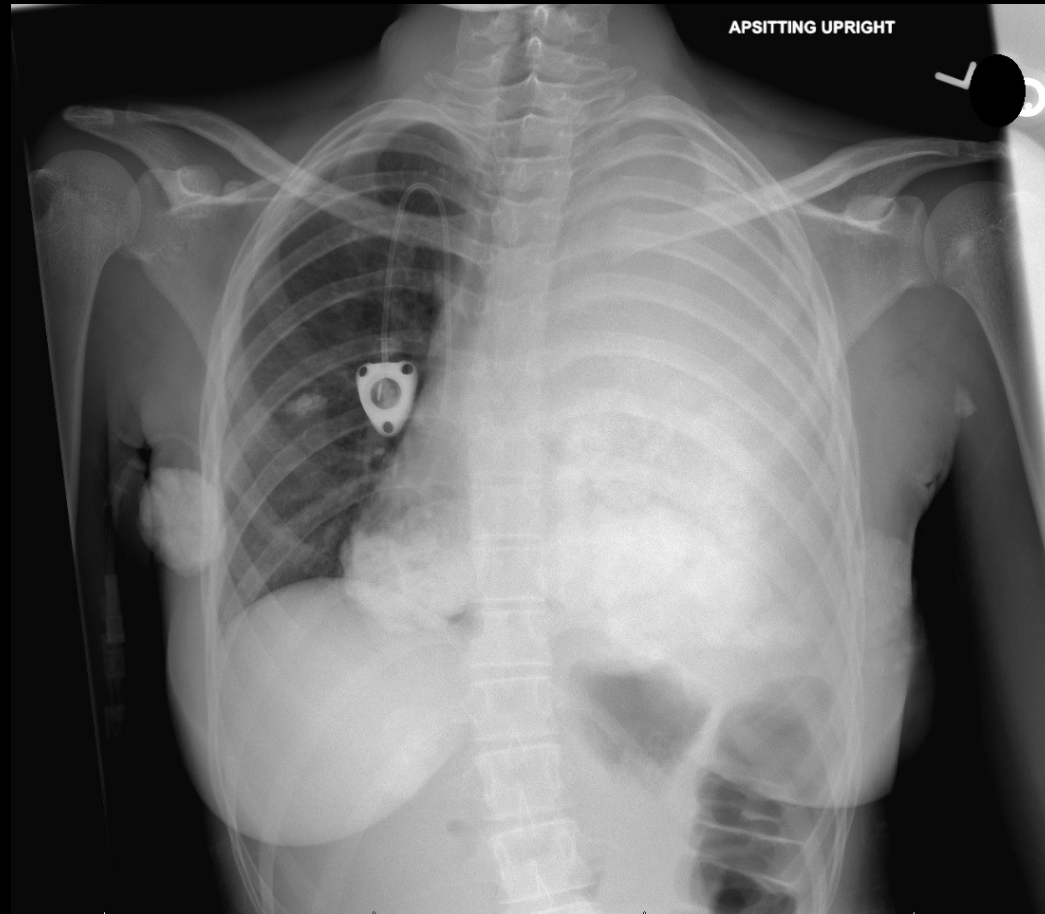
Variant 2:

Acute respiratory illnesses in immunocompetent patients with positive physical examination, abnormal vital signs, organic brain disease, or other risk factors. Initial imaging.

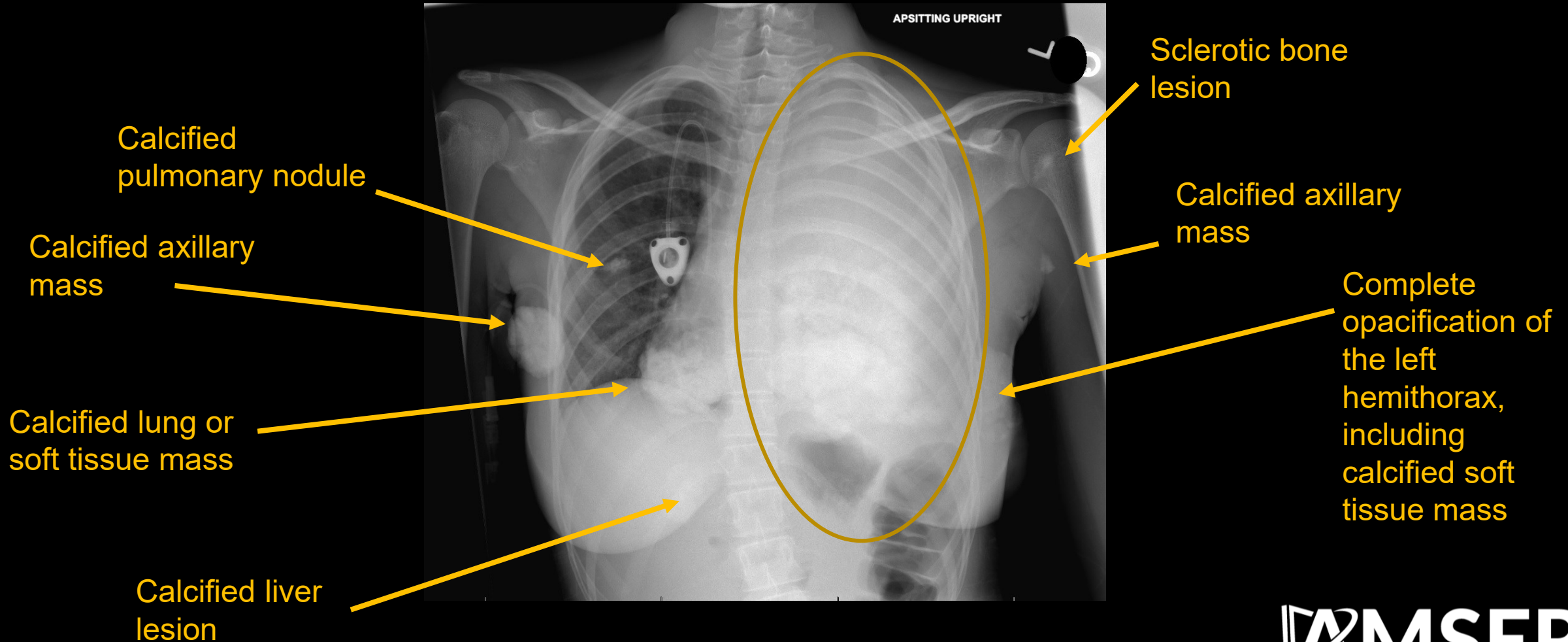
Procedure	Appropriateness Category	Relative Radiation Level
Radiography chest	Usually Appropriate	☼
US chest	May Be Appropriate	○
CT chest with IV contrast	Usually Not Appropriate	☼ ☼ ☼
CT chest without and with IV contrast	Usually Not Appropriate	☼ ☼ ☼
CT chest without IV contrast	Usually Not Appropriate	☼ ☼ ☼
MRI chest without and with IV contrast	Usually Not Appropriate	○
MRI chest without IV contrast	Usually Not Appropriate	○



Findings (unlabeled)



Findings (labeled)

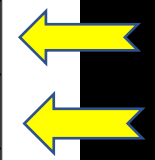


Select the applicable ACR Appropriateness Criteria

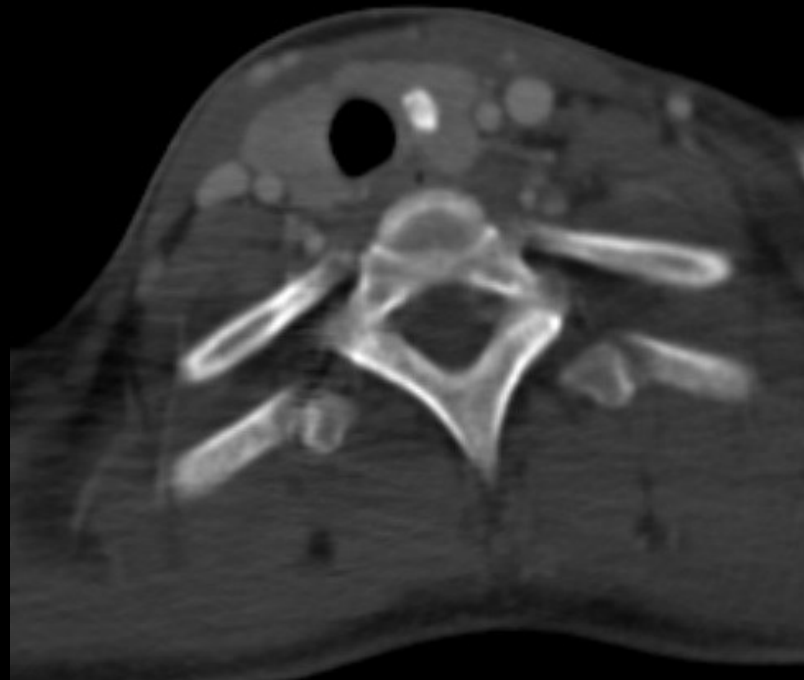
Variant 2:

Indeterminate mediastinal mass on radiography. Next imaging study.

Procedure	Appropriateness Category	Relative Radiation Level
MRI chest without and with IV contrast	Usually Appropriate	○
MRI chest without IV contrast	Usually Appropriate	○
CT chest with IV contrast	Usually Appropriate	☢☢☢
CT chest without IV contrast	Usually Appropriate	☢☢☢
US chest	Usually Not Appropriate	○
Image-guided transthoracic needle biopsy	Usually Not Appropriate	Varies
CT chest without and with IV contrast	Usually Not Appropriate	☢☢☢
FDG-PET/CT skull base to mid-thigh	Usually Not Appropriate	☢☢☢☢

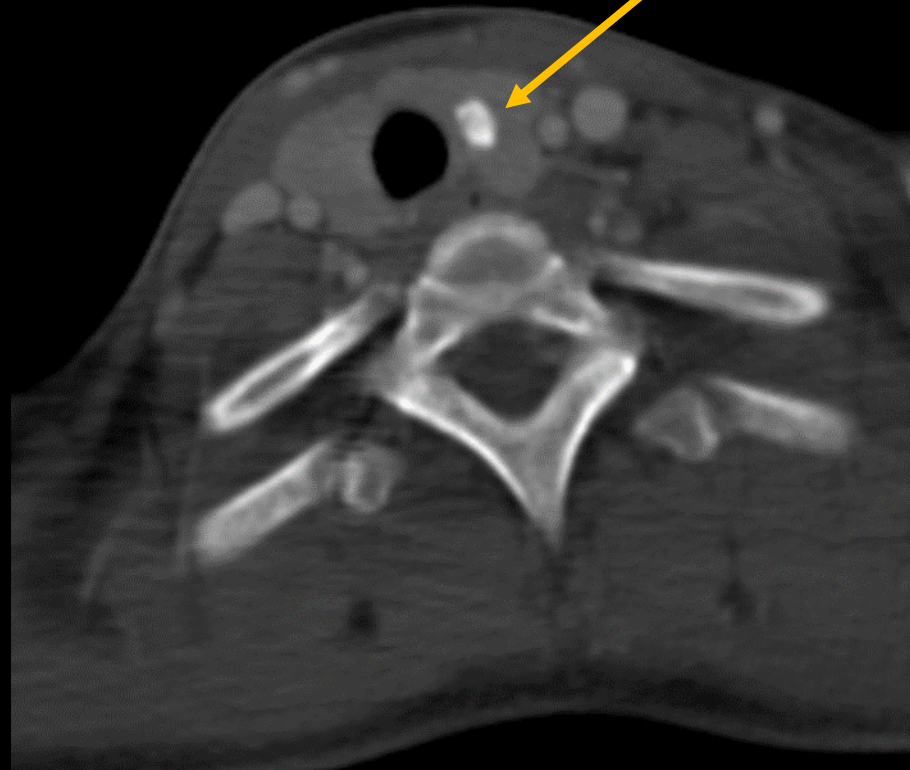


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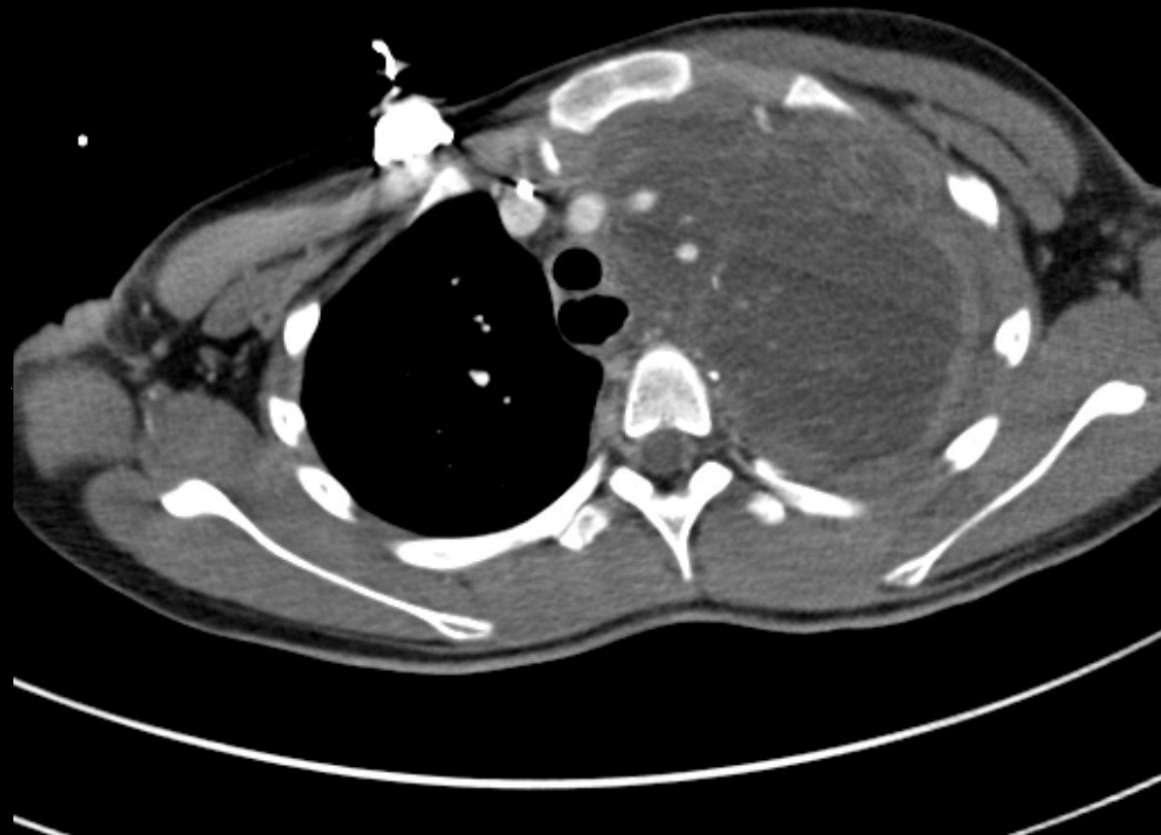


Findings (labeled)

Left thyroid
lobe
metastasis

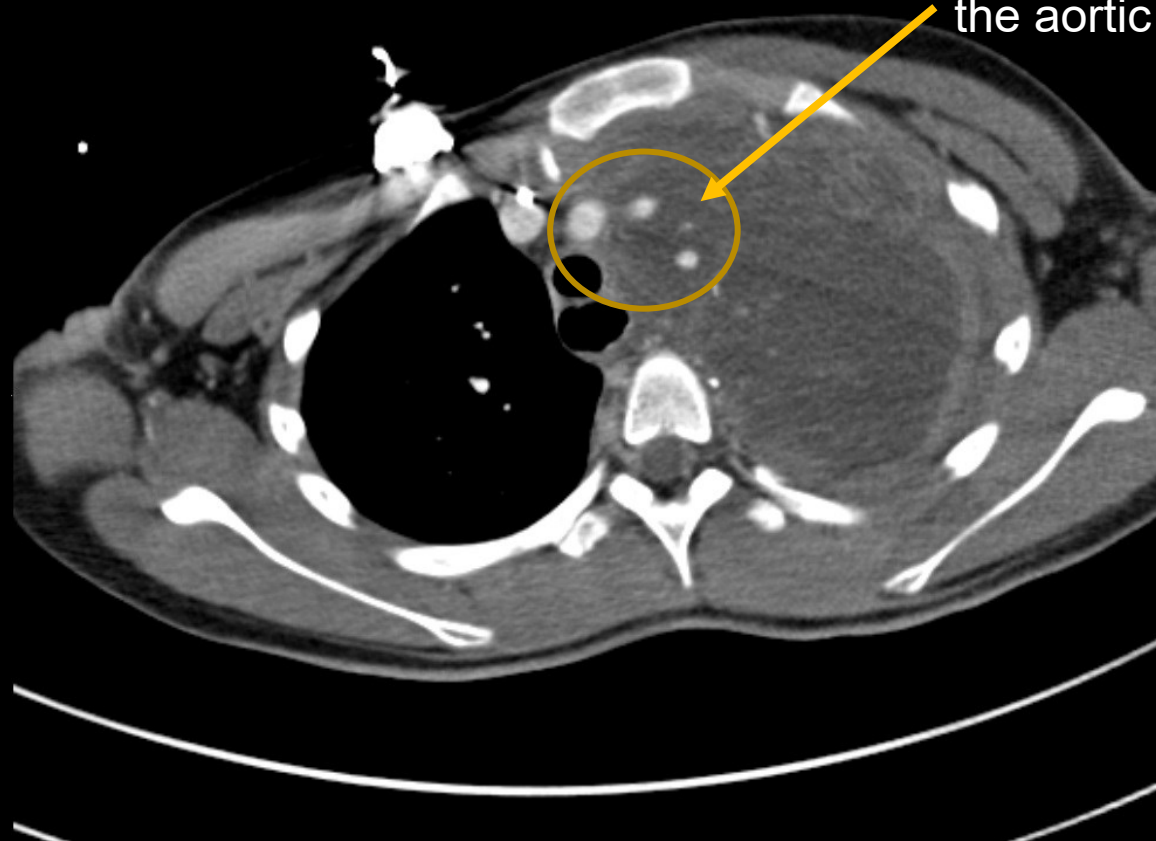


Findings (Unlabeled)

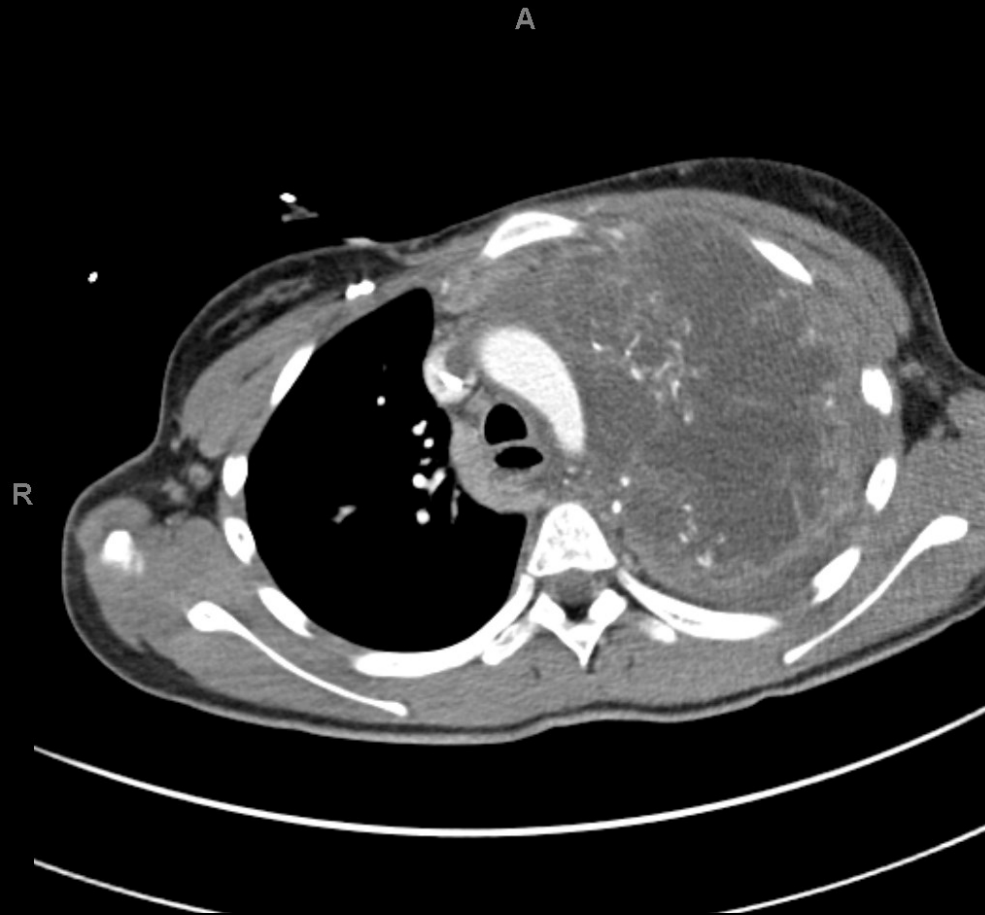


Findings (labeled)

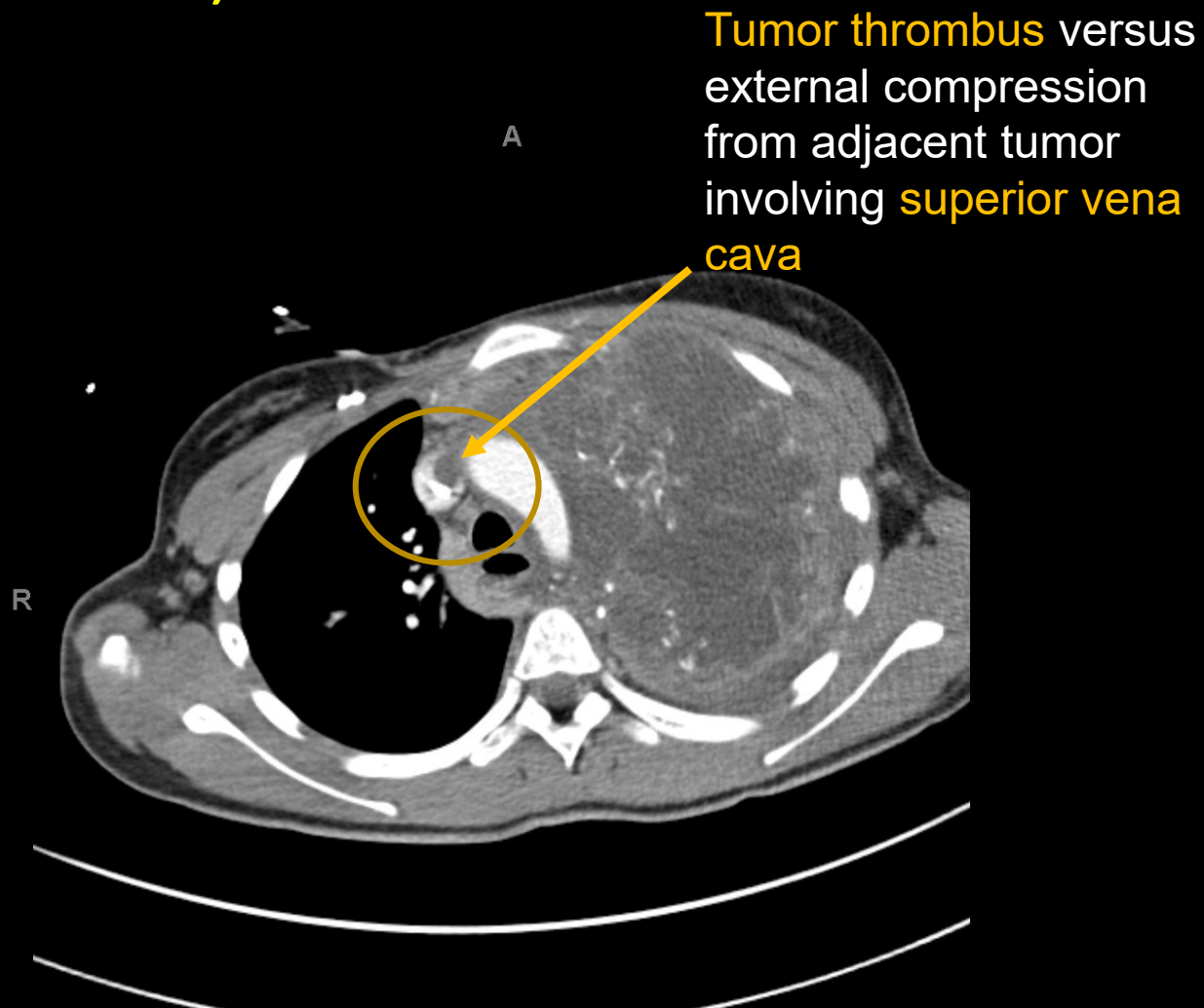
Large left upper lobe metastasis encasing the large branching vessels of the aortic arch



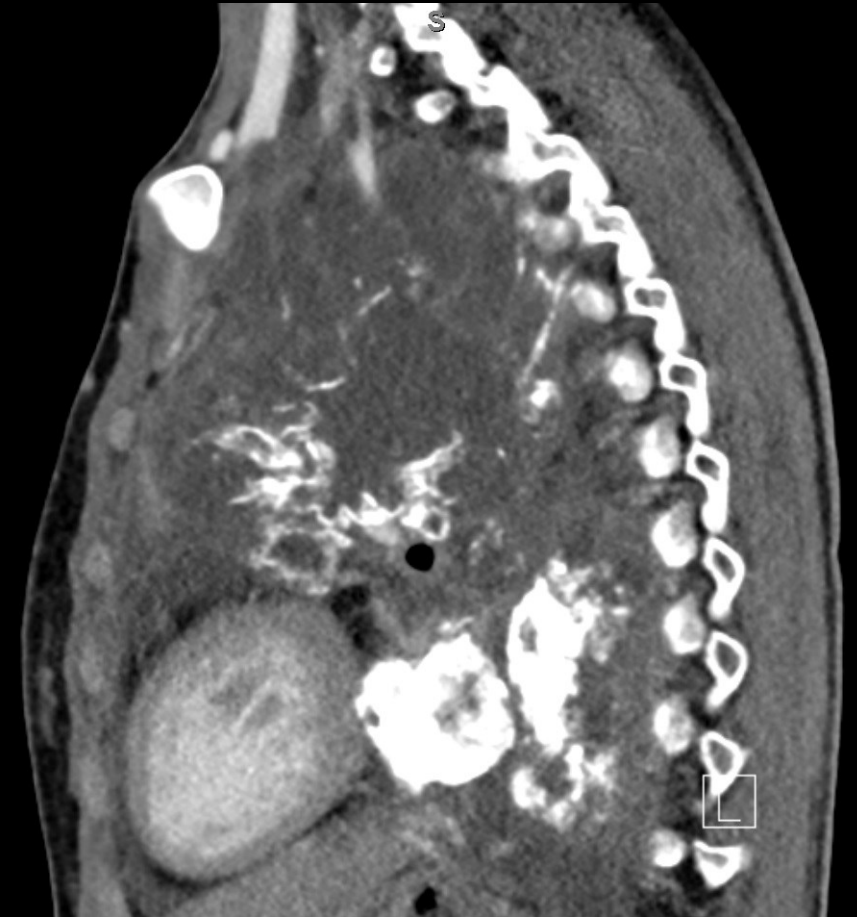
Images (unlabeled)



Findings (labeled)



Findings (unlabeled)



Findings (labeled)

Abrupt cutoff of the left IJ vein

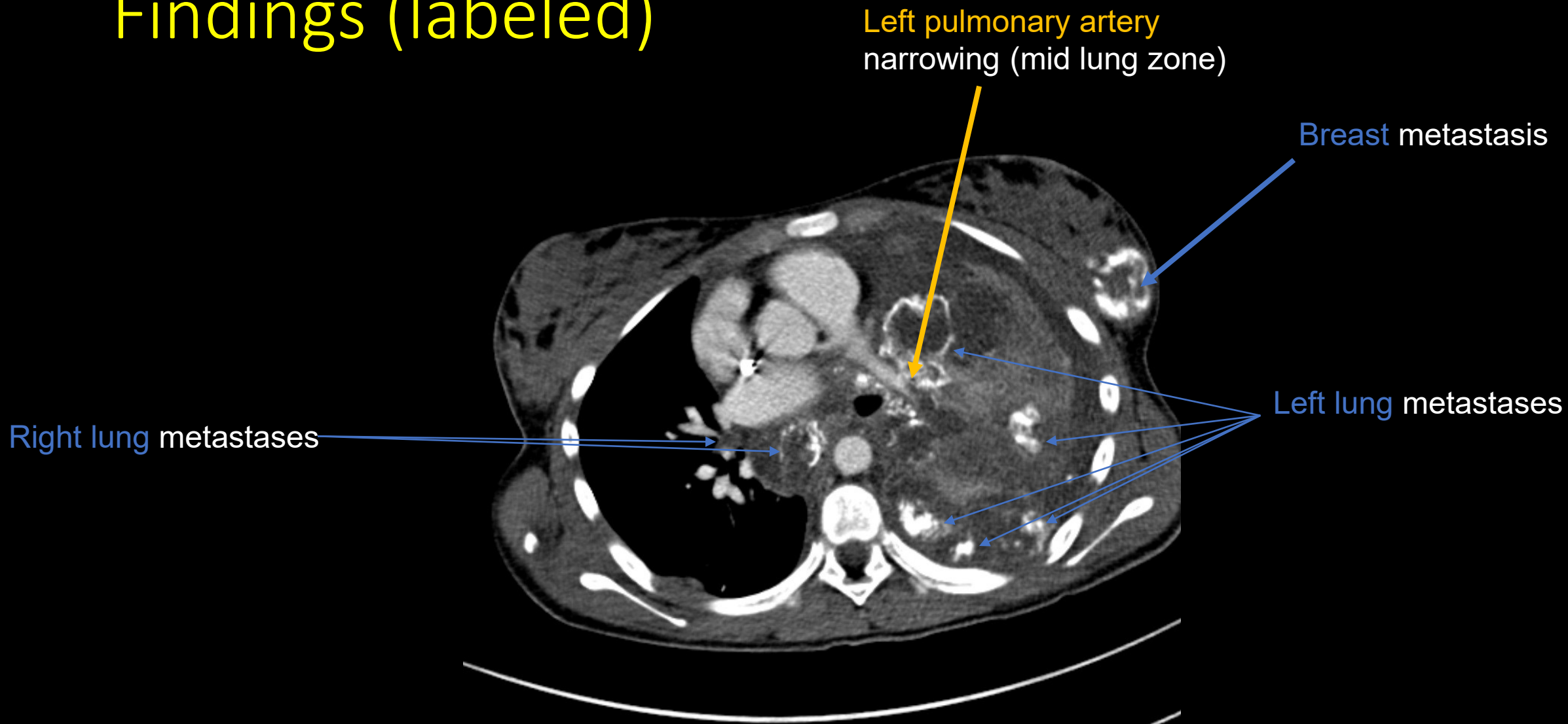
Abrupt cutoff of the left IJ vein



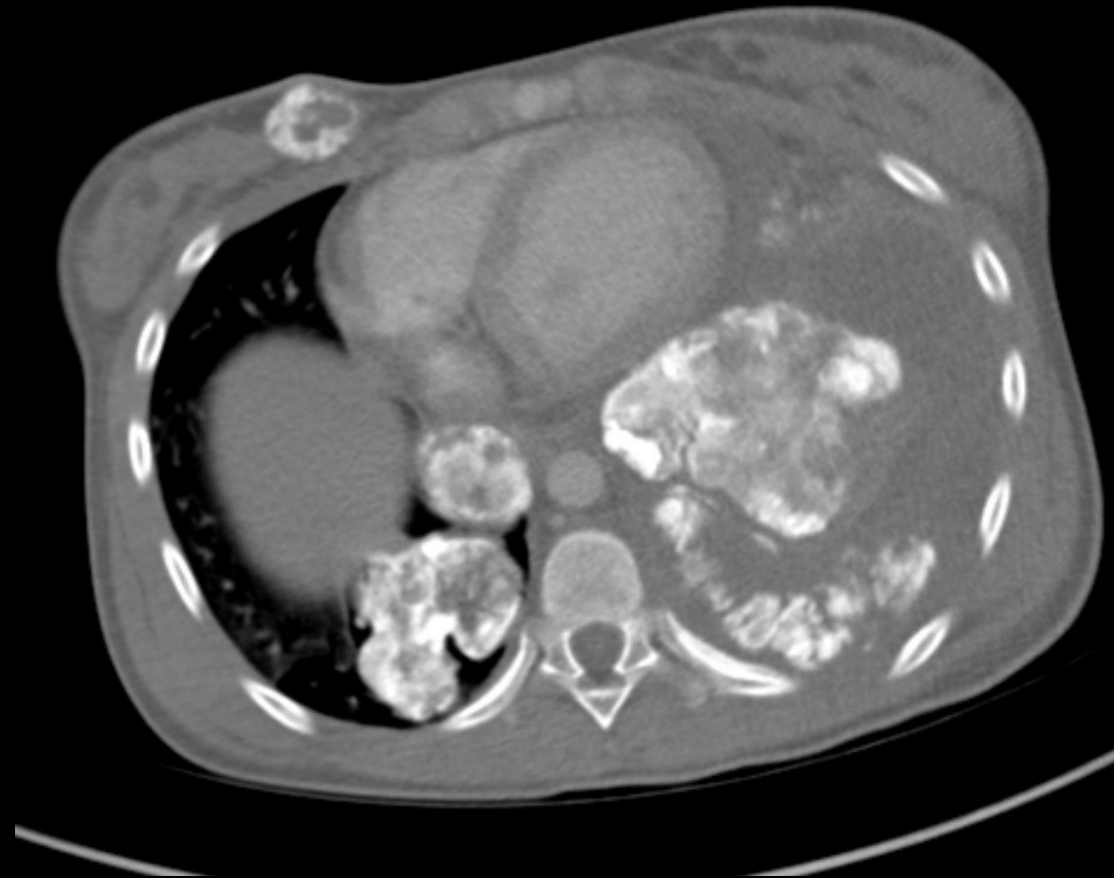
Findings (unlabeled)



Findings (labeled)



Findings (unlabeled)

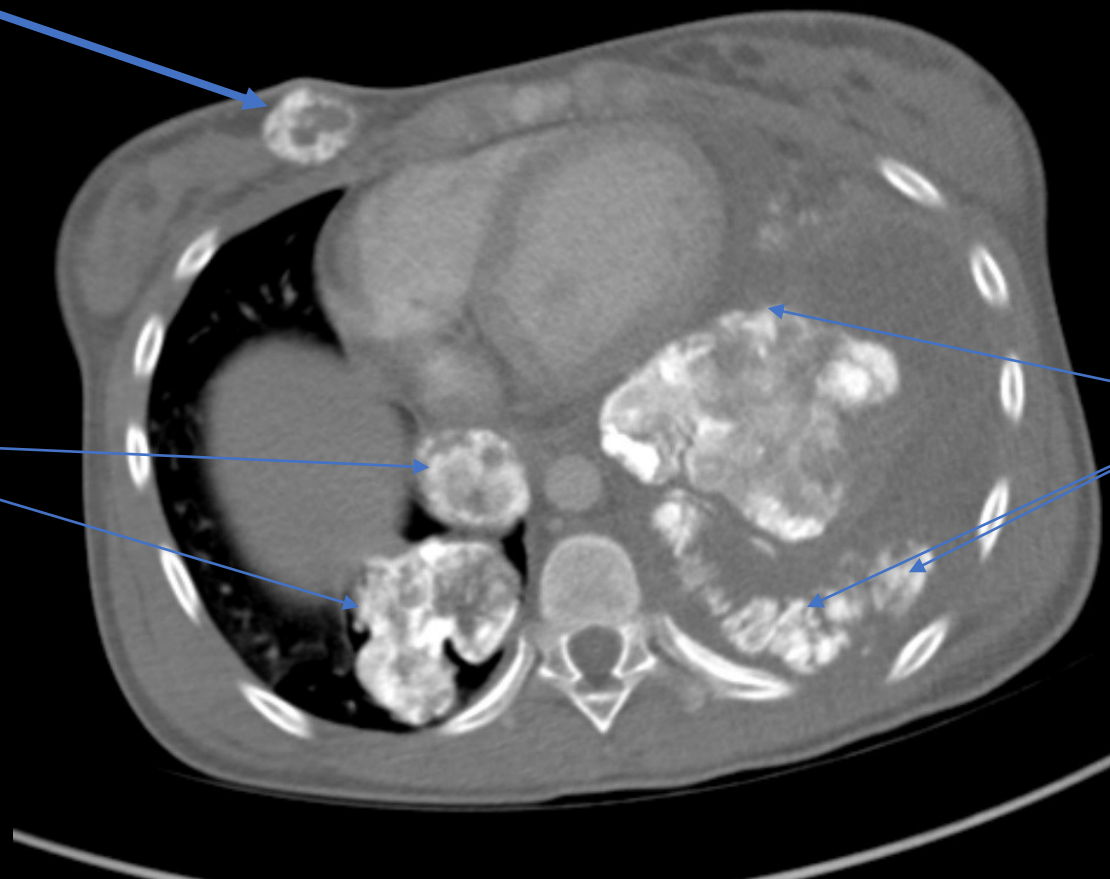


Findings (labeled)

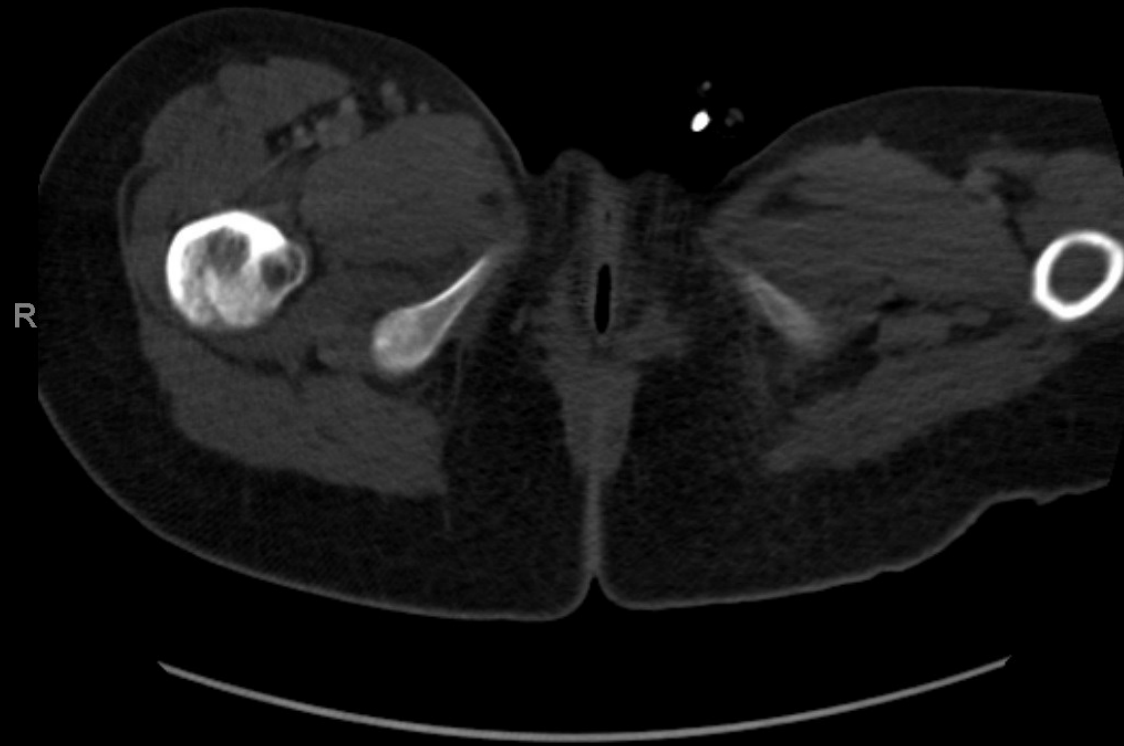
Breast metastasis

Right lung metastases

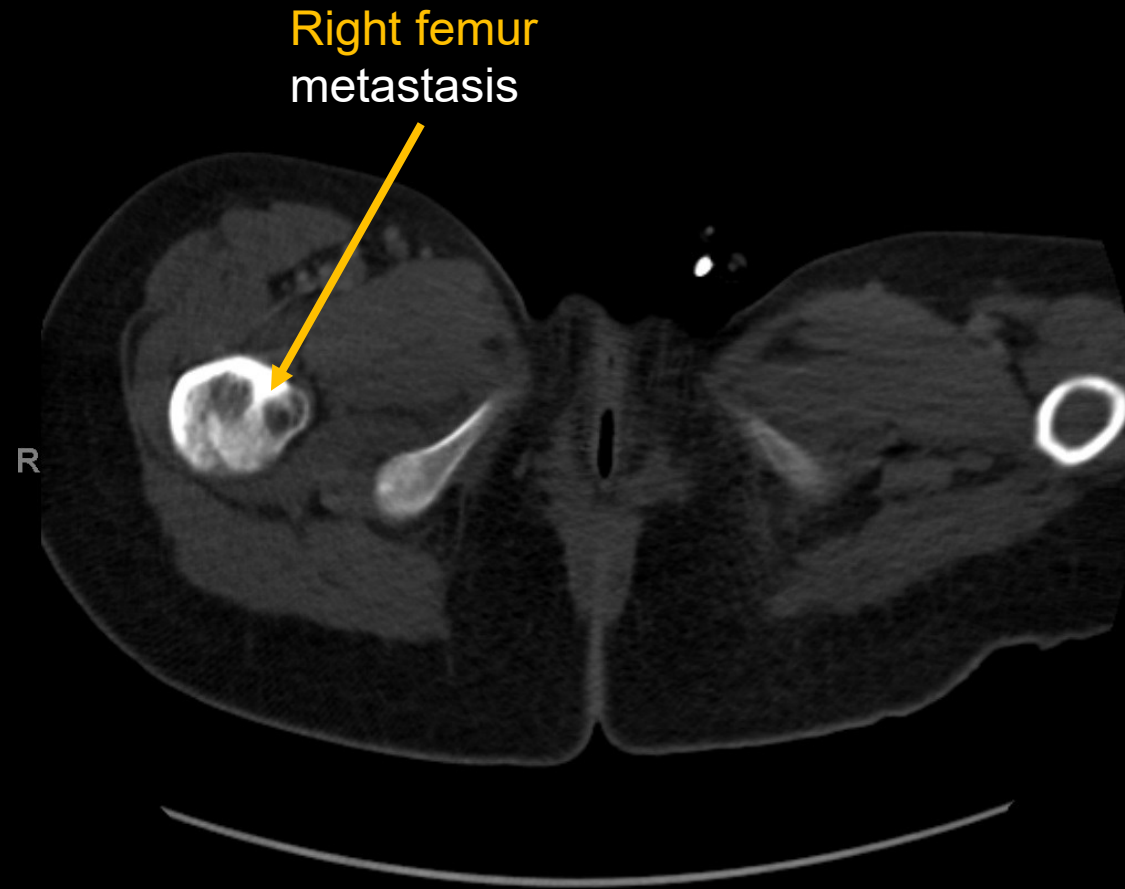
Left lung metastases



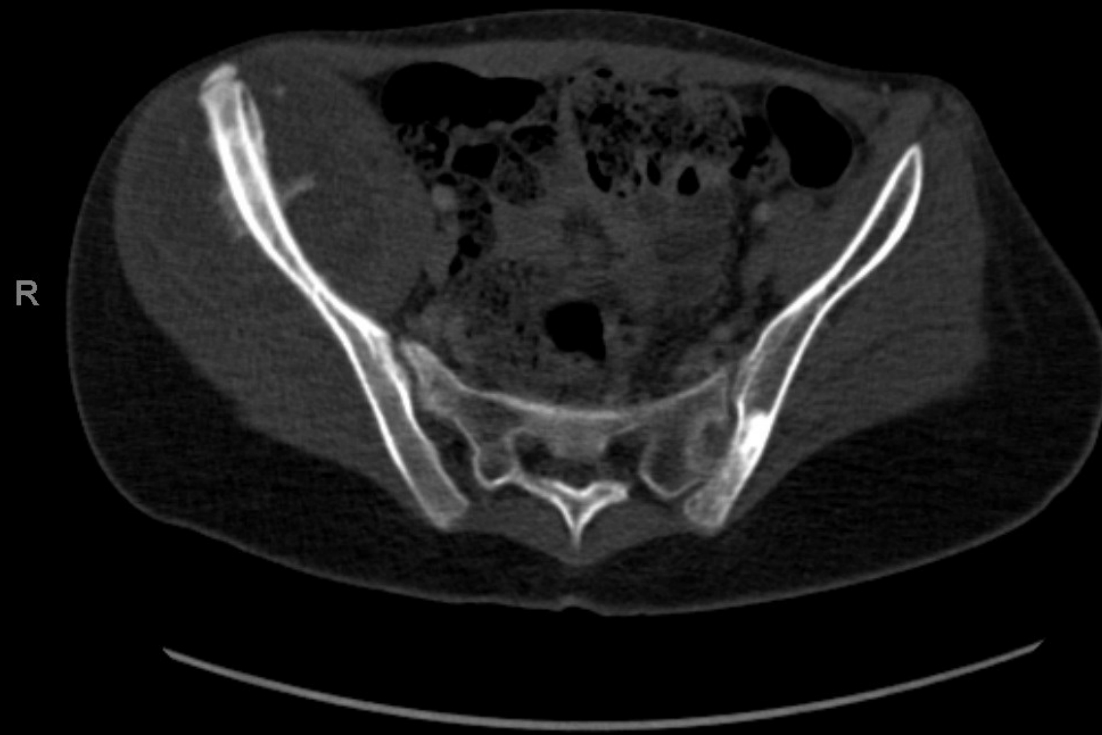
Findings (unlabeled)



Findings (labeled)

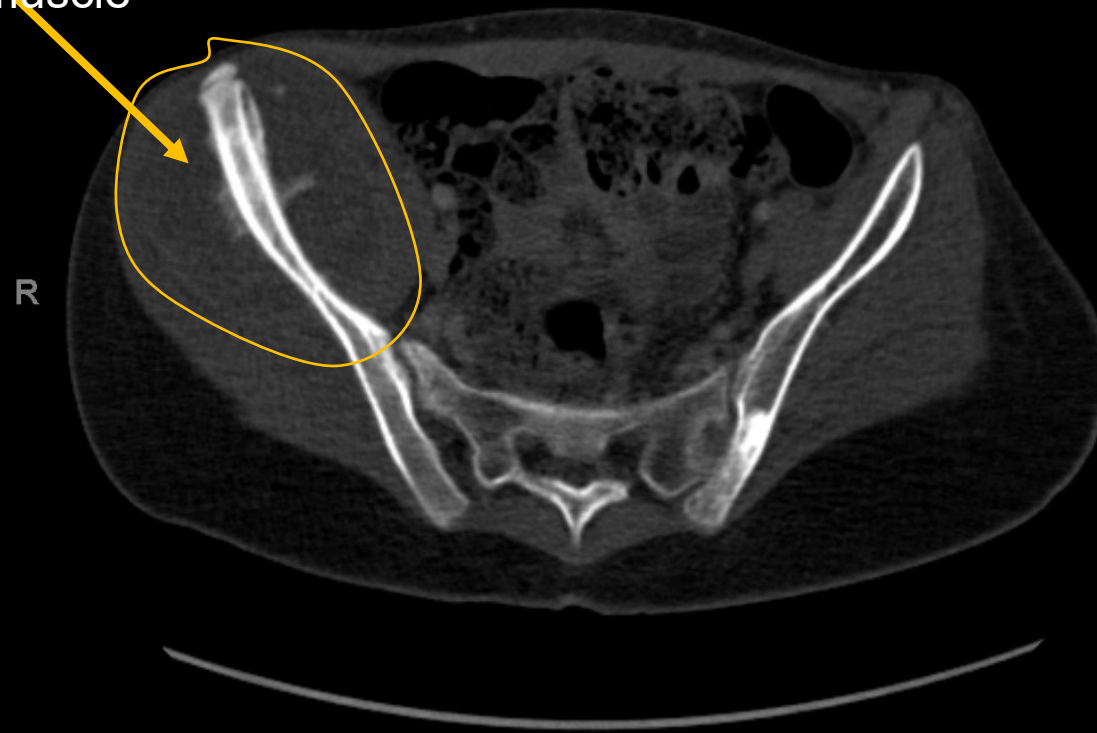


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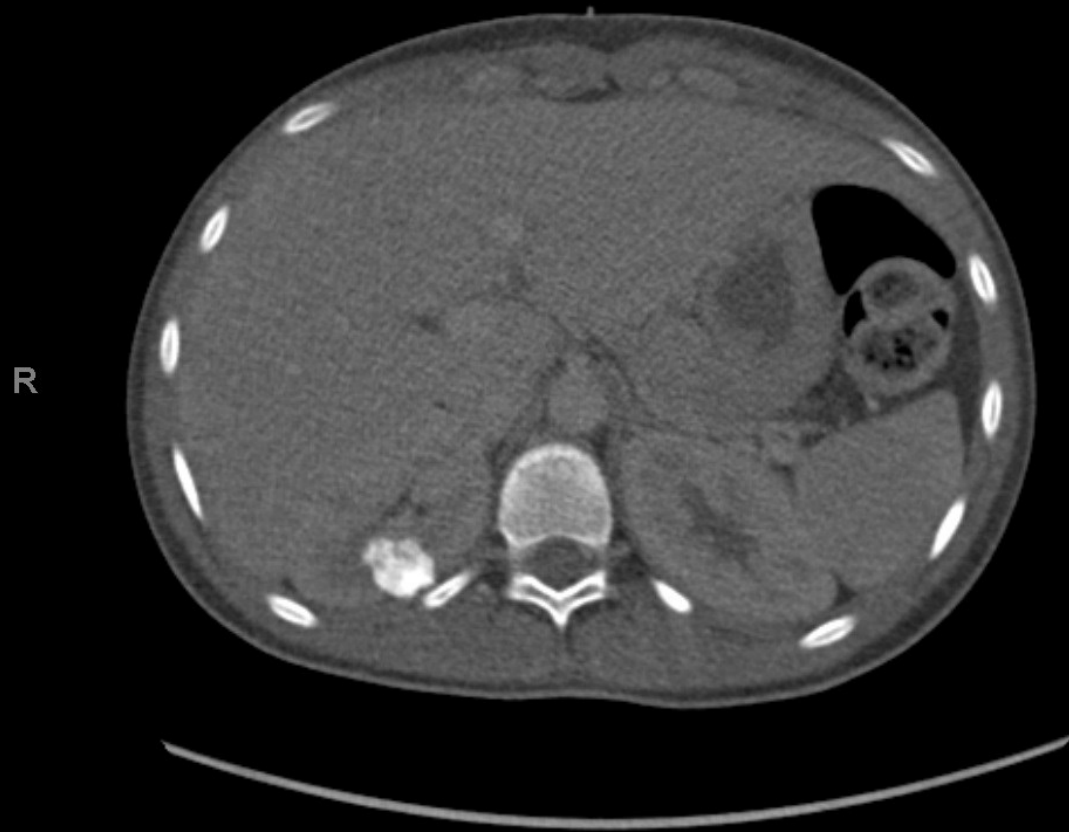


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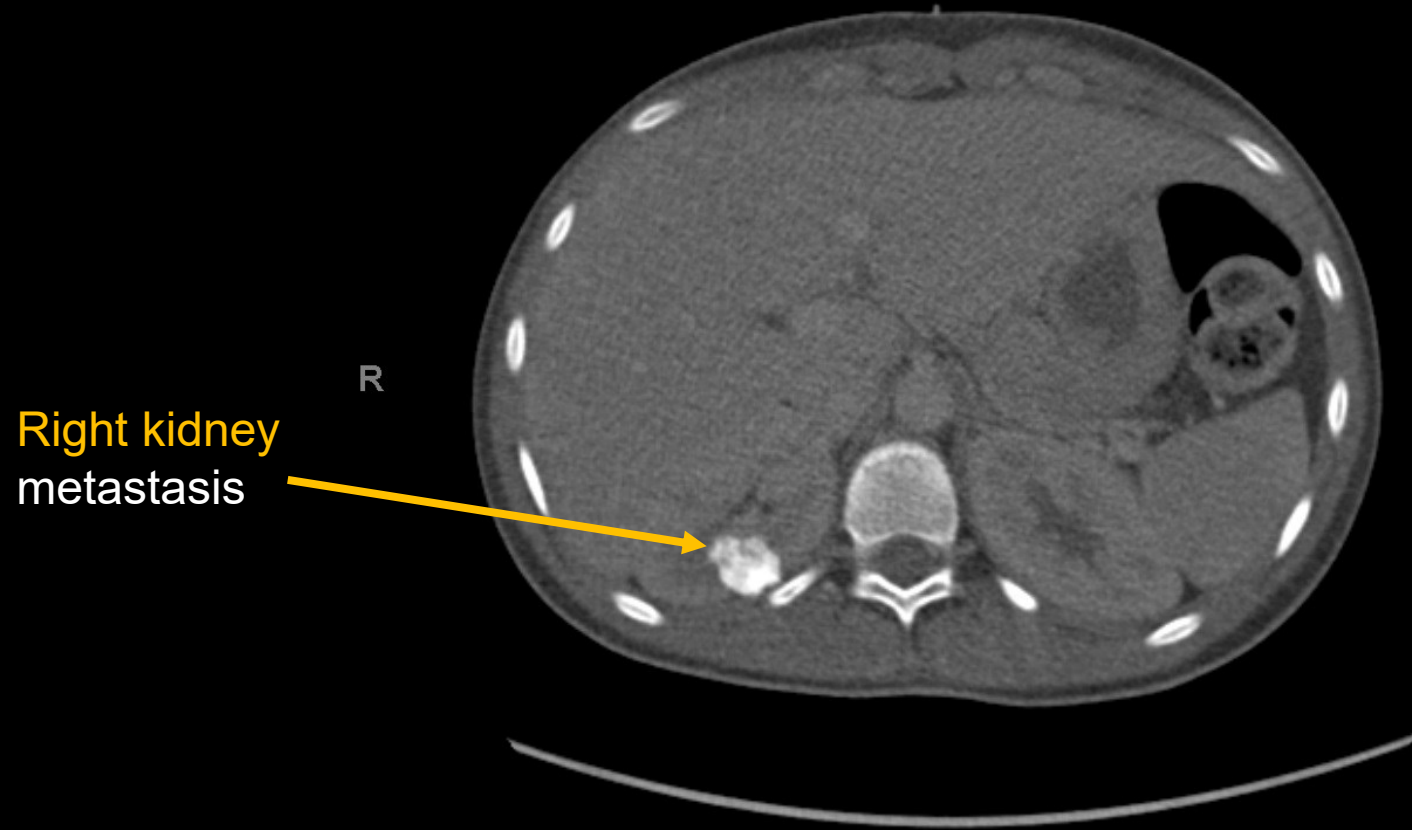
Right iliac sclerosis
with extra-osseous
soft tissue component
in adjacent muscle



Findings (unlabeled)



Findings (labeled)



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 to 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:

Kundu, Zile Singh. "Classification, imaging, biopsy and staging of osteosarcoma." *Indian journal of orthopaedics* 48 (2014): 238-246.

Mirabello, Lisa, Rebecca J. Troisi, and Sharon A. Savage. "Osteosarcoma incidence and survival rates from 1973 to 2004: data from the Surveillance, Epidemiology, and End Results Program." *Cancer: Interdisciplinary International Journal of the American Cancer Society* 115.7 (2009): 1531-1543

Vyas, Sameer, et al. "Bilateral calcified renal metastases from osteosarcoma." *Cancer Imaging* 10.1 (2010): 124.

Geller, David S., and Richard Gorlick. "Osteosarcoma: a review of diagnosis, management, and treatment strategies." *Clin Adv Hematol Oncol* 8.10 (2010): 705-718.