

# AMSER Case of the Month

## December 2021

30 year old presents the ED with acute right thigh pain

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# Patient Presentation

- **Chief Complaint** : Acute right thigh pain
- **History of present Illness**: Patient presents following a slip and fall in the mud onto her right side.

# Patient Presentation

- **Past Medical History:** Seizure disorder, migraines, ruptured ovarian cysts.
- **Review of Systems:** Reports indolent right lower extremity pain for the past 3 years and walks with a limp.
- **Physical Exam:**
  - Swelling and slight deformity to distal femur/knee
  - Warm, well perfused
  - Radial/PT/DP pulses 2+
  - Lower extremity compartments are soft
  - Sensations intact throughout, 5/5 strength in all extremities
  - Able to dorsiflex and plantarflex right ankle
  - No abrasions, bleeding or bruising

# Pertinent Labs

- **Elevated**
  - WBC – 13.36 (ref. 4.4-11.3 k/mcL)
  - ALP – 115 (ref. 35-104 U/L)
  - LDH – 320 (ref. 110-216 U/L)
  - ESR – 37 (ref. <24 mm/hr)

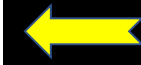
What Imaging Should We Order?

# Select the applicable ACR Appropriateness Criteria

**Variant 1:** Adult or child greater than or equal to 5 years of age. Chronic knee pain. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
Radiography knee	Usually Appropriate	☢
Image-guided aspiration knee	Usually Not Appropriate	Varies
CT arthrography knee	Usually Not Appropriate	☢
CT knee with IV contrast	Usually Not Appropriate	☢
CT knee without and with IV contrast	Usually Not Appropriate	☢
CT knee without IV contrast	Usually Not Appropriate	☢
MR arthrography knee	Usually Not Appropriate	○
MRI knee without and with IV contrast	Usually Not Appropriate	○
MRI knee without IV contrast	Usually Not Appropriate	○
Bone scan knee	Usually Not Appropriate	☢☢☢
US knee	Usually Not Appropriate	○
Radiography hip ipsilateral	Usually Not Appropriate	☢☢☢

This imaging modality was ordered by the ER physician



# X-rays on ED Admission



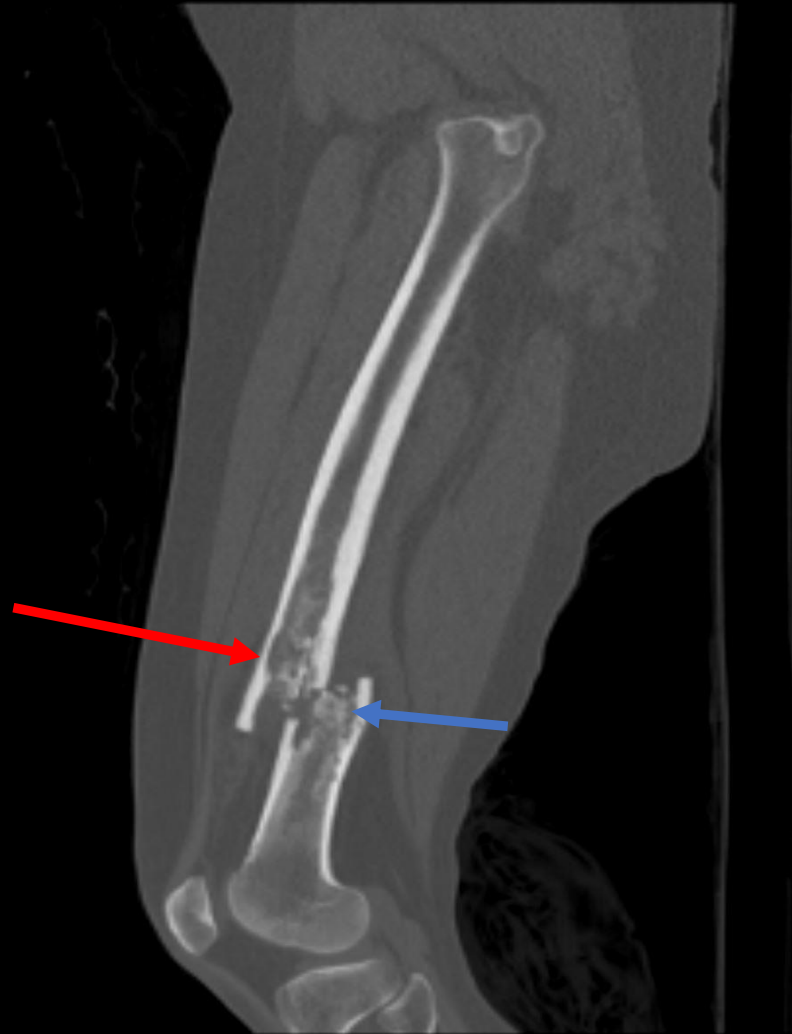
# X-rays on ED Admission



- Acute fracture in the distal femur
- Mild angulation and displacement
- Ill-defined sclerosis and cortical thickening in the area of the fracture



# CT Performed Upon Hospital Admission



**Pathologic fracture** of the distal femoral diaphysis due to underlying destructive lesion

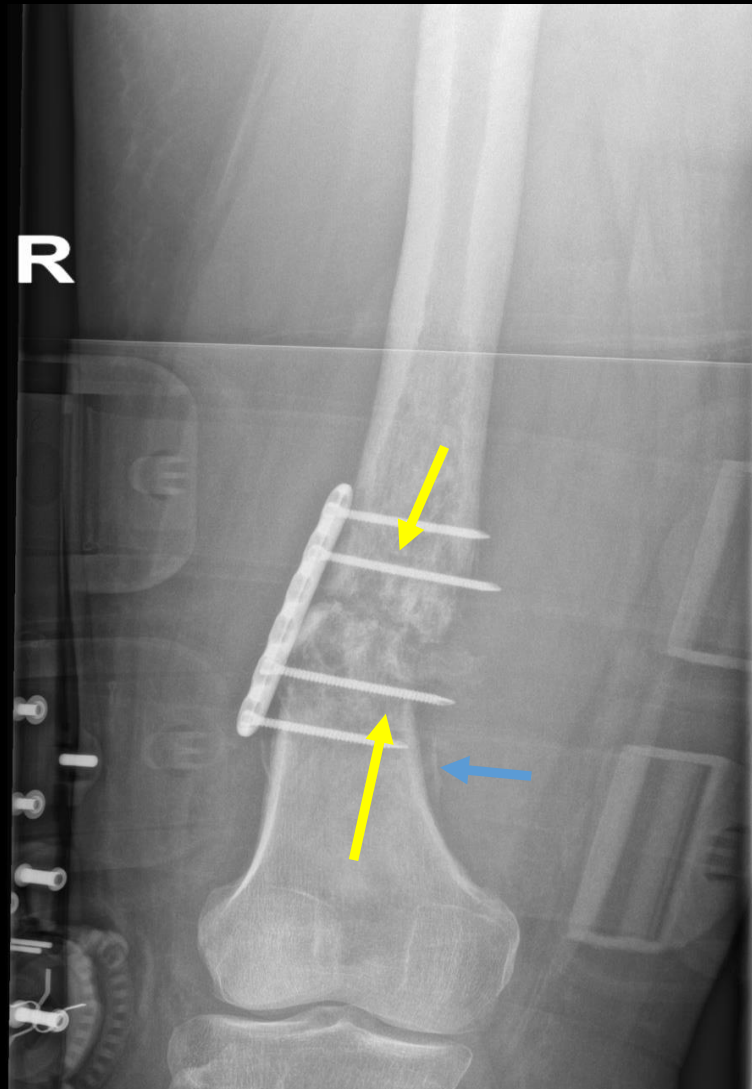
CT demonstrates medullary osteoid mineralization (Blue arrow) and endosteal scalloping (red arrow)

# Fracture fixation was performed

However, the patient continues to experience significant pain.

There is an internal fixation of the distal diaphysis fracture with lateral plate and screws.

Follow-up radiograph 1 month after internal fixation shows poor fracture healing.



There is no significant bridging callus formation. There is thin periosteal reaction around the fracture line (blue arrow).

There is lucency around the screws consistent with loosening (yellow arrow).

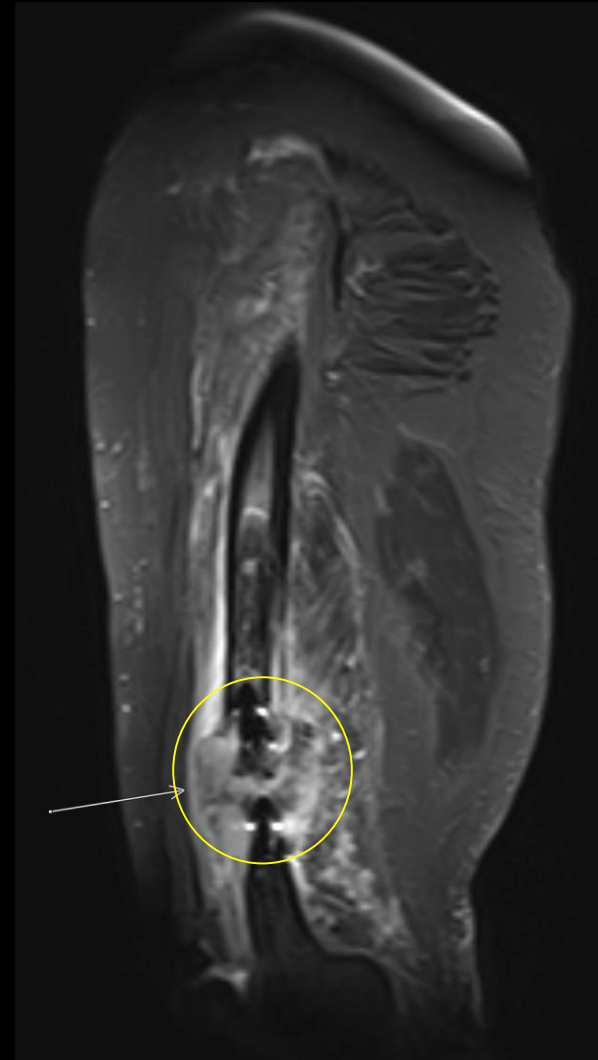
The distal femoral lesion has a moth eaten appearance.

# MRI of the Right Femur



T1 weighted images demonstrate abnormal T1 hypointense marrow signal from the level of mid to distal diaphysis.

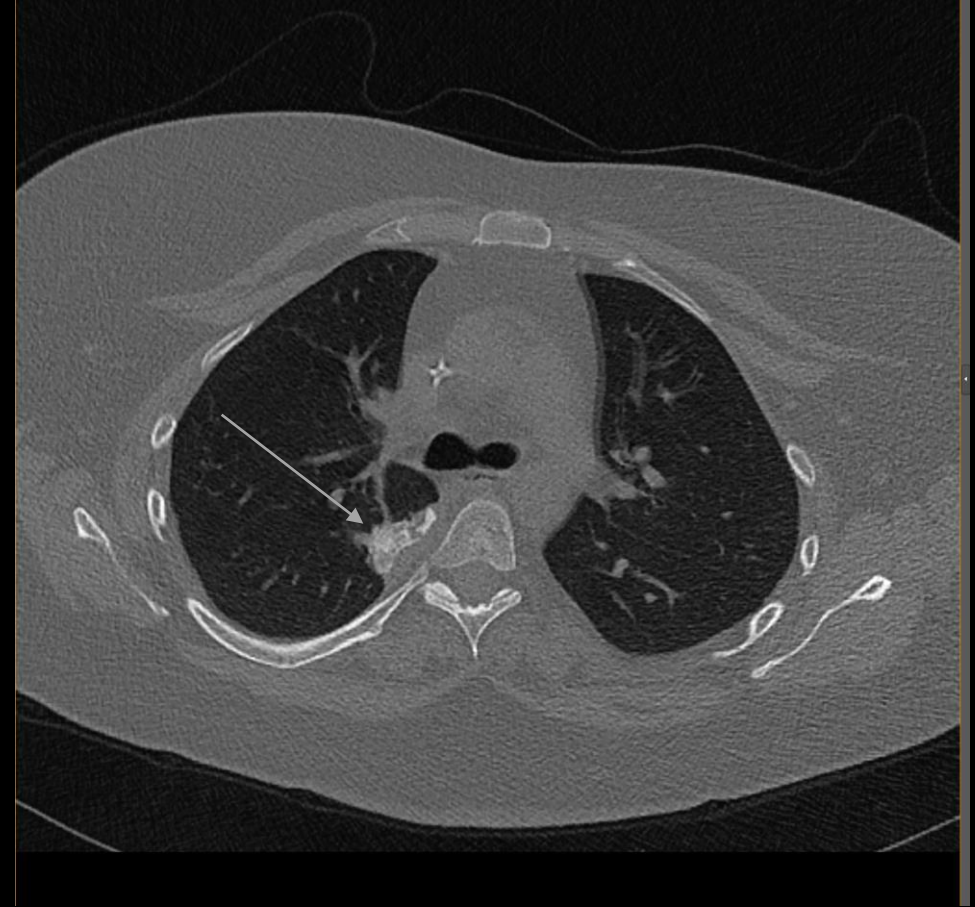
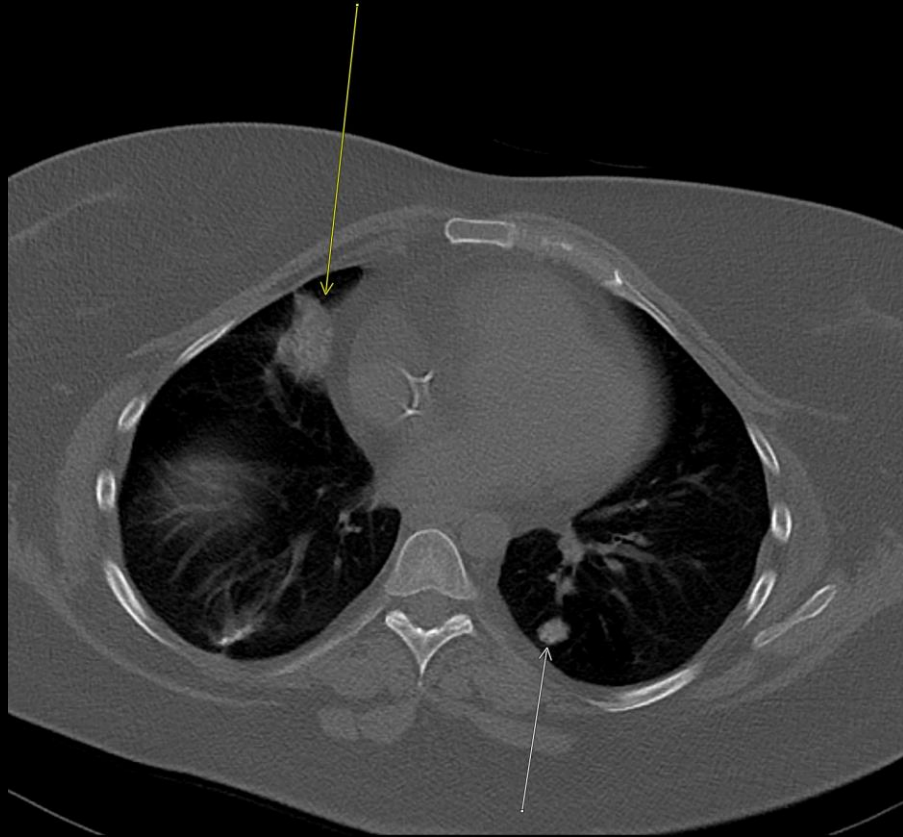
T1 weighted Sagittal Image



T2 weighted images demonstrate a rounded T2 isointense mass in the area of the fracture.

T2 weighted Fat suppressed Sagittal Image

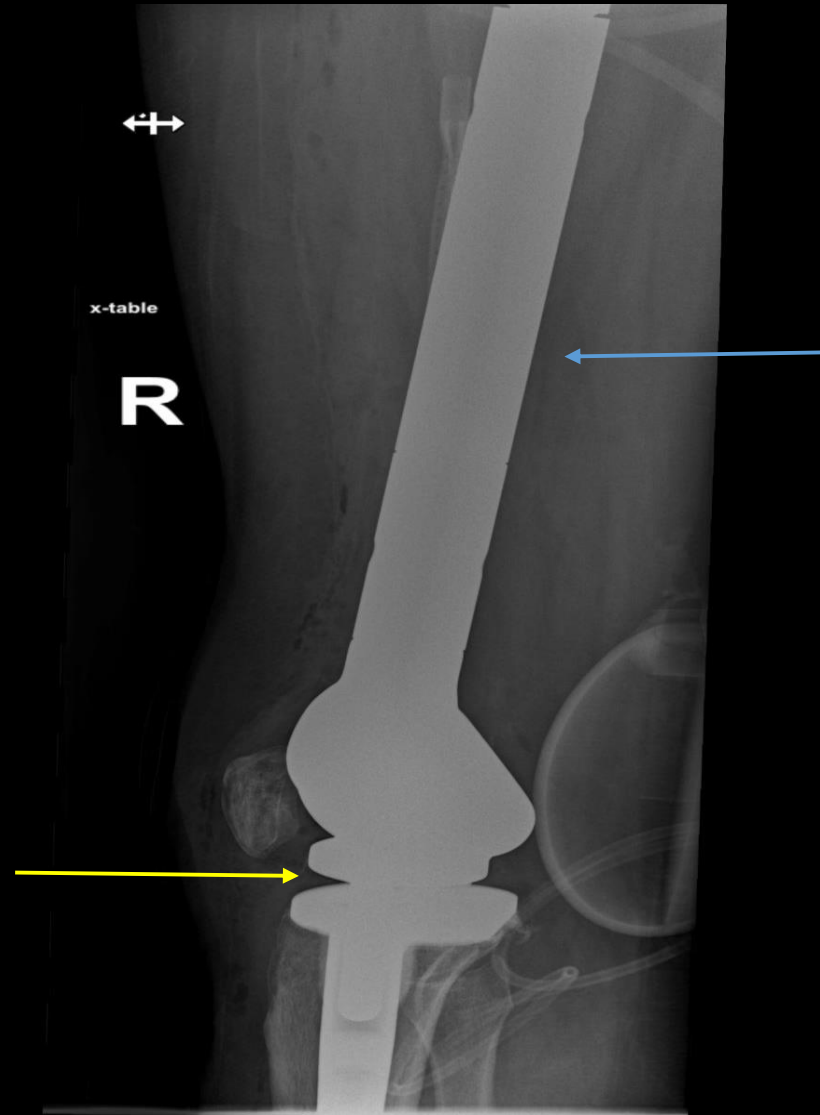
# CT chest Imaging findings:



Multiple calcified nodules bilaterally consistent with metastasis

# Treatment - Limb resection

The patient underwent right distal femur resection with distal femur prosthesis (blue arrow) and right knee arthroplasty (yellow arrow)



## Differential Dx:

Osteosarcoma  
Ewing's sarcoma  
Osteoid osteoma  
Osseous metastasis

Final Dx:

Pathological fracture due to osteosarcoma.

# Case Discussion

- **Osteosarcoma**

- Osteosarcoma is a malignant tumor that primarily affects the long bones but can also involve other bones in the body. It has a bimodal distribution with peaks in the second decade of life and late adulthood.
- Is highly heterogeneous in its manifestation, which permits division into several subtypes according to the degree of differentiation, location within the bone, and histological variation.

- **Epidemiology:**

- Osteosarcoma is the 8<sup>th</sup> most common childhood malignancy. Accounting for 2.4% of all malignancies in pediatric patients and 20% of primary bone cancers
- Originates mostly in tubular long bones, most frequently in the metaphyseal region
  - 42% in femur, 19% in tibia, 10% in humerus, 8% skull/jaw and 8% pelvis



# Case Discussion

- **Pathophysiology**

- Primary Tumors:

- Predilection for metaphysis of knee (60%)
    - Children and adolescents account for the vast majority

- Secondary tumors

- Osteosarcoma occurring at sites of another disease process (i.e. Pagets disease or previous radiation)
    - Almost always occurs in adult population (>50)
    - Commonly occur in flat bones and pelvis

- **Histopathology:**

- Osteosarcomas are composed of sarcomatous tumor cells that produce malignant bone or osteoid
  - Tumor cells resemble osteoblasts with nuclear atypia

# Case Discussion

- **Clinical Presentation**
  - Most commonly bone pain, especially with activity
  - May or may not have reported history of traumatic MSK injury
  - Swelling, lump, decreased range of motion, local adenopathy, systemic symptoms (fevers, chills, night sweats)
  - Respiratory symptoms rare with metastatic disease.
- **Diagnostic Imaging of Primary tumor:**
  - Radiographs
  - MRI
  - CT
  - PET / Radionuclide bone scan
- **Treatment:**
  - Limb Salvage (minimum margins of 2 cm)
  - Allograft/Autograft Bone Reconstruction
  - Metallic Prosthetics
  - Amputation

# References:

- Hameed, M., & Mandelker, D. (2018). Tumor Syndromes Predisposing to Osteosarcoma. *Advances in Anatomic Pathology*, 25(4), 217–222. <https://doi.org/10.1097/pap.000000000000190>
- Klein MJ;Siegal GP. (2021). Osteosarcoma: anatomic and histologic variants. *American Journal of Clinical Pathology*, 125(4). <https://doi.org/10.1309/UC6K-QHLD-9LV2-KENN>
- Prater, S., & McKeon, B. (2021, June 4). Osteosarcoma. Retrieved July 26, 2021, from Nih.gov website: <https://www.ncbi.nlm.nih.gov/books/NBK549868/#>
- Misaghi, A., Goldin, A., Awad, M., & Kulidjian, A. A. (2018). Osteosarcoma: a comprehensive review. *SICOT-J*, 4, 12. <https://doi.org/10.1051/sicotj/2017028>
- Ottaviani, G., & Jaffe, N. (2009). The Epidemiology of Osteosarcoma. *Cancer Treatment and Research*, 3–13. [https://doi.org/10.1007/978-1-4419-0284-9\\_1](https://doi.org/10.1007/978-1-4419-0284-9_1)