# AMSER Case of the Month September 2025

## 91 y.o. male with left lower extremity pain

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AMSER

# Patient Presentation

91-Year-Old male presents to the Emergency Department with left hip pain

- PMHx: Prostate cancer with bone metastases, hypertension
- HPI: Presents with left lower extremity pain for 2 weeks, localized to the left hip. Reports progressive weakness and increasing difficulty with activities of daily living. Pain is exacerbated by weight-bearing. No history of recent falls or trauma. Completed fourth cycle of radiation therapy one month ago. Family reports worsening fatigue and weakness following previous treatment.
- Physical Exam: Normal lower extremity physical exam
- ROS: negative for fever, chills, upper respiratory symptoms, chest pain, shortness of breath, abdominal pain, urinary or bowel incontinence or retention
- Medications: calcium citrate, Vit D, denosumab, enzalutamide, gabapentin, leuprolide, and losartan

# Pertinent Labs

- None

# What Imaging Should We Order?

# ACR Appropriateness Criteria

**Variant 1:** **Adult. Suspect stress fracture, excluding vertebrae. Initial imaging.**

| Procedure | Appropriateness Category | Relative Radiation Level |
|---|---|---|
| Radiography area of interest | Usually Appropriate | Varies |
| Bone scan whole body with SPECT or SPECT/CT area of interest | May Be Appropriate (Disagreement) | ☢☢☢ |
| US area of interest | Usually Not Appropriate | O |
| MRI area of interest without and with IV contrast | Usually Not Appropriate | O |
| MRI area of interest without IV contrast | Usually Not Appropriate | O |
| CT area of interest with IV contrast | Usually Not Appropriate | Varies |
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This imaging modality was ordered by the ER physician

# Findings (unlabeled)

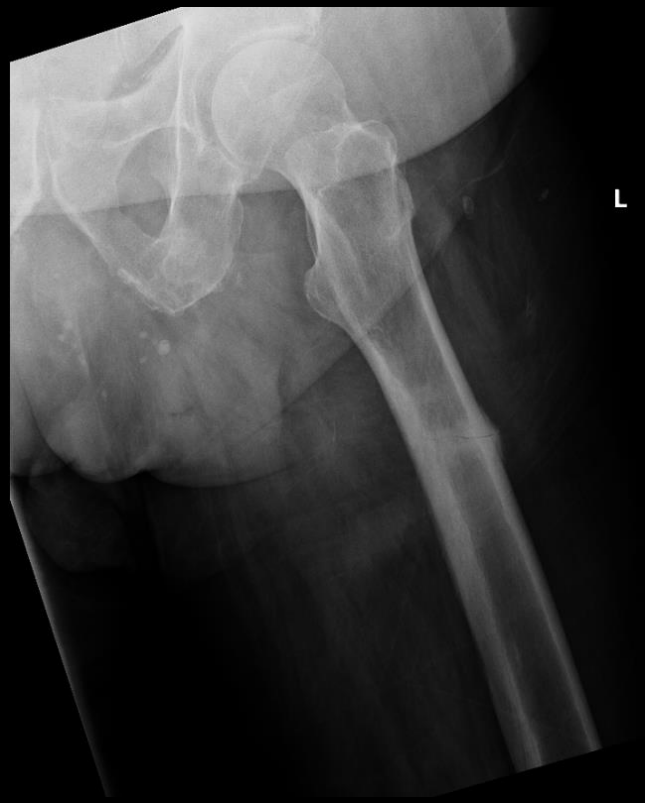
# Findings (labeled)


AP view of pelvis

Severe degenerative changes with joint space narrowing, subchondral sclerosis and osteophyte formation

Otherwise, no acute findings

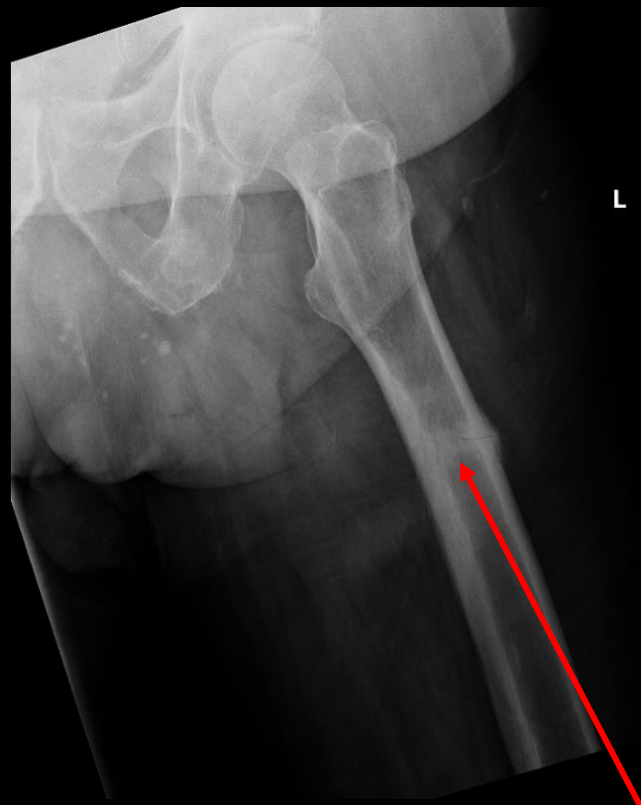
# Findings (unlabeled)




# Findings (labeled)

**Left femur**

Lateral view




AP view

Linear lucency of the left femoral proximal diaphysis with lateral periosteal/callus formation → subacute, nondisplaced fracture likely associated with denosumab use

**Right femur**

AP view


No acute findings

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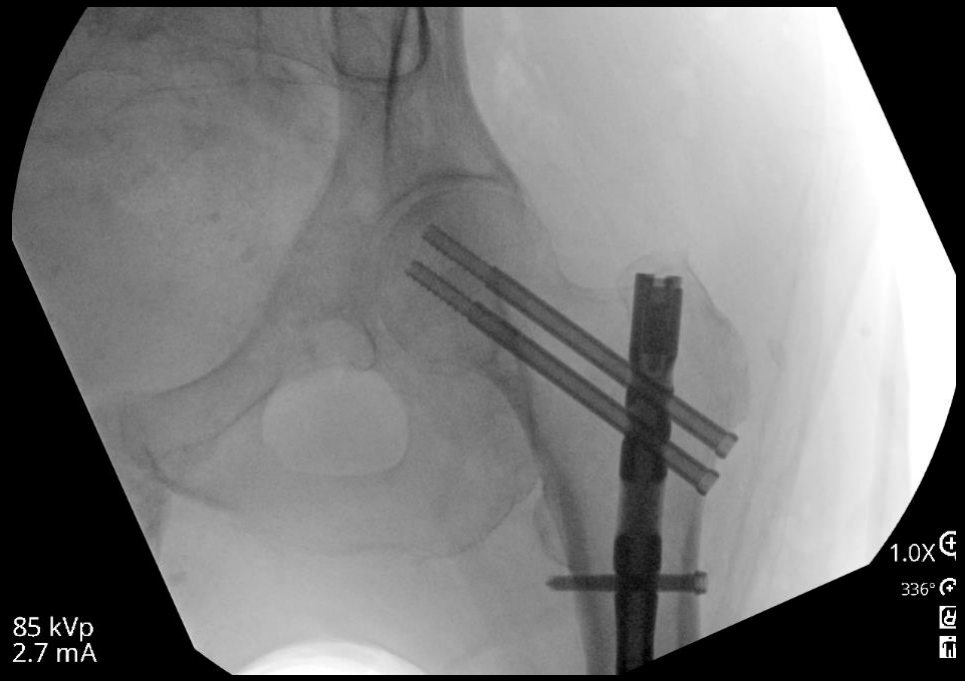
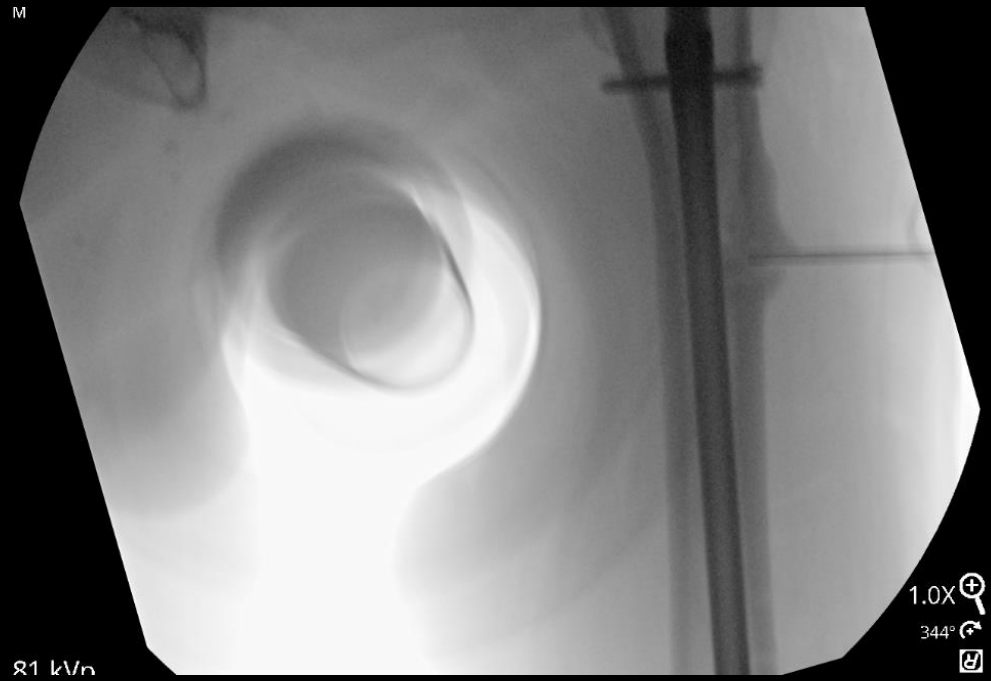
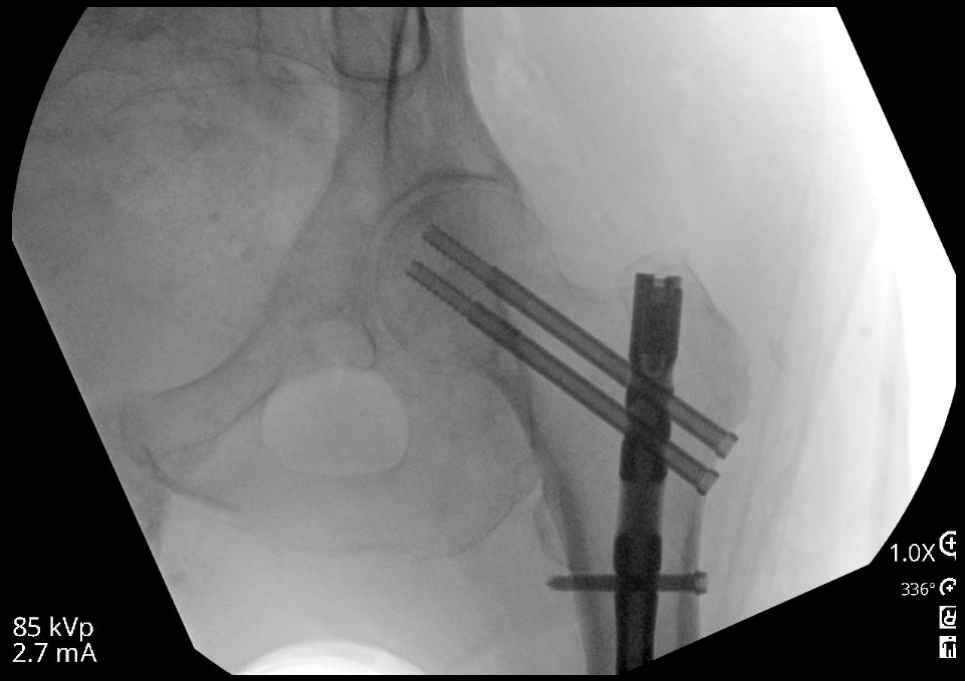
# Findings (unlabeled)

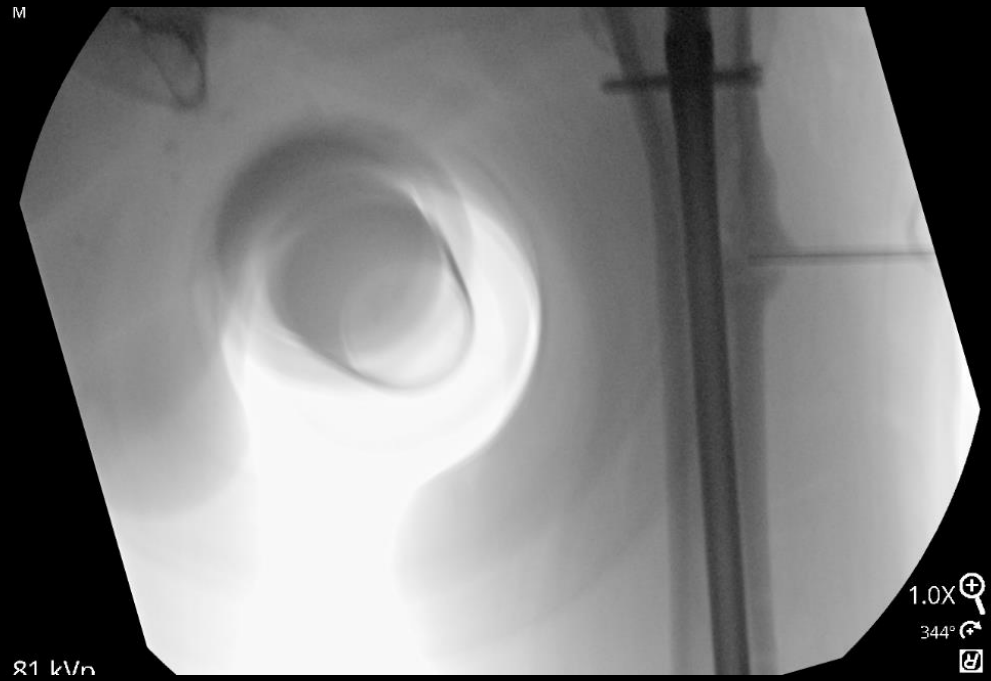


# Findings (labeled)

Post-surgical fluoroscopic images of the left femur




Internal fixation with a long cephalomedullary nail extending from the proximal femur into the diaphysis. Hardware is appropriately positioned.

# Final Dx:

Denosumab-related insufficiency fracture

# Case Discussion

- Atypical femoral fractures are a subtype of insufficiency fractures, resulting from normal stressors on abnormal bone.
  - Most commonly associated with long-term bisphosphonate use
- Denosumab is a monoclonal antibody that inhibits RANKL (Receptor Activator of Nuclear factor Kappa-B Ligand), thereby preventing osteoclast recruitment and bone resorption[1]
- Microcracks in bone are identified and repaired through a process called targeted remodeling, which relies on osteoclasts being recruited via RANKL signaling[1]

# Case Discussion

- Denosumab disrupts target remodeling, allowing microcracks to coalesce into stress fractures – similar to the mechanism proposed for bisphosphonates[2]
- Unlike bisphosphonates, denosumab's effects are reversible between doses, allowing partial recovery of bone remodeling and a lower risk of atypical fractures with intermittent exposure[2]
- Denosumab carries a similar risk of atypical femoral fractures as bisphosphonates via RANKL inhibition, but its fracture prevention benefits outweigh risk in appropriately selected patients[2]
  - May be indicated in osteoporosis, cancer-related bone loss, bone metastases at high fracture risk, etc.

# Case Discussion

- Imaging of the contralateral femur is recommended, as 20–64% of patients with atypical femoral fractures show similar findings bilaterally[3]
- Proximal femoral diaphyseal fractures occurring after low-energy trauma should raise concern for long-term bisphosphonate or denosumab use[4]

# References:


[1] Aspenberg P. Denosumab and atypical femoral fractures. *Acta Orthop.* 2014;85(1):1. doi:10.3109/17453674.2013.859423. PMID: 24171676. PMCID: PMC3940980.

[2] Kwek EB, Koh JS, Howe TS. More on atypical fractures of the femoral diaphysis. *N Engl J Med*. 2008;359(3):316–317; author reply 317–318.

[3] Lenart BA, Lorich DG, Lane JM. Atypical fractures of the femoral diaphysis in postmenopausal women taking alendronate. *N Engl J Med.* 2008;358(12):1304–1306.

[4] Shane E, Burr D, Abrahamsen B, et al. Atypical subtrochanteric and diaphyseal femoral fractures: second report of a task force of the American Society for Bone and Mineral Research. *AJR*. 2010;196(1):W52–W57. doi:10.2214/AJR.09.3383