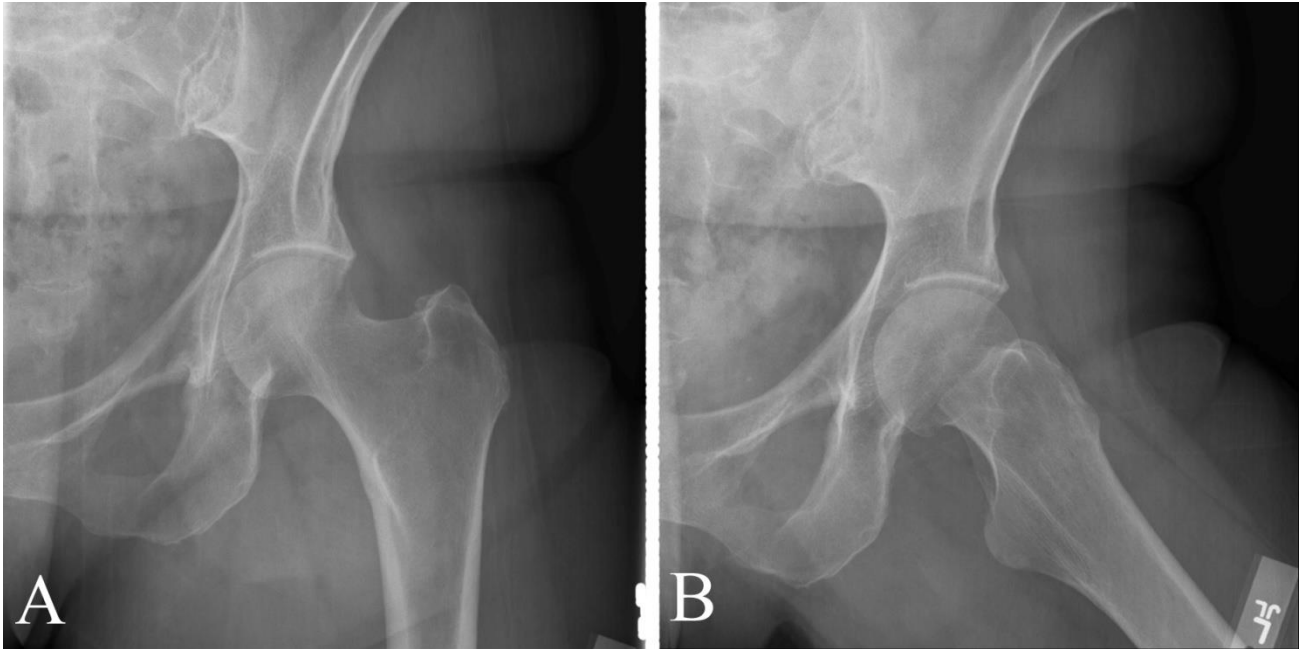


## CLINICAL PRESENTATION AND RADIOLOGY QUIZ QUESTION

A 67 year old woman with chronic osteoporosis being treated with Fosamax presents with hip pain. She has had the pain for approximately two years. The patient is an avid exerciser and notes that the pain is exacerbated by walking and running. A plain film of the hip was obtained:



Which of the following imaging studies would be *least* helpful in further evaluation of this patient?

- (a) magnetic resonance (MR) imaging of the hip
- (b) plain film examinations of the femur and knee
- (c) nuclear medicine bone scan
- (d) magnetic resonance (MR) imaging of the cervical spine

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| <b>RADIOLOGY QUIZ QUESTION, ANSWER, AND EXPLANATION</b> |
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A 67 year old woman with chronic osteoporosis being treated with Fosamax presents with hip pain. She has had the pain for approximately two years. The patient is an avid exerciser and notes that the pain is exacerbated by walking and running. A plain film of the hip was obtained (see figure on Page 1).

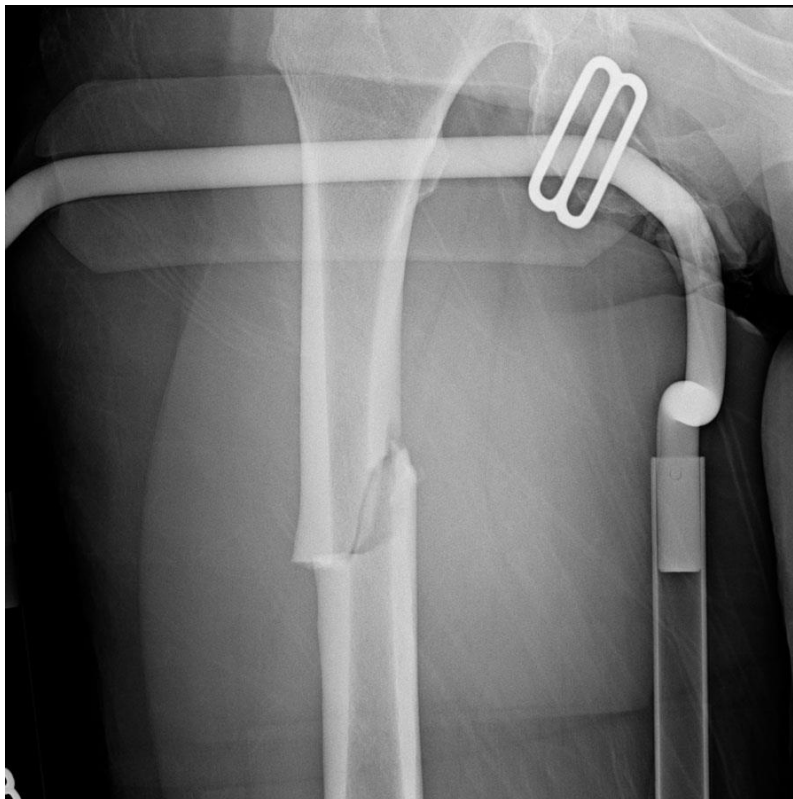
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- (a) magnetic resonance (MR) imaging of the hip
- (b) plain film examinations of the femur and knee
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- (d) magnetic resonance (MR) imaging of the cervical spine

The patient's plain film of the hip is normal. MR imaging of the hip (a) may be helpful to exclude avascular necrosis of the femoral head, stress fracture, and metastatic deposit and to evaluate the articular cartilage. Plain film examinations of the femur and knee (b) may be helpful to exclude processes of the femur and knee (including degenerative changes of the knee) which may cause referred pain to the hip. A nuclear medicine bone scan (c) may be helpful in excluding areas of increased radiotracer indicating increased bone turnover such as might be seen in metastatic deposit or stress fracture. MR imaging of the *lumbar* spine would be helpful in evaluating possible lumbar herniated discs or other causes of L2 or L3 nerve root compression/irritation which may cause perceived "hip" pain. MR imaging of the *cervical* spine (d), however, would be less helpful than any of the other listed studies and is therefore the correct answer to the question.

## IMAGING STUDY AND QUESTIONS

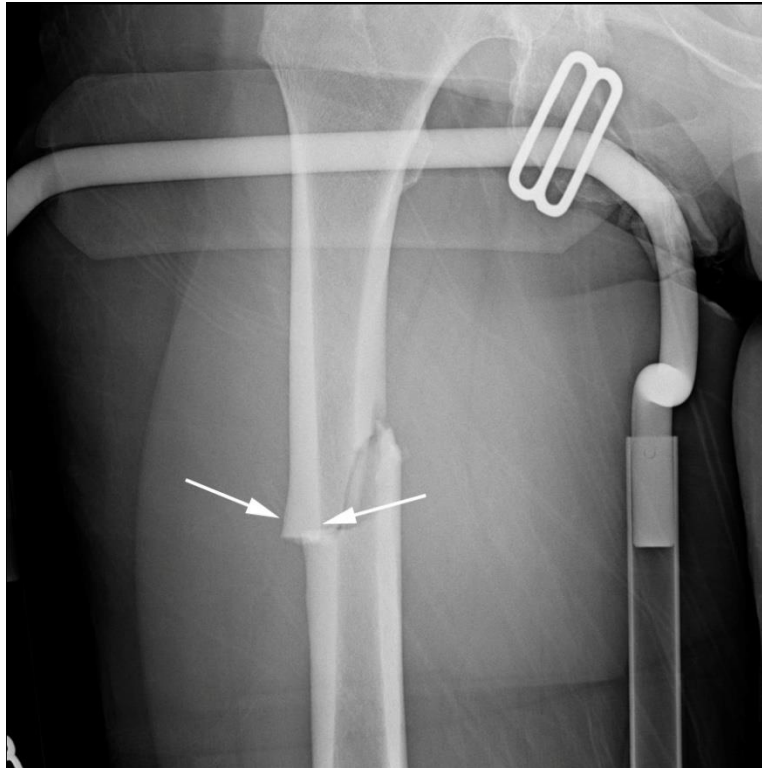
The patient was referred to a sports medicine physician who diagnosed bursitis and recommended a bursal injection which the patient chose not to have done because of a dislike of injections. She was subsequently referred to a rheumatologist who did perform a bursal injection which offered temporary relief. She underwent a lumbar spine MR which showed multilevel degenerative disc disease and an old lumbar compression fracture secondary to osteoporosis, without neural compression. The patient lost her footing one day, fell, and had immediate severe *right* thigh pain and deformity, on the side opposite the patient's chronic left hip pain. An imaging study was performed:



Imaging questions:

- 1) What type of study is shown?
- 2) Are there any abnormalities?
- 3) What is the most likely diagnosis?
- 4) What is the next step in management?

## IMAGING STUDY QUESTIONS AND ANSWER

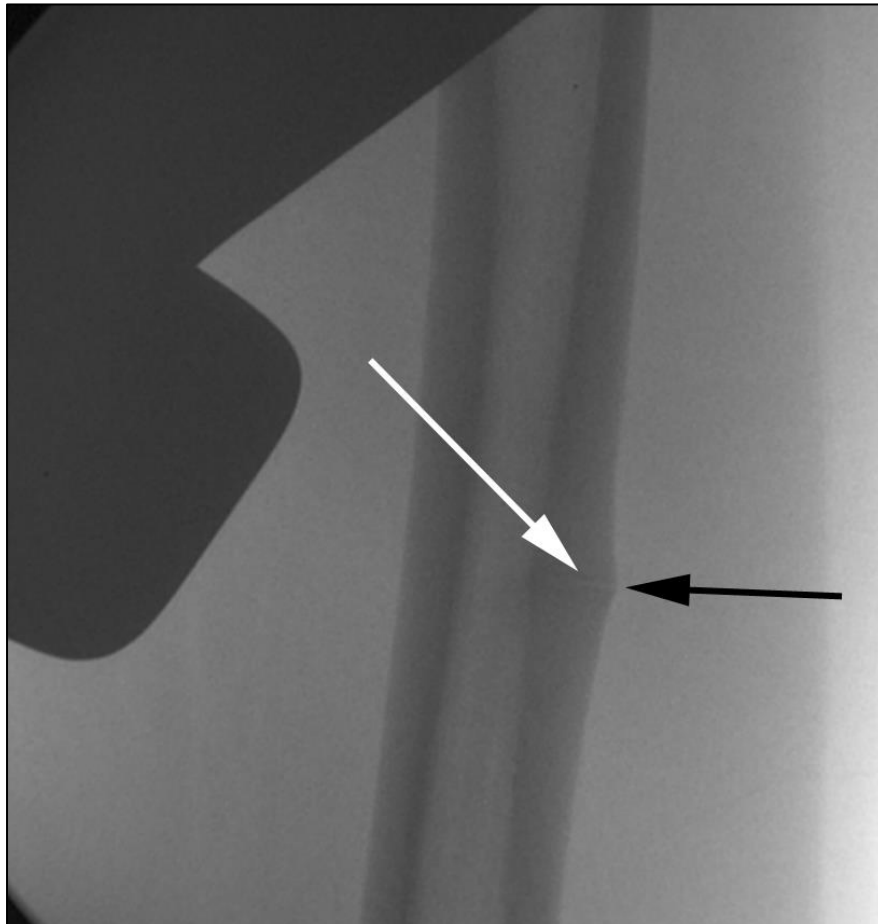


### Imaging questions:

- 1) What type of study is shown? An AP plain film examination of the right femur.
- 2) Are there any abnormalities? There is a fracture of the mid-shaft of the right femur. This is an unusual location for a femur fracture, and the fracture has an unusual course, traversing the lateral cortex in the axial plane while extending obliquely through the medial femur. In addition, the cortex at the location of the fracture is abnormally thickened (arrows), which indicates an underlying abnormality of the bone.
- 3) What is the most likely diagnosis? Femur fracture. The unusual course of the femur and thickened lateral cortex are features that suggest the patient had an underlying abnormality of the femur.
- 4) What is the next step in management? Referral to an orthopedic surgeon for fracture fixation.

## PATIENT DISPOSITION, DIAGNOSIS, AND FOLLOW-UP

The patient was referred to an orthopedic surgeon, who performed open reduction and internal fixation of the patient's right femur fracture. The (very astute!) orthopedic surgeon recognized that the pattern of the fracture was quite unusual and represented an acute complete fracture through a healing insufficiency fracture, surmised that this was secondary to the patient's Fosamax treatment, and used the C-arm fluoroscope at the time of surgery to image the patient's contralateral left femur (the side of her chronic hip pain). This demonstrated a stress fracture of the mid-shaft of the left femur, just below the field of view of the patient's hip examination done for evaluation of her "hip" pain (see image below). The patient underwent prophylactic internal fixation of the left femur fracture.



67 year old woman on Fosamax with chronic left "hip" pain and an acute contra-lateral right femur fracture following minimal trauma. A digital image obtained at the time of fracture fixation of the contra-lateral femur demonstrates a healing fracture of the left femur, with fracture lucency (white arrow) and cortical thickening (black arrow).

## SUMMARY

For additional quiz cases and information, please visit [www.symptombasedradiology.com](http://www.symptombasedradiology.com)

**Presenting symptoms:** The patient had persistent hip pain worse with motion. The key to making the diagnosis in this case was that the patient was being treated with Fosamax.

**Imaging work-up:** The initial imaging study of choice for hip pain is a plain film evaluation of the hip. Additional imaging needs to be based on the duration and severity of pain, response of the patient's pain to measures taken on the basis of any provisional diagnosis, and any additional symptoms (pain in other locations of the body especially the back or elsewhere in the lower extremities). The patient underwent an MR examination of the back which showed degenerative disc disease but no obvious nerve root compression to account for "hip" pain. A hip MR was *not* done and may well have not included the stress fracture in the field of view anyway (although it would be reasonable to perform the hip MR in order to exclude avascular necrosis of the femoral head). Plain films of the femur, or a bone scan, would have demonstrated the stress fracture, but were not obtained.

**Establishing the diagnosis:** Fractures of the femur associated with bisphosphonate use are a relatively recently described entity. These fractures may be secondary to suppressed bone turnover and tend to occur along the lateral femur, from just below the trochanter to the mid-shaft region. They usually have a transverse (or short oblique) orientation, and may be associated with prodromal pain.

**Take-home message:** The initial study of choice for virtually all patients with "hip" pain is a plain film evaluation of the hip. In patients who are on Fosamax, plain film evaluation should include images of the femur, as well, because the patient's "hip" pain may be coming from a stress fracture of the femur which is outside the field of view on the hip plain films. If both of these studies are negative, then the patient should probably have a nuclear medicine bone scan to evaluate for a radiographically occult stress fracture or stress response.

#### FURTHER READING

Renfrew DL. Polyarthritis, musculoskeletal masses, and osteoporosis. Chapter 13 in *Symptom Based Radiology*, Symptom Based Radiology Publishing, Sturgeon Bay, WI, 2010, available for no charge at [www.symptombasedradiology.com](http://www.symptombasedradiology.com).

Sellmeyer DE, "Atypical Fractures as a Potential Complication of Long-term Bisphosphonate Therapy," *JAMA*, 2010, 304(13):1480-4.

Shane E, Burr D, Ebeling PR, et al, "Atypical Subtrochanteric and Diaphyseal Femoral Fractures: Report of a Task Force of the American Society for Bone and Mineral Research," *J Bone Miner Res*, 2010, 25(11):2267-94.