

CLINICAL PRESENTATION AND RADIOLOGY QUIZ QUESTION

An 86 year old man presents with the acute onset of post-traumatic hip pain. The patient tripped on a mat in a drug store and fell onto his right hip. He experienced immediate pain and could not get up by himself. When placed on his feet with assistance, he cannot bear weight. The patient has little pain while lying still but experiences severe pain whenever he moves his hip. His vital signs are unremarkable. He has pain along the greater trochanteric ridge with no crepitus or deformity of the hip. There is no leg shortening.

Which of the following imaging studies is the initial examination of choice for evaluation of post-traumatic hip pain?

- (a) magnetic resonance (MR) imaging of the hip
- (b) plain film examination of the hip
- (c) nuclear medicine whole body bone scan
- (d) ultrasound (US) examination of the hip

RADIOLOGY QUIZ QUESTION, ANSWER, AND EXPLANATION

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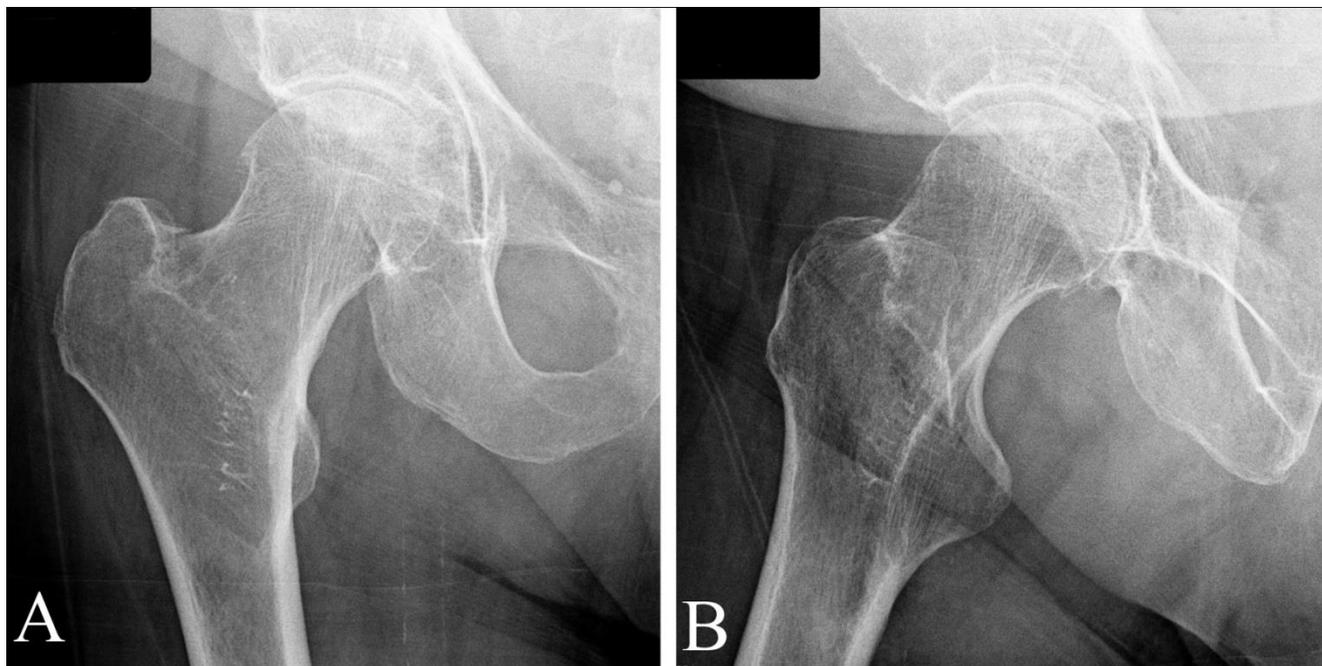
- (a) magnetic resonance (MR) imaging of the hip
- (b) plain film examination of the hip
- (c) nuclear medicine whole body bone scan
- (d) ultrasound (US) examination of the hip

The initial imaging study in almost all patients with acute hip pain following trauma is a plain film examination of the hip, and (b) is correct.

MR imaging of the hip (a) may be helpful for evaluation of the hip and may allow diagnosis of a variety of traumatic and non-traumatic hip abnormalities (including radiographically occult fractures, tendon injuries, avascular necrosis, arthritis, and bone and soft tissue tumors). However, MR of the hip is typically performed only *after* plain film examination of the hip, and (a) is incorrect. 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 radiographically occult post-traumatic fracture, stress fracture, or complex regional pain syndrome. However, as in the case with MR imaging, nuclear medicine is typically performed only *after* plain film examination of the hip, and (b) is incorrect. US examination of the hip (d) may be helpful to demonstrate hip joint effusion fluid (especially in pediatric patients), but is not widely used in the setting of acute trauma with suspected fracture or fracture/dislocations, and (d) is incorrect.

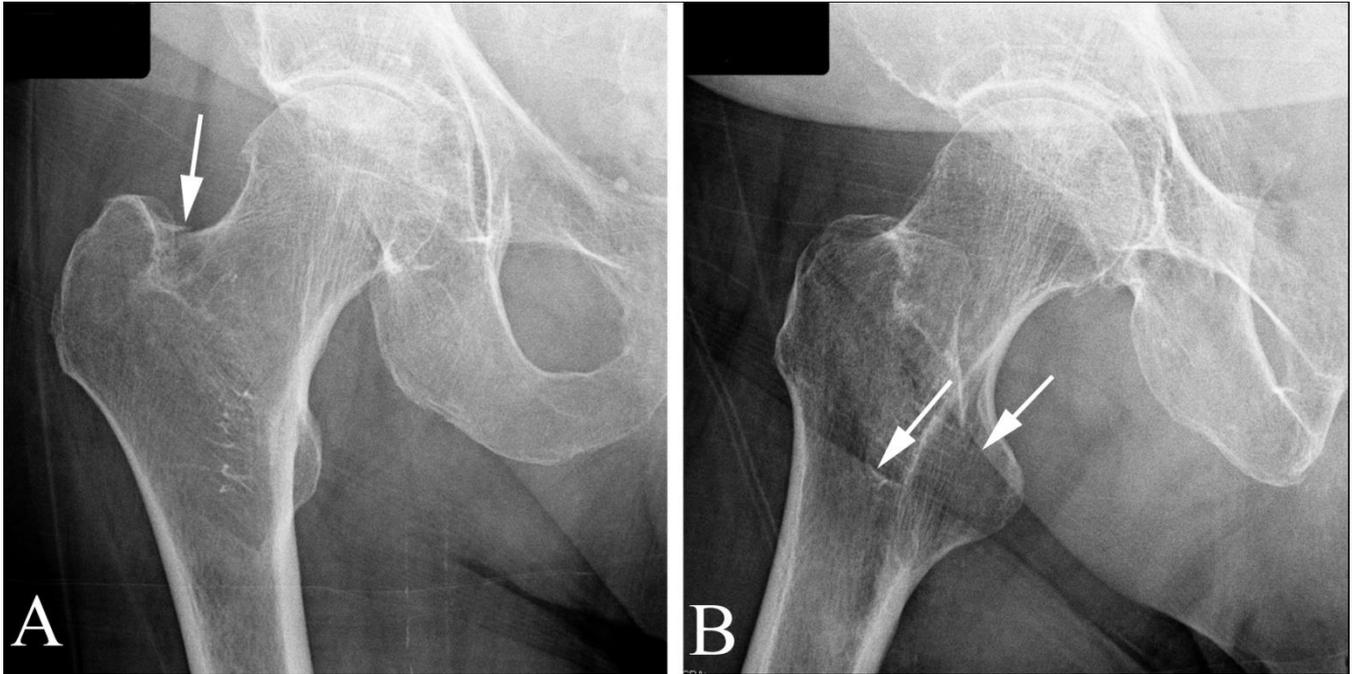
IMAGING STUDY AND QUESTIONS

An imaging study was performed:



Imaging questions:

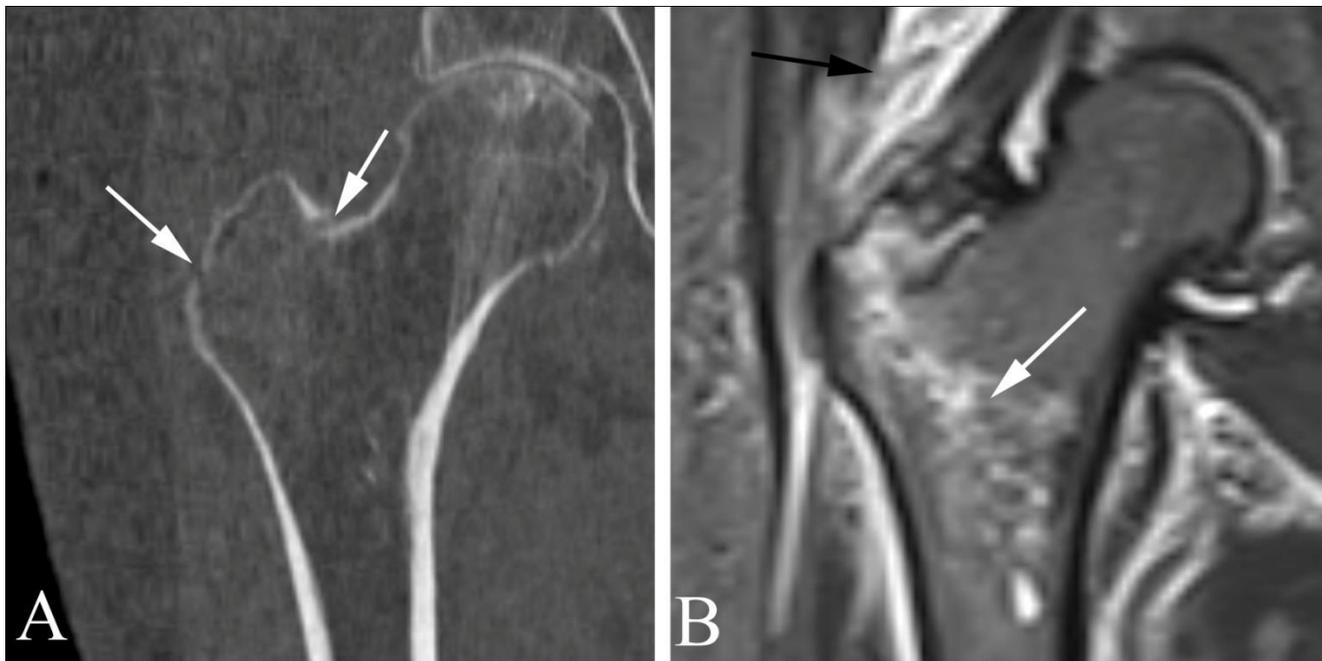
- 1) What type of study is shown?
- 2) Are there any abnormalities?
- 3) What is the most likely diagnosis?
- 4) What is the next step in management?

IMAGING STUDY QUESTIONS AND ANSWER**Imaging questions:**

- 1) What type of study is shown? An AP (A) and “frog lateral” (B) hip plain film examination.
- 2) Are there any abnormalities? Yes. There is cortical discontinuity along the greater trochanter in A (arrow) indicating an acute fracture. There are two lines crossing the intertrochanteric hip in B, but these lines continue outside the bone and represent skin folds (arrows).
- 3) What is the most likely diagnosis? Acute post-traumatic hip fracture.
- 4) What is the next step in management? It is not clear from this plain film whether this fracture represents an isolated greater trochanter fracture or a fracture extending through the femoral neck. These two fractures are treated differently. It is appropriate to consult with an orthopedic surgeon, but it is also necessary to obtain further imaging to define the extent of the fracture.

PATIENT DISPOSITION, DIAGNOSIS, AND FOLLOW-UP

The patient underwent computed tomography (CT) of the hip (see below figure). This examination allowed better evaluation of the fracture, which was interpreted as an isolated greater trochanter fracture (arrow). The patient continued to have significant pain and was admitted to the hospital. Because of concern that the CT exam may not have demonstrated the full extent of the injury, a magnetic resonance examination was performed. This demonstrated abnormal signal intensity crossing the proximal femur compatible with a fracture through the proximal femur (as well as adjacent soft tissue injury including muscle tears). Because a fracture through the intertrochanteric region (unlike an isolated greater trochanter fracture) requires operative fixation to prevent significant debilitating shift with weightbearing, this distinction is critical. The patient underwent open reduction and internal fixation of the fracture with a dynamic compression screw, and had an uneventful recovery with return of ambulation.



86 year old man with acute pain in the hip following trauma. A. Coronal reconstruction computed tomography shows an apparent isolated greater trochanter fracture (arrows). B. Coronal magnetic resonance image demonstrates abnormal signal through the entire proximal trochanter compatible with a nondisplaced fracture (white arrow). Note the associated increased signal in adjacent muscular structures including the gluteus minimus (black arrow) indicated muscle tears.

SUMMARY

Presenting symptoms: The patient presented with acute hip pain following trauma. The main considerations are fracture and soft tissue injury. In the case of fracture, the nature of the fracture is also critical to patient management. Isolated greater trochanter fractures or minimally displaced pubic ring fractures generally do not require fracture fixation, whereas fractures crossing the femoral neck do require fixation.

Imaging work-up: The initial imaging study of choice for post-traumatic hip pain is a plain film examination of the hip. Views obtained typically include an anteroposterior (AP) and “frog lateral” examination. Plain films may be negative, positive and provide complete information necessary for treatment, or positive but not provide complete information necessary for treatment. If plain films are positive but do not provide complete information necessary for treatment of the injury, as in this case, additional imaging may include computed tomography (CT) or magnetic resonance (MR) imaging. As a generalization, CT is preferred for obvious displaced fractures to further evaluate intra-articular extent of the fracture or loose bodies within the hip joint when there is a fracture/dislocation. When plain films show a minimally displaced fracture, or are equivocal or negative, MR is generally preferred since it offers very sensitive depiction of fractures and soft tissue injury.

Establishing the diagnosis: When plain films or CT demonstrate definite fracture lucency they are diagnostic. However, MR may show fractures not seen on plain films or even, on occasion, CT, and is preferred when a radiographically occult fracture is suspected or a minimally displaced fracture needs further characterization. MR also allows the diagnosis of soft tissue injury such as muscle tear by direct visualization of the abnormality.

Take-home message: The initial study of choice for virtually all patients with acute post-traumatic hip pain is a plain film evaluation. Whether further imaging is necessary, and whether further imaging should be performed with CT or MR, depends on the findings on the plain film examination and on the clinical circumstances.

Note the similarity of this case to that presented in RQW090 Acute Post-traumatic Shoulder Pain, 09-15-12, RQW092 Acute Post-traumatic Elbow Pain 09-29-12, RQW094 Acute Post-traumatic Wrist Pain 10-13-12, and RQW096 Acute Post-traumatic Hand Pain 10-20-12. In most cases, acute post-traumatic joint pain is first evaluated with a plain film, although the patterns of injury are specific to the joint.

FURTHER READING

Feldman F, Staron RB. MRI of seemingly isolated greater trochanter fractures. *Am J Roentgenol* 2004;183:323-329.

Renfrew DL. Single joint pain. Chapter 14 in *Symptom Based Radiology*, Symptom Based Radiology Publishing, Sturgeon Bay, WI, 2010, available for no charge at www.symptombasedradiology.com.