

## CLINICAL PRESENTATION AND RADIOLOGY QUIZ QUESTION

A 66 year old woman presents with the acute onset of post-traumatic ankle pain after a bicycle accident in which his recliner-type bicycle tipped over on its side and landed on his ankle and foot. He had immediate ankle pain and deformity at the time of the injury, and cannot bear weight on the ankle. He has had no prior ankle injury. He sustained no other injuries during the accident. On physical examination the right ankle shows deformity. Pulses are present and sensation in the toes is intact. There is a small skin abrasion. His vital signs are unremarkable.

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

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

## RADIOLOGY QUIZ QUESTION, ANSWER, AND EXPLANATION

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The initial imaging study in patients with high velocity trauma of the ankle is a plain film examination. In patients with low velocity trauma, the Ottawa rules apply. Patients that do not meet any of the Ottawa criteria do not require imaging. The Ottawa criteria include bone tenderness along the distal 6 cm of the posterior edge of the tibia or at the tip of the medial malleolus; bone tenderness along the distal 6 cm of the posterior edge of the fibula or the tip of the lateral malleolus; or inability to bear weight both immediately and on subsequent examination. In patients with obvious deformity of the foot or ankle, the injury is assumed to be a high velocity injury and plain film examination should be performed.

MR imaging of the ankle (a) may be helpful for evaluation of the ankle and may allow diagnosis of a variety of traumatic and non-traumatic ankle abnormalities (including radiographically occult fractures, tendon and ligament tears, sinus tarsi syndrome, arthritis, and bone and soft tissue tumors). However, MR of the ankle is typically performed only *after* plain film examination of the ankle in the setting of acute trauma, 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 ankle, and (b) is incorrect. US examination of the ankle (d) is not widely used in the setting of acute trauma with suspected fractures 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

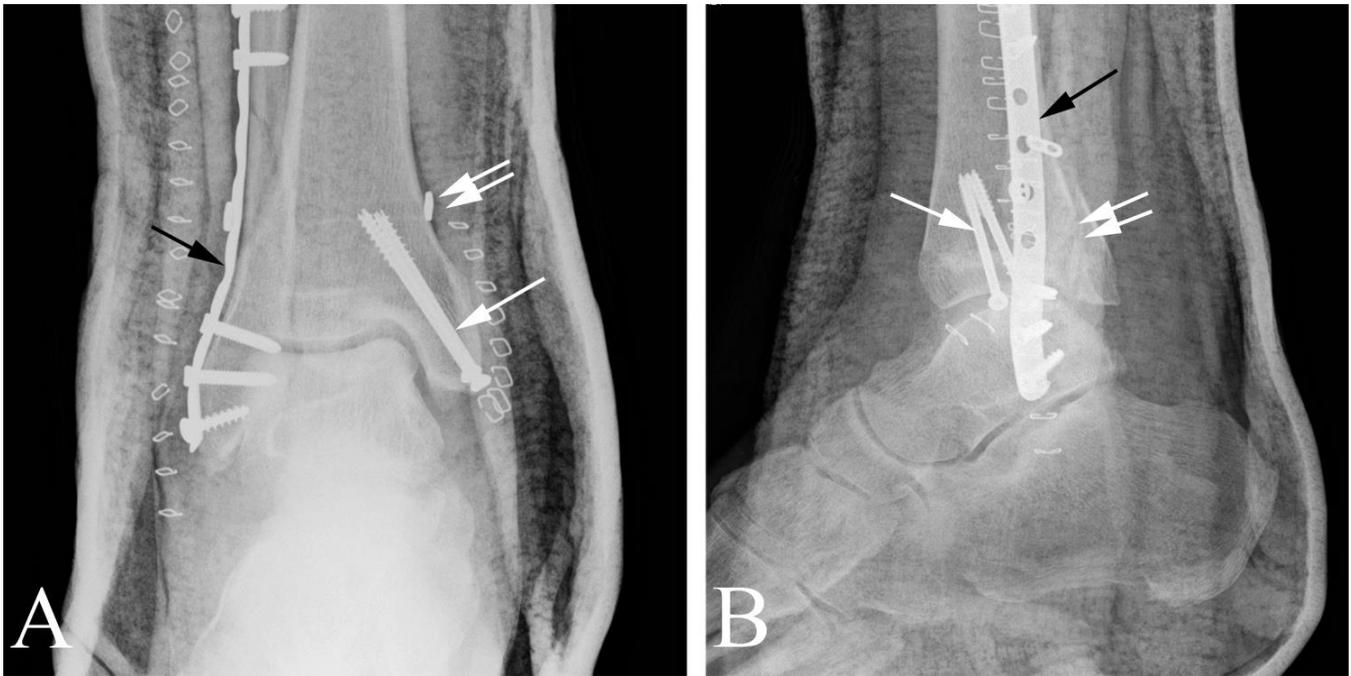


### Imaging questions:

- 1) What type of study is shown? An anteroposterior (A) and lateral (B) plain film examination of the ankle.
- 2) Are there any abnormalities? Yes. There are fractures of the distal fibula, distal posterior tibia, and through the base of the medial malleolus, along with dislocation of the ankle joint.
- 3) What is the most likely diagnosis? Trimalleolar fracture with ankle dislocation.
- 4) What is the next step in management? Referral to an orthopedic surgeon.

## PATIENT DISPOSITION, DIAGNOSIS, AND FOLLOW-UP

An orthopedic surgeon was consulted and advised open reduction internal fixation to re-locate the dislocated ankle joint and properly align and fix the fractures. The patient was taken to the operating room and fluoroscopic guidance was used during the procedure. The surgeon brought the displaced medial malleolus into anatomic position and fixed it in place using cannulated screws. The surgeon then reduced the fibular fracture using a lateral fixation plate. Because of the high likelihood of an associated syndesmotic injury given the severe nature of the injury, syndesmotic fixation was performed as well. A split was applied. The patient did well following surgery.



66 year old man with an ankle fracture/dislocation who underwent open reduction internal fixation. A. Anteroposterior postoperative plain film of the ankle taken through a plaster split demonstrates medial fixation screws through the medial malleolus (white arrow), a lateral fixation plate along the fibula (black arrow), and "buttons" (double arrows) at the ends of syndesmotic fixation. B. Lateral plain film of the ankle taken through a plaster splint demonstrates medial fixation screws (white arrow) and the lateral fixation plate (black arrows). Note that the patient's posterior malleolus fracture (double arrows), which was not instrumented during the procedure.

## SUMMARY

**Presenting symptoms:** The patient presented with acute ankle 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. Minimally displaced fractures often do not require operative treatment, whereas fractures compromising the stability of the ankle and fractures with accompanying dislocation may require open reduction and internal fixation to achieve optimal results.

**Imaging work-up:** For low-velocity ankle injuries, plain films are usually *not* necessary. However, if the patient meets any of the three criteria listed in the Ottawa rules (bone tenderness along the distal 6 cm of the posterior edge of the tibia or at the tip of the medial malleolus; bone tenderness along the distal 6 cm of the posterior edge of the fibula or the tip of the lateral malleolus; or inability to bear weight both immediately and on subsequent examination) then plain films should be obtained. In cases of obvious deformity (as in this case), plain films are the first (and often only) imaging study necessary.

**Establishing the diagnosis:** When plain films demonstrate a definite fracture lucency or dislocation, they are diagnostic.

**Take-home message:** Plain films are not necessary in patients with low-velocity ankle trauma if the patient does not meet any of the Ottawa criteria. When the patient does meet the Ottawa criteria, plain films are the initial imaging study of choice.

### FURTHER READING

ACR appropriateness criteria for suspected ankle fractures. [www-acr.org](http://www-acr.org) accessed 6/7/12.

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](http://www.symptombasedradiology.com).

Stiell IG, Greenberg G, McKnight RD et al. A study to develop clinical decision rules for the use of radiography in acute ankle injuries. *Ann Emerg Med* 1992;21:384-390.