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CLINICAL PRESENTATION AND RADIOLOGY QUIZ QUESTION

A 37 year old man is on the gurney, about to be wheeled into the operating room to have a rotator cuff repair. During a final review the patient is found to have a swollen, painful left foot which he says has been bothering him since a slip and fall one week prior to his scheduled shoulder surgery. The patient states that the foot has been painful since the fall and that the pain is not improving through time. A plain film was obtained:

Which of the following imaging studies would be most helpful in further evaluation, and why?

(a) magnetic resonance (MR) imaging of the foot to confirm a second metatarsal fracture
(b) computed tomography (CT) of the foot to evaluate the Lisfranc joint
(c) nuclear medicine whole body bone scan to exclude metastatic disease
(d) ultrasound (US) examination of the foot to evaluate for tendon tear

RADIOLOGY QUIZ QUESTION, ANSWER, AND EXPLANATION

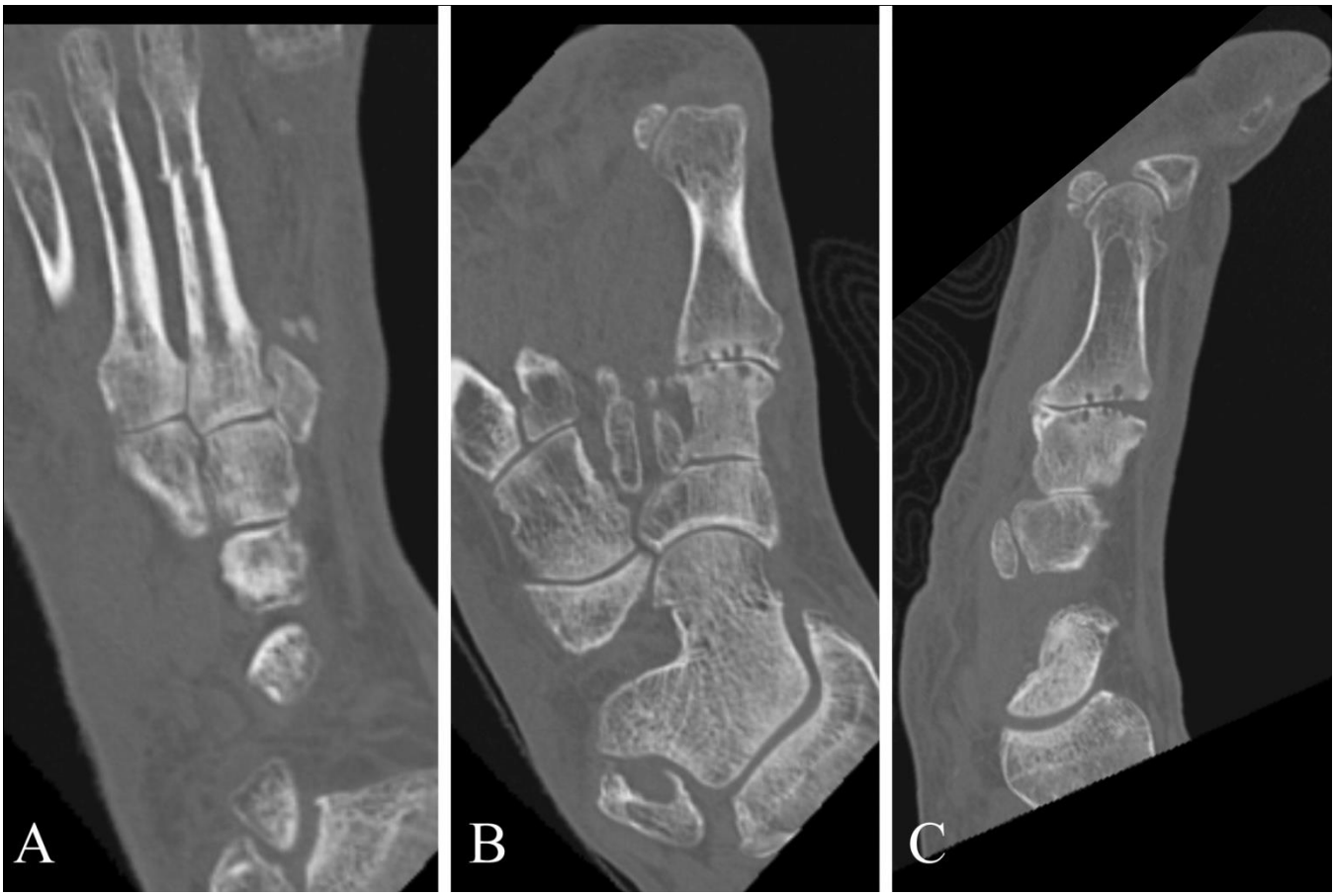
37 year old man with forefoot pain and swelling one week after a fall on the ice. A. Anteroposterior view of the foot demonstrates a fracture of the second metatarsal (white arrow), along with an abnormal appearance of the Lisfranc joint between the medial cuneiform and great toe metatarsal (black arrow). B. Oblique view confirms the same abnormalities. Note prominent space between the proximal aspects of the first and second metatarsals in both projections.

The initial imaging study in patients with high velocity post-traumatic foot pain is a plain film examination. In this case, the plain film showed an obvious acute second metatarsal fracture. The plain film also showed an abnormal appearance of the Lisfranc joint (the joint between the midfoot and forefoot). Note the abnormal appearance of the articulation between the medial cuneiform and great toe metatarsal. This appearance may indicate instability of the Lisfranc joint, which may lead to devastating long term disability if not identified and treated appropriately. Given the abnormal appearance on the plain film examination, CT is appropriate for further evaluation of the joint, and (a) is correct.

MR imaging of foot ankle (a) may be helpful for evaluation of the foot 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). MR may be helpful to evaluate the ligaments of the Lisfranc joint, but it is *not* necessary to confirm the second metatarsal fracture, and (a) is incorrect. A nuclear medicine bone scan (c) would likely show increased radiotracer localization along the obvious second metatarsal fracture (of little benefit) and may show nonspecific turnover at the Lisfranc joint, but metastatic disease is not really a consideration in this 37 year old man with post-traumatic abnormalities of the foot, and (c) is incorrect. US examination of the foot (d) may be helpful for patients with specific, dynamic abnormalities of the foot. However, the concern in this case is for an injury of the Lisfranc joint (either fracture or ligament injury), and not for tendon rupture, 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? CT of the foot. A is an axial study through the second and third metatarsals, B is an axial study through the first metatarsal and tarsometatarsal (TMT) joint, and C is an sagittal study through the first metatarsal and TMT joint.
2) Are there any abnormalities? Yes. A confirms an acute fracture through the second MT as seen on the plain film examination (white arrow) and B and C demonstrates joint space narrowing, subchondral cyst formation, and osteophytic spurring (black arrows) along the first TMT joint.
3) What is the most likely diagnosis? Acute second metatarsal fracture and osteoarthritis of the first tarso-metatarsal joint without acute fracture.
4) What is the next step in management? Metatarsal fracture management and symptomatic treatment for osteoarthritis of the first TMT.

PATIENT DISPOSITION, DIAGNOSIS, AND FOLLOW-UP

The patient was already seeing an orthopedic surgeon for his rotator cuff injury. He was fitted with a post-operative shoe, instructed in heel walking with a cane, and told to take pressure off of the forefoot for the next two weeks. A follow-up radiograph of the foot demonstrated callus formation along the second metatarsal margins:

37 year old man with an acute fracture of the second metatarsal and degenerative changes along the Lisfranc joint between the medial cuneiform and first metatarsal. A. Initial anteroposterior (AP) plain film of the foot shows an acute fracture through the second metatarsal (arrow). B. Follow-up AP plain film of the foot taken two weeks later shows callus crossing the fracture site (arrow).

SUMMARY

Presenting symptoms: The patient presented with foot pain following trauma. Initial imaging in patients with foot pain following trauma is a plain film examination.

Imaging work-up: The initial imaging examination in patients with a suspected forefoot fracture is typically a plain film study including a lateral, anteroposterior (AP) and oblique plain film of the foot. Additional imaging is usually done only after the foot plain films, and is predicated on the history, physical examination, laboratory results, and the results of the plain film.

Establishing the diagnosis: When characteristic findings of a sharply defined lucency through bone cortex or a displaced bone fragment is seen, plain film findings are diagnosis of fracture. In cases where there is a disorganized or otherwise unusual appearance of the bone, further evaluation with CT (as in this case) may be very helpful in further diagnosis and management.

Take-home message: The initial imaging study of choice for foot pain is a plain film examination. Additional studies are based on the history and physical examination, laboratory results, and the results of the plain film study.

FURTHER READING

ACR Appropriateness Criteria: Acute trauma to the foot. www-acr.org accessed 6/7/12.

Bachmann LM, Kolb E, Koller MT et al. Accuracy of Ottawa ankle rules to exclude fractures of the ankle and midfoot: systematic review. BMJ 2003;326:417-419.

Hatch RL, Clugston JR. Metatarsal shaft fractures. UpToDate.com, accessed 5/25/12.

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.