

## CLINICAL PRESENTATION AND RADIOLOGY QUIZ QUESTION

A 22 year old student athlete (800 meter runner) comes to the clinic with a history of increasing foot pain. She describes a two and a half week history of increasing pain along the dorsal aspect of the right forefoot. The pain is worse with running and better with rest, but now seems persistent despite not running at all.

Which of the following imaging studies is the initial examination of choice for evaluation of ongoing foot pain?

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

<b>RADIOLOGY QUIZ QUESTION, ANSWER, AND EXPLANATION</b>
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The initial imaging study in patients with foot pain is a plain film examination of the foot, and (b) 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). However, MR of the foot is typically performed only *after* plain film examination of the foot, 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 foot, and (b) is incorrect. US examination of the foot (d) may be helpful for patients with specific, dynamic abnormalities of the foot, but requires local expertise and is typically performed only after plain film evaluation, 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 (AP) and oblique plain film of the foot.
- 2) Are there any abnormalities? Yes. There is extremely subtle focal periostitis along the medial aspect of the third metatarsal near the metatarsal neck as best seen on C, a magnified, sharpened oblique view.
- 3) What is the most likely diagnosis? Stress fracture of the third metatarsal.
- 4) What is the next step in management? Counsel the patient regarding stress fractures and limit activity until the fracture is healed to the point where activity can be resumed.

## PATIENT DISPOSITION, DIAGNOSIS, AND FOLLOW-UP

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The patient was seen by a podiatrist, who placed the patient in a surgical shoe with accommodating padding and instructed the patient to rest for at least three weeks, followed by a trial of elliptical training or swimming. A follow-up radiograph (see below) showed further healing during a follow-up study three weeks later. The patient gradually increased her activity level without any complication of fracture healing or new problem.



22 year old female student athlete with a stress fracture of the third metatarsal. A. AP of the foot showed no abnormality (not shown here; see figure on page 3). B. Oblique plain film of foot shows very subtle periostitis along the medial border of the third metatarsal (arrow). C. Oblique plain film, magnified and digitally enhanced (sharpened) better demonstrates the periostitis (arrow). D. Oblique plain film, also magnified, obtained 3 weeks later, shows maturation of the periostitis into cortical bone (arrow).

## SUMMARY

**Presenting symptoms:** The patient presented with foot pain following ongoing athletic activity. Possible causes of such pain include a stress fracture, soft tissue trauma, and Morton's neuroma. The first step in evaluation is a history and physical examination. The physical examination results were compatible with a stress fracture.

**Imaging work-up:** The initial imaging examination in patients with a suspected stress 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:** Since stress fractures rarely if ever come to surgery, there is usually no tissue for the pathologist to analyze, and the diagnosis is based on the imaging findings. Plain films may not demonstrate all stress fractures. While MR may show stress fractures or "stress response" (abnormal marrow signal without a fracture line), a stress fracture may be diagnosed on the basis of clinical examination findings.

**Take-home message:** The initial imaging study of choice for virtually all patients with 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

Chorley J, Powers CR. Clinical features and management of foot pain in the young athlete. UpToDate.com, accessed 5/25/12.

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