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Tibial Stress Fracture in a Runner

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Introduction

Stress fractures are classified as an overuse injury that occurs as the result of repetitive loading, or stress, that is either compressive or tensile in nature. Bones are continuously undergoing a process of remodeling, which balances bone resorption with the formation of new, healthy bone. This process is in response to mechanical stress and dependent upon the number and frequency of loading cycles. In times of increased duration, frequency, or intensity of stress to the bone, the formation lags behind resorption and microfractures develop. With continued overloading, these microfractures eventually coalesce into discontinuity of cortical bone and that is the point along the spectrum of "stress injuries" considered a stress fracture (deWeber, 2017; Wheeless, 2015).

Stress fracture may occur secondary to a small number of repetitions with a large loading force, commonly seen in military recruits during training or "boot camp" or a large number of lower force repetitions as is the case with distance running, basketball, or ballet. The lower extremities are understandably most frequently affected, with the tibia being the most common site of stress fracture in athletes. Risk factures include low body mass index, low level of physical fitness, a sudden increase in volume or intensity of weight-bearing activity, being female, poor nutrition or intake of calcium, anatomic variants such as leg length discrepancy or foot planus/cavus, and a history of prior stress fracture (Bonanno, Landorf, Munteanu, Murley, & Menz, 2017; deWeber, 2017; Wheeless, 2015; Wright, Taylor, Ford, Siska, & Smoliga, 2015).

Case Presentation

A 32-year-old man presented with acute onset of left lower leg pain, 2 days prior to evaluation, while running. He had been training for a marathon for the previous 4 months, noting various aches and pains throughout that time but nothing to the degree he experienced in this most recent incident. He noted the leg "completely shut down." He rested on a bench for about 20 minutes before "hobbling" over to street and getting a cab home. There was no bruising or swelling. He rested and iced but noted continued pain, diffusely about the lower leg, with any attempted weight-bearing.

Upon presentation was a slender male, alert, oriented, and in no apparent distress. He ambulated with an antalgic, straight-legged, gait. There was no swelling, discoloration, or deformity about the leg. He noted vague tenderness of the proximal-medial aspect of the tibia. There was no pain with knee or ankle range of motion beyond an uncomfortable stretching feeling in the calf upon ankle dorsiflexion. No instability was noted with ligamentous testing. Strength was 5/5 in both lower extremities. Bounce home and straight leg raise were negative. McMurray's test was equivocal. He was unable to perform a single leg stance for more than 2 seconds.

Images taken at time of evaluation included anteroposterior and lateral views of the lower leg (tibia and fibula) and were unrevealing for any acute osseous abnormality (see Figure 1). Despite the recommendation, the patient refused crutches. He was instructed on continued conservative management, including rest, icing, and use of over-the-counter medications for symptom management, and to follow up within 2–3 weeks if symptoms persisted.

He returned just over 3 weeks later with continued lower leg pain that had become more focal to the proximal aspect of tibia. He had been cycling and walking to and from work, which was about a half mile from his home. He denied any running or other impact activities. There was still no swelling or discoloration. He continued to display an antalgic gait. There was focal bony tenderness of the proximal-medial tibia. Repeat imaging included anteroposterior, lateral, and oblique views and was revealing for linear sclerosis and periosteal reaction, consistent with a stress fracture of the proximal tibia (see Figure 2).

Management

Initial management includes protected weight-bearing with crutches and overall activity modification and reduction. One should stress the importance of avoiding any impact activities. Symptoms managed with rest, ice, and use of over-the-counter medications such as acetaminophen and/or ibuprofen are usually sufficient. Prognosis is good in the compliant patient. Follow-up intervals are typically every 2–3 weeks, with progression back to weight-bearing, but not impact activities, after the initial 6–8 weeks as long as the patient is asymptomatic

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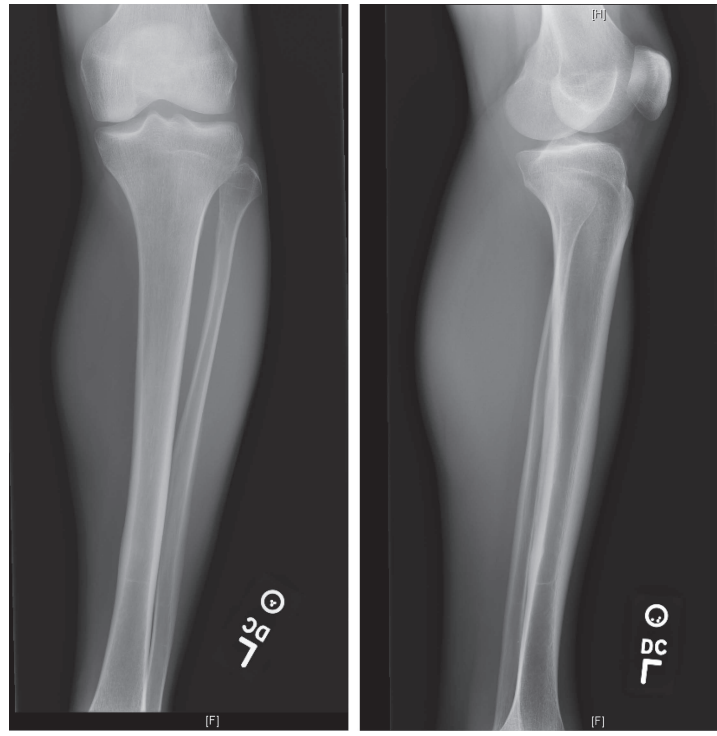

Figure 1. Anteroposterior and lateral views of the left tibia taken on the day of incident. There is no apparent fracture or other concerning osseous finding.

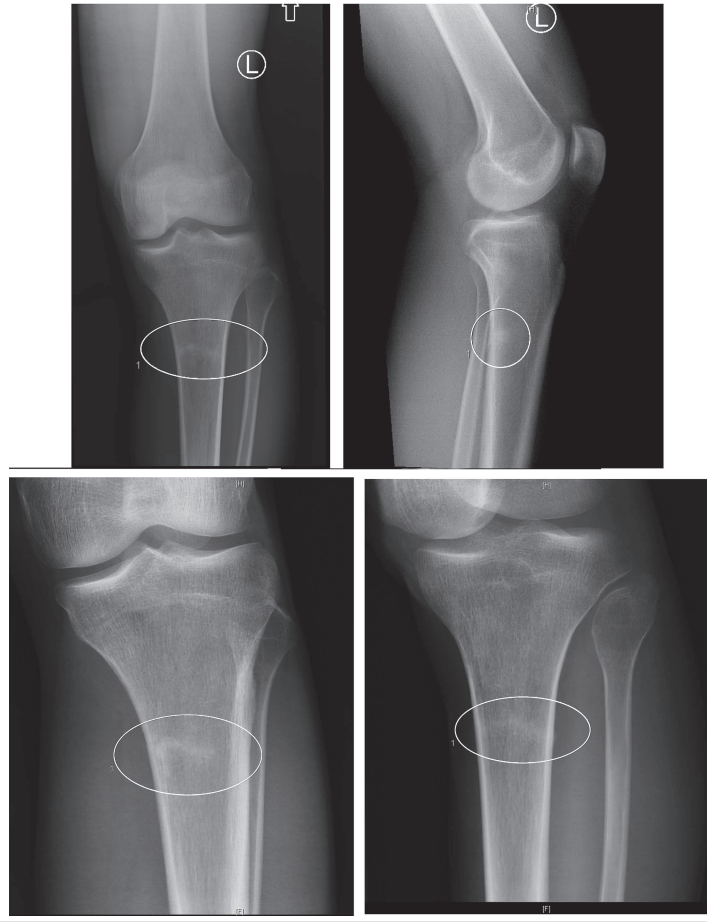

Figure 2. Three-week follow-up—anteroposterior/lateral/oblique—ellipse denotes stress fracture. Note linear sclerosis and subtle periosteal reaction denoting the site of stress response/fracture.

with single leg stance during evaluation. One can anticipate upward of 4–6 months for a return to repetitive impact activities such as running, basketball, or tennis. Providers can consider the use of an external bone stimulator for those patients with delayed healing, noted as continued symptoms at 3 months from injury (deWeber 2017; Fields, 2018; Wheeless, 2015).

Surgery is indicated in cases of nonunion. In regard to the tibia, that is achieved via intramedullary nail or rod. The advanced practice provider should consider referral if a patient continues to show symptoms for more than 6 months despite conservative management as discussed. The patient needs to understand the risks associated with surgery, as well as the possibility of continued pain, although it is typically to a lesser degree than before fixation is undertaken (deWeber, 2017; Fields, 2018; Wheeless, 2015).

Discussion

Stress fractures are uncommon in the general population but should be in the differential diagnosis for any patient presenting with symptoms associated with repetitive impact activities or those who have recently started a more rigorous exercise program. Early diagnosis, with initiation of protected weight-bearing and activity modification, is essential in avoiding complications such as nonunion. Those with noted delayed healing should have calcium and vitamin D levels checked and supplemented as necessary. Magnetic resonance imaging is appropriate to obtain when the patient's history and presenting symptoms are consistent with stress fracture, but plain radiographs are unrevealing (deWeber, 2017; Fields, 2018; Wright et al., 2016).

Those with foot deformities or leg length discrepancy will likely see benefit from the use of orthotics or a shoe lift, respectively. It is also important to address potential biomechanical issues, especially in the running population, that may underlie abnormal loading. Physical therapy is instrumental in identifying and addressing these underlying issues as well as utilizing modalities such as ultrasound that are to promote bone healing (Bonanno et al., 2017; deWeber, 2017; Fields, 2018). The advanced practice provider can reassure patients that the majority of tibial stress fractures are successfully treated nonoperatively, understanding that it may take several months for return to strenuous activities such as running (deWeber, 2017; Fields, 2018; Wheeless, 2015).

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