

Exercise-related longitudinal tibial stress fracture in a young person

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A 22-year-old man presented to the Nuclear Medicine Clinic for evaluation of distal right tibial pain. The patient reported recently beginning a rigorous exercise program involving lower extremity impact temporally related to the onset and worsening of the pain. The physical examination was remarkable for significant tenderness to palpation of the distal one-third of his right tibia. The presumptive diagnosis was a stress fracture. Recent roentgenograms of the right tibia were not available for review but were reportedly normal. Scintigraphy, in combination with computed tomography, revealed an unusual type of stress fracture (particularly in a young person and in relation to exercise)—a longitudinal stress fracture.

Key words: bone scintigraphy, longitudinal, tibia, stress fracture

INTRODUCTION

TIBIAL STRESS FRACTURES ACCOUNT for over 50% of all stress fractures, and are particularly common in military medical practice.¹ Individuals with tibial stress fractures present with shin pain which is often associated with a recent acceleration in their level of lower extremity exercise. The majority of tibial stress fractures demonstrate increased transverse uptake in a fusiform configuration encompassing a percentage (but not the entire diameter) of the tibia on delayed scintigrams. Much less commonly, a tibial stress fracture will present on the delayed images with increased uptake extending over a significant length of the tibia and involving the tibial diameter in its entirety—a so-called longitudinal stress fracture. Unlike the much more common transverse tibial stress fracture, longitudinal stress fractures usually occur in middle-aged and elderly adults and are not typically exercise related.^{2–5} Here, we report a case of this uncommon type of tibial stress fracture in an uncommon demographic—a young adult whose injury was temporally associated

with an increase in level of exercise.

CASE REPORT

A 22-year-old male was referred by his family physician for scintigraphic evaluation of one month of distal right tibial pain. The onset of the pain was temporally related to the start of a rigorous exercise program, including backpacking and running. The pain gradually worsened as the patient continued his strenuous exercise regimen. The patient was evaluated by his family physician who made a presumptive diagnosis of a stress fracture and ordered roentgenograms of the right tibia. These were not available for review at the time of the patient's presentation to the Nuclear Medicine Clinic but were reportedly normal. The patient's past medical history was unremarkable and the only medication he was taking was ibuprofen for pain palliation.

The patient's site of pain, and the temporal association of the pain with rigorous exercise, strongly suggested a common stress fracture, and our standard practice of performing two-phase osseous scintigraphy for evaluation was followed. Immediate blood pool and three hour delayed scintigrams of the tibiae and fibulae were obtained following the intravenous administration of 925 MBq of Tc-99m MDP. Contrary to our expectation, the pattern of radiotracer accumulation was atypical for a common (i.e. transverse) stress fracture in terms of the longitudinal extent of the increased activity, the apparent encompassing of the tibial diameter in its entirety, the

Received July 19, 2005, revision accepted May 19, 2006.

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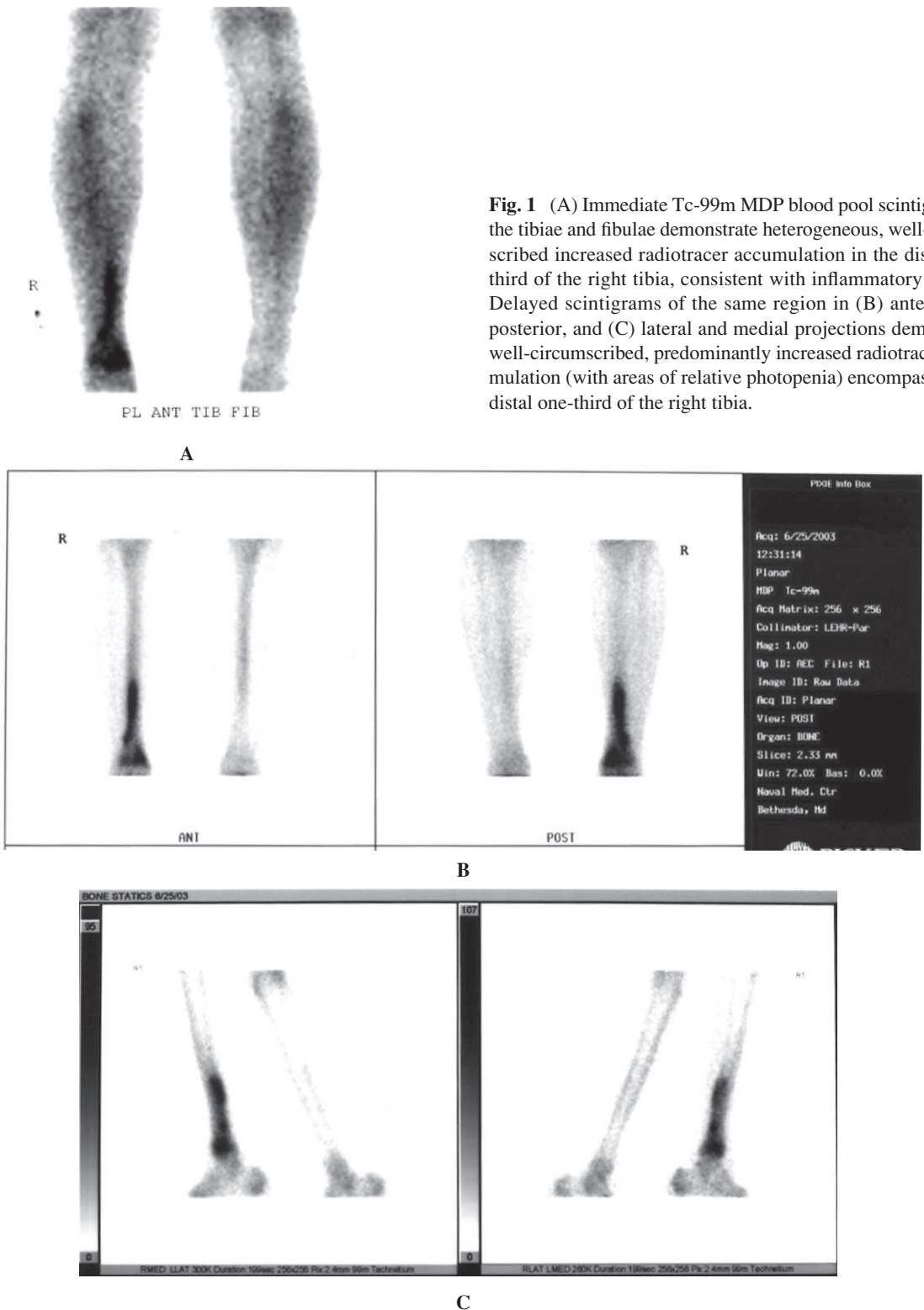


Fig. 1 (A) Immediate Tc-99m MDP blood pool scintigrams of the tibiae and fibulae demonstrate heterogeneous, well-circumscribed increased radiotracer accumulation in the distal one-third of the right tibia, consistent with inflammatory change. Delayed scintigrams of the same region in (B) anterior and posterior, and (C) lateral and medial projections demonstrate well-circumscribed, predominantly increased radiotracer accumulation (with areas of relative photopenia) encompassing the distal one-third of the right tibia.

heterogeneous nature of the tracer accumulation, and the very-well circumscribed but non-fusiform morphology of the uptake (Fig. 1). The scintigraphic findings were, however, typical for a longitudinal stress fracture, but were not specific enough to definitively rule-out the other entities in the differential diagnosis based upon the scin-

tigraphic appearance—infection and neoplasm.

Our musculoskeletal radiologist was consulted, and computed tomography was recommended to attempt to narrow the differential. Noncontrast helical computed tomography of the right lower extremity was performed using 5 mm beam collimation and 2.5 mm reconstructions



A



B

Fig. 2 (A) An axial computed tomographic image through the distal right tibia shows ill defined cortical graying (*arrow*) with central linear low attenuation in the posterior cortex associated with solid periosteal reaction (*arrowhead*). (B) A coronal reconstruction through this same region reveals the linear geometry of the posterior cortical abnormality.

through the distal one third of the right tibia. CT demonstrated findings consistent with a stress fracture, but with the fracture's orientation parallel to the long axis of the tibia (i.e. longitudinal), as opposed to the much more typical perpendicular (i.e. transverse) orientation to the long axis of the involved bone (Fig. 2). The computed tomogram, combined with osseous scintigraphy, confirmed the diagnosis of a longitudinal tibial stress fracture.

DISCUSSION

Tibial pain associated with lower extremity impact exercise is a common presenting symptom in military medicine, particularly in military medical practices involving recruits. Because of the rigorous marching and running often associated with basic training, lower extremity stress-related injuries are common with, in our experience, tibial injuries being the most common. These may be generally divided into two broad categories: stress-related change without scintigraphic findings to suggest a bona fide stress fracture (e.g. "shin splint") and, the more serious condition, stress fracture. The latter entity is usually transverse to the long axis of the involved bone, while stress fractures with a longitudinal orientation account for only 10% of tibial stress fractures.⁴ In addition to this case being unusual based solely upon the low incidence of longitudinal stress fractures, this case is also

both demographically and historically atypical for this specific type of injury. Instead of young adults engaged in strenuous exercise programs, the vast majority of the reported cases of this entity occur in middle-aged to elderly adults,²⁻⁵ and are not usually associated with strenuous activity.^{2,3}

This case was, however, typical in that the strikingly positive bone scan findings were nonspecific, and resulted in a differential diagnosis of infection and neoplasm: a differential diagnosis entertained in previously reported cases of longitudinal stress fractures.⁶ Incidentally, the extension of increased tracer activity to encompass the entire distal extent of the tibia (seen in our patient's bone scan) has been described in other cases of this type of fracture, and has understandably raised concern for Paget's disease in older patients.⁶

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