
Scintigraphic Manifestations of Infraction of the Second Metatarsal (Freiberg's Disease)

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Two patients with Freiberg's infraction of the second metatarsal are presented. The scintigraphic pattern of a photopenic defect with hyperactive collar is demonstrated as evidence of the existence of avascular necrosis or infarction in this entity. The photopenia was appreciated only on pinhole collimator images in our first patient. The later revascularization phase of avascular necrosis with diffuse increase in uptake is demonstrated scintigraphically in the second patient.

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Freiberg's infraction refers to the occurrence of pain and swelling about the second metatarsal of the foot (1). The early radiographic appearance may consist of a normal or slightly flattened epiphysis with some widening of the adjacent joint space. The later radiographic findings include flattening, rarefaction, fragmentation, and sclerosis of the distal epiphysis (2). It is thought that the etiology of the lesion is ischemia producing avascular necrosis (AVN) possibly secondary to repeated trauma (3). However, a photopenic defect on bone scintigraphy typical of AVN or infarction has not been previously recognized. This report represents examples of early and late scintigraphic manifestations of Freiberg's disease, indicating an AVN and subsequent healing respectively.

CASE REPORTS

Patient 1

A 12-yr-old girl with insidious onset of right foot pain presented with increasing severity of the discomfort. The patient had been evaluated 4 wk previously and was reported to have had a normal x-ray examination. No history of specific injury was noted. Physical examination showed swelling and pain localized to the distal right second metatarsal. Radiographic examination revealed slight increased density to the head of the second metatarsal (Fig. 1A). A bone scintiscan, using technetium-99m methylene diphosphonate (^{99m}Tc MDP), was performed to evaluate the osseous structures as the source of the foot pain. The blood-pool and delayed images demonstrated diffuse increased uptake in the distal right sec-

ond metatarsal signifying hyperemia and accelerated bone turnover (Fig. 2A). An area of relative photopenia with a hyperactive collar was demonstrated only on a pinhole image of the forefoot (Fig. 2B). A 6-mo follow-up x-ray of the foot showed evolution of the characteristic radiographic changes of Freiberg's infraction (Fig. 1B).

Patient 2

A 15-yr-old girl with a 1.5 yr history of pain localized to the left second metatarsal head came to medical treatment attention because of a recent re-exacerbation of her symptoms. A radiograph revealed a flattened, fragmented, and sclerotic appearing left second metatarsal head (Fig. 3). The bone scan, using ^{99m}Tc MDP, demonstrated blood pool and delayed images with increased activity localized to the symptomatic metatarsal head. (Figs. 4A,B).

DISCUSSION

Freiberg's disease or infraction is typically seen in adolescent girls (3:1, female:male). The second metatarsal is most frequently involved; it usually is the longest and probably is subjected to the greatest weight and repeated trauma. Other metatarsals can be affected and the disease may be bilateral in 10% of cases (2). The higher incidence in female patients may be related to the wearing of high-heeled shoes. Clinical manifestations consist of pain, swelling, and limitation of motion. With immobilization, the symptoms usually resolve. Sometimes recurrence of symptoms in adult life is sufficiently painful that surgical resection of the metatarsal head is performed.

In most texts, sclerosis has been described as the earliest radiographic change observed in the disease (2). However, as in the hip with idiopathic AVN or Legg-Perthe's disease, one can assume that a normal epiph-

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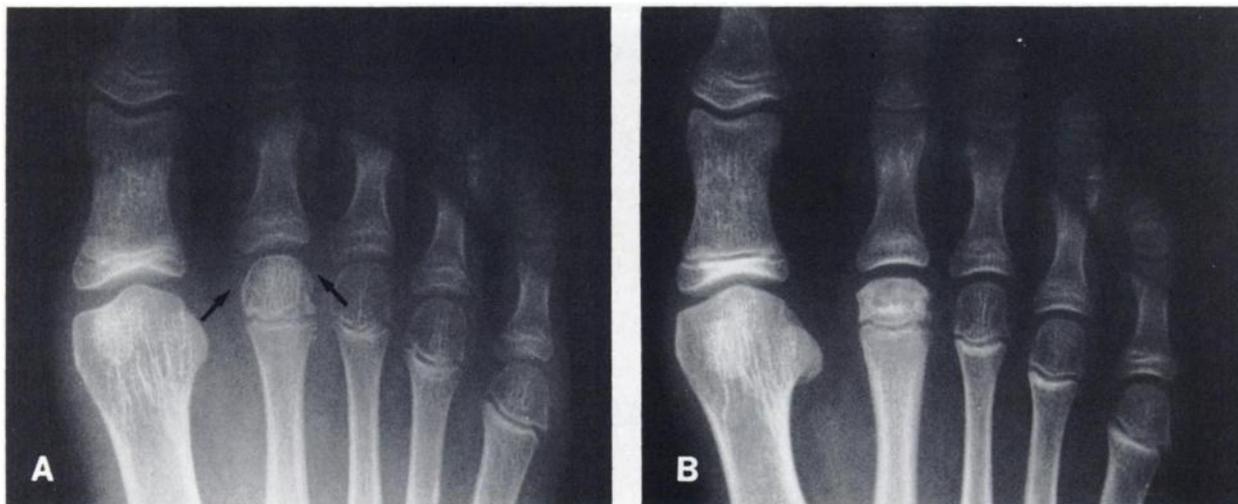


FIGURE 1
 A: Questionable increased density to normally shapen head of right second metatarsal on A-P radiograph (arrows). The change in density could be related to overlying soft tissue swelling. B: A-P radiograph 6 mo later with progression of flattening, sclerosis, and rarefaction of right second metatarsal head.

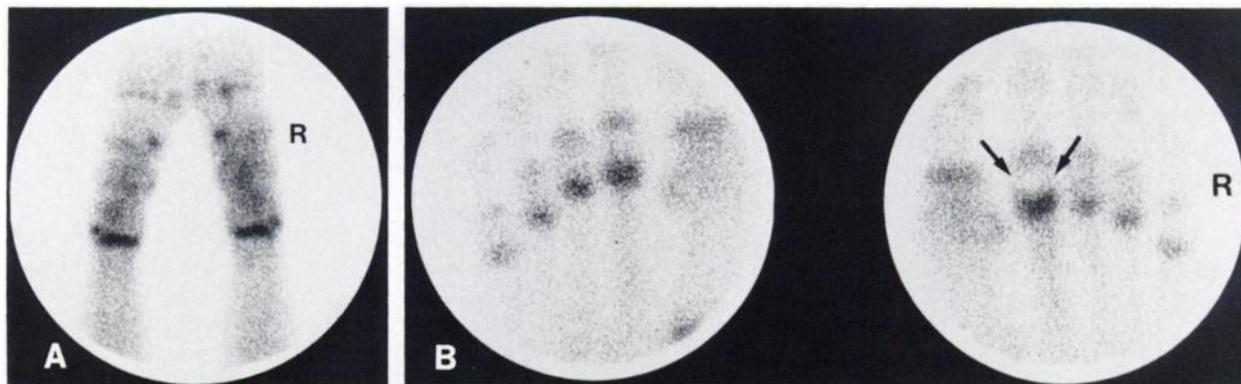


FIGURE 2
 A: Early anterior blood-pool images of both feet depicting hyperemia of right second metatarsal head and shaft. B: Anterior pinhole images demonstrating photopenic center with hyperactive collar (arrows) indicative of avascular necrosis of the right second metatarsal.



FIGURE 3
 Oblique radiograph demonstrating a flattened, sclerotic, and fragmented left second metatarsal head.

ysis is present in the earliest phase of the disease. As patients tend to present quite late in the evolution of the disease, previous scintigraphic accounts, as in our second patient, depict Freiberg's disease as a diffuse increase in activity involving the metatarsal head (4). In previously reported cases the patients have most likely been scanned in the late revascularization phase and/or by routine planar images, which have not resolved a photopenic defect. Examination of our second patient, which included pinhole imaging, showed no photopenic defect; this correlates well with the patient's long history (Fig. 4B). In our first patient, only the high resolution magnification images, obtained with the pinhole collimator, were able to show the photopenic area surrounded by a very active revascularized collar (Fig. 2B); one would expect such findings in the early stages of avascular necrosis.

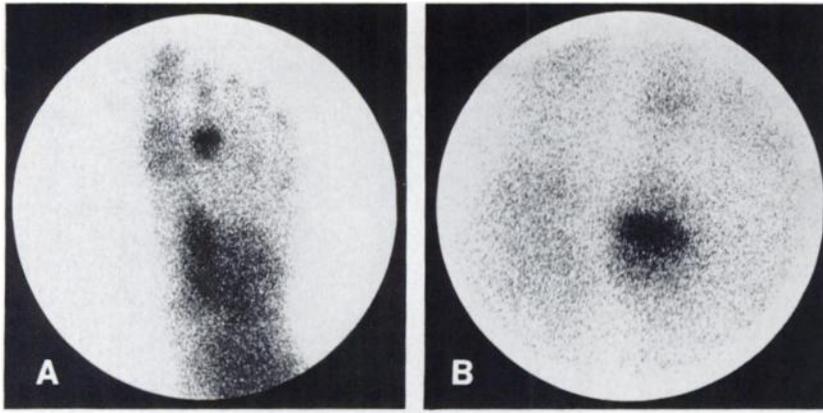


FIGURE 4

A: Planar image with increased activity in region of left second metatarsal head. B: Planar pinhole image with area of increased activity but no photopenic defect.

Scintigraphic demonstration of a photopenic metatarsal head in our first patient provides evidence that early in its course, Freiberg's infraction involves ischemia producing AVN. The photopenia of the scan predates significant radiographic findings that evolve over 6 mo time from being almost normal into the pattern typical of Freiberg's disease (flattened, fragmented, sclerotic appearance). Our second patient with advanced radiographic changes of AVN demonstrates the pattern of diffuse hyperactivity on scintiscan secondary to revascularization and repair. As with Legg-Perthe's disease, magnification bone scintigraphy should be used to make an earlier, more precise diagnosis.

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