New York, for part of the case material on Patient 3.

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Diverse Bone Scan Abnormalities in "Shin Splints"

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Four young patients who presented with pain over the anterior compartment of the legs, gave a recent athletic history suggesting stress fractures. Although radiographs were initially normal in all four cases, the bone scintigrams were positive. The individual findings, however, were quite different. In one there was a single focal area of increased radioactivity in each of the tibias; the second patient had uneven uptake of radiotracer and several foci of accumulation in the fibulas; the third showed diffuse linear tibial uptake suggesting periosteal lesions; and the fourth case revealed uptake in the lateral malleolus and in bones of the foot.

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Although the term "shin splints" has been applied to stress fractures in horses (*1*), it has also become commonly used by the laymen to refer to anterior leg soreness occurring in athletes (*2*). We have performed bone scans on four young people with negative radiographs of the area, who turned out to have stress fractures of the leg.

CASE REPORTS

All four patients were seen because of pain over the anterior compartments of one or both legs. Each had a history of active participation in sports, and radiographs of the legs were negative. Only one of these people had any other problem (spondylolisthesis of L-5 in Case 2). After the intravenous administration of Tc-99m methylene diphosphonate, images were obtained with a gamma camera. The pertinent data are summarized in Table 1, and scintigrams from each patient are shown in Figs. 1-4.

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RESULTS AND DISCUSSION

Stress fractures have been demonstrated early in their course by radionuclide imaging, before demonstrable radiographic changes (*3,4*). In each of the four cases presented here the initial

FIG. 1. Anterior scintiphotos in Case 1, demonstrating intense focal tibial uptake bilaterally.

TABLE 1. SUMMARY OF DATA ON FOUR PATIENTS HAVING BONE SCANS FOR "SHIN SPLINTS"

Case	Sex	Age	Athletic history	Early radiographic findings*	Bone-scan findings
1	M	15	Basketball player	Normal	One intense "hot spot" in each tibia
2	M	16	Active in track, jogging, and other sports	Normal tibias and fibulas	Multiple areas of uptake in both fibulas, and uneven uptake in tibias
3	F	21	Modern dancing, practiced 4 hr daily	Normal	Diffuse uptake along length of tibias
4	M	20	Runner, specialized in 440 yd distance	Normal	Uptake in lateral malleolus (fibula) and in bones of foot

* At time of bone scan.

radiographs of the tibias and fibulas were negative. The combination of anterior leg pain, negative radiographic findings, and a history of physical activity suggested the diagnosis of stress fractures. At this point, a diagnostic decision had to be made, pitting the advantages of establishing the diagnosis against radiation exposure from radionuclide bone imaging. Definite information from the imaging and the clinical course should clarify the need for subsequent radiographic examinations.

It is believed that stress fractures are the result of bone remodeling in response to repeated stress. The events appear to be: (a) bone resorption from the existing pattern, then (b) reformation in a design more appropriate for the stress. The sequence, however, may weaken the bone, with the appearance of small fractures. The positive findings in our four cases do not imply that all instances of anterior-compartment involvement will necessarily have stress fractures. Conversely, a bone scan, no matter what the results, does not rule out soft-tissue or other nonosseous disease. It is only late in the sequence of events that there is radiographic evidence of healing fractures, with focal radiolucencies, bony sclerosis, and periosteal reaction.

What clearly emerges from the present cases is that scintigrams in stress fractures may present at least four variants: focal tibial lesions, diffuse tibial lesions, a combination of tibial and fibular lesions, and fibular lesions perhaps with changes in the bones of the feet. The relative frequency of each type of lesion is still to be determined. The fibular abnormality is of particular interest, since such lesions may make it particularly difficult for the patient to locate the source of trouble.

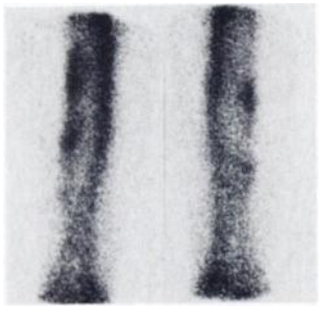

FIG. 2. Case 2: images of the lower anterior portions of the fibulas and tibias. (Right side is to viewer's left.)

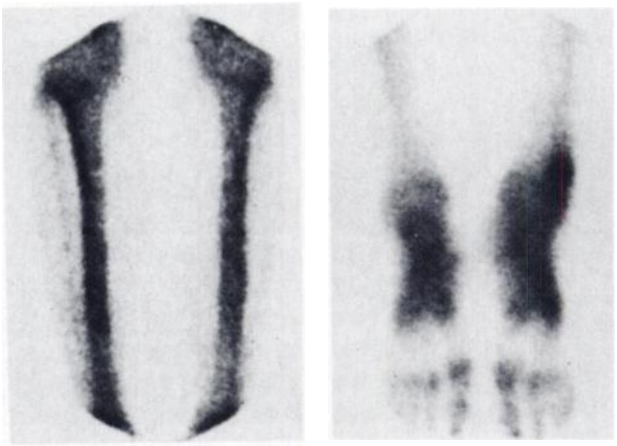

FIG. 3. (left) Case 3: intense and diffuse bilateral tibial uptake of radiotracer is noted.

FIG. 4. (right) Anterior scintiphotos in Case 4. Note uptake in left lateral malleolus and bones of feet.

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