

## Stress fractures: a diagnostic problem

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**SUMMARY** Three cases of stress fracture, in which diagnosis was aided by sequential radiographs and radionuclide scanning are presented; and a procedure for their management, which attempts to eliminate the need for invasive investigations, is suggested.

Stress fractures in children may present diagnostic dilemmas, as they may have clinical and pathological features in common with infectious or malignant conditions.<sup>1-3</sup> Although stress fractures have been described previously, the associated problems have received scant attention in published reports.

### Case reports

**Case 1.** A previously healthy 9 year old girl presented at the day care unit with a three week history of pain in the right shin and a mild limp. The pain was constant during the day, but disappeared at night. There was no history of trauma nor was there any evidence of an underlying bony or metabolic

disorder, febrile illness, or weight loss. Physical examination showed a mild swelling and local tenderness in the proximal and medial aspects of the right tibia. Blood count, erythrocyte sedimentation rate, and serum calcium and phosphorus concentrations and alkaline phosphatase activity were normal.

Radiographs of the right tibia at the time of initial evaluation showed a thick lamellar periosteal reaction over the proximal and medial aspect of the tibia; no fracture line was evident, and <sup>99m</sup>Tc radionuclide scintigraphy showed increased uptake across the proximal part of the tibia (Figure 1).

A computed tomography scan showed a non-specific region of slightly increased medullar density. A bone biopsy was considered and postponed, and during three weeks observation the symptoms progressively resolved. Serial radiographs showed thickening of the periosteal reaction and the appearance of a horizontal fracture line (Figure 2). A second bone scan, carried out after three weeks showed decreased uptake when compared with the previous one and confirmed the diagnosis of stress fracture of the right upper tibia. Only then did we learn that the patient was an amateur ballet dancer.



Fig. 1 Thick lamellar periosteal reaction over proximal posterior and medial aspect of the shaft of right tibia.



Fig. 2 Three weeks later: thickening of periosteal reaction and appearance of horizontal fracture line.

**Case 2.** A previously healthy 10 year old boy presented with a two week history of pain in the right tibia and a mild limp. The pain worsened during exercise and lessened at rest. There was no history of trauma. Physical examination yielded normal results, except for some swelling and tenderness at the medial aspect of the right tibia. All laboratory investigations gave normal results. Radiographs of the right tibia at the time of initial evaluation showed a thick periosteal reaction over the medial aspect of the upper shaft of the tibia with a blurred zone of the compact bone at the medial and posterior aspect. Computed tomography did not help, but radionuclide scintigraphy showed increased activity. Although the clinical and roentgenographic findings suggested stress fracture with subperiosteal haematoma, the possibility of a bone tumour could not be excluded. Complete rest was ordered. During the subsequent six weeks of follow up his symptoms progressively resolved. The x-ray findings did not change but a second bone scan clearly showed decreased activity compared with that of the first. Subsequent radiographs and bone scans performed three and eight months after admission yielded normal results.

**Case 3.** A 13 year old girl was admitted because of pain just below the left knee, which had lasted for about 10 days. There was no history of trauma. Physical examination showed slight tenderness and a mild swelling of the proximal medial aspect of her left tibia. Laboratory investigations showed no abnormality. Radiographs of the affected tibia showed thickening of an area of compact bone over the proximal and medial aspect of the metaphysis. A radionuclide scan showed increased activity across the affected area of the tibia, and a stress fracture was suspected. Her symptoms subsequently resolved; there was improvement on radiography and decreased uptake over the affected area on bone scan. Stress fracture was confirmed.

### Discussion

These three cases represent different presentations of stress fractures in children. Such injuries are uncommon in children, probably because of the increased flexibility of immature bones.<sup>3</sup> Devas<sup>1</sup> has shown that the most common site of a stress fracture in a child is the upper third of the tibia, and our case studies confirmed this. In adults the clinical history is the most important feature in diagnosis. The classic history is limb pain that recurs with a particular activity and is relieved by rest.<sup>4</sup> In children, however, the difficulty in obtaining a detailed history greatly limits the physician in this diagnosis (case 1).

The differential diagnoses include osteoid osteoma, infection, osteosarcoma, and Ewing's sarcoma.<sup>1,3</sup> Laboratory estimations—for example, blood count and erythrocyte sedimentation rate—may help to rule out osteomyelitis. The possibility of a tumour, however, is of great concern. In certain cases the distinction between these two conditions may be difficult because the suggestive history of stress fracture is often lacking in children and the clinical and diagnostic findings are usually not helpful. Furthermore, even bone biopsies are not always reliable for definitive diagnosis, because a healing stress fracture may histologically resemble a bone sarcoma or a Ewing's tumour.<sup>1,3</sup> Misdiagnosis has been emphasised by Engh,<sup>2</sup> who described nine children with stress fractures who had initial diagnoses of osteoid osteoma, low grade osteitis, and osteosarcoma.

Resolution of symptoms, typical serial x ray changes appearing two to three weeks after the onset of symptoms,<sup>1,4</sup> and an initial positive radionuclide bone scan that reverts to normal within four to six weeks,<sup>5,6</sup> may help to establish the diagnosis.

We therefore agree with Devas<sup>1</sup> and Engh,<sup>2</sup> who maintain that if there is any possibility that a bone lesion may represent a healing stress fracture biopsy should be avoided unless there is clear evidence that the lesion has not changed radiographically for several weeks. The dilemma of whether to biopsy the lesions was raised in all our cases. In cases of bone lesions with no expansion of the pathological process to the soft tissues, where a bone tumour is not highly suspected and all laboratory results are within normal limits, a policy of observation for a short period should therefore be adopted. In the interim complete rest should be ordered and close follow up started. Such management will avoid unnecessary biopsies.

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