

Musculoskeletal case 21. Diagnosis

Insufficiency fracture of the sacrum

The diagnosis was insufficiency fracture occurring in previously irradiated osteoporotic bone.

Figs. 2 and 3 (see question page 92) demonstrate an irregular, vertical, lucent line with sclerotic margins in the left sacral ala (open arrows) and an ill-defined lucency in the upper sacral ala on the right (closed arrows). The remainder of the bony pelvis, including the pubic bones, appear normal. On axial computed tomography through the sacrum, a characteristic pattern of irregular lucencies can be seen in both sacral alae (Fig. 4, arrows see page 92). The lucencies run in a vertical pattern through the alae along the length of the sacrum. Partially sclerotic margins are noted (arrows). No soft-tissue mass or spinal canal abnormality was identified, and apart from minor degenerative disease, the sacroiliac joints appear normal. A subtle linear area of sclerosis was noted in the pubic ramus corresponding to the findings on the bone scan (not shown).

Stress fractures are categorized into fatigue fractures, resulting from repetitive muscular stress on a normal bone, and insufficiency fractures, resulting from normal physiological stress on abnormal bone. Underlying conditions that weaken the elastic resistance of bone and predispose to insufficiency fractures include osteoporosis, rheumatoid arthritis, irradiation, osteomalacia and miscellaneous conditions such as fibrous dysplasia,

diabetes mellitus, Paget's disease and osteogenesis imperfecta.^{1,2} This type of fracture differs from pathologic fractures, which are described in the setting of underlying infection or neoplasm.¹

Insufficiency fractures usually present with sudden onset of lower back, hip or groin pain in the absence of significant trauma. The sacrum (particularly the superior aspect and the alae) and pubic bones are most commonly affected.³ When a patient with underlying malignant disease presents in this fashion, the chief concern is metastatic bone disease. Awareness by both clinician and radiologist is essential in making the diagnosis.

Sacral fractures are notoriously difficult to diagnose on plain radiographs. The only finding may be a sclerotic band, although cortical disruptions and frank fracture lines are occasionally seen.⁴ Findings in the pubic bones tend to be more readily appreciated, although not in this case. With time, however, insufficiency fractures of the pubis may develop an aggressive lytic appearance and simulate infection or malignant disease.⁴

Bone scintigraphy will often be diagnostic, particularly if the typical sacral butterfly or H-shaped pattern of uptake is seen — the "Honda sign."^{1,4} Incomplete versions of this pattern, including unilateral alar uptake may be seen and strongly suggest the diagnosis.⁴

Axial computed tomography demonstrating a sclerotic band, a linear fracture line or a combination of these may be required to confirm the diagnosis. Computed tomography is

also helpful in excluding a soft-tissue mass causing bone destruction or predisposing abnormalities such as a Tarlov cyst. Magnetic resonance imaging may also be used to assess insufficiency fractures. Magnetic resonance imaging will readily identify abnormal areas and exclude associated masses. However, in inexperienced hands, findings may occasionally be confusing,⁵ and in such cases correlation with either plain radiography or computed tomography may be required.

Treatment consists of bed rest, analgesia and graduated physiotherapy. Symptoms can take a year or more to resolve and up to 30 months to heal radiologically.

References

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