Parasymphyseal insufficiency fracture

Q W Arafat, A M Davies

Clinical history

A 62 year old postmenopausal woman presented with a one month history of pain in the left groin which caused her to limp, but was not incapacitating. The pain had become worse

and she also complained of vague, poorly localised back pain. She had suffered from rheumatoid arthritis for 12 years and took non-steroidal anti-inflammatory drugs. She had also intermittently received steroids for

Figure 1 Left parasymphyseal insufficiency fracture at presentation (A), at four months (B), and at 10 months (C).

The MRI Centre,
The Royal
Orthopaedic Hospital,
Birmingham B31 2AP,
United Kingdom
Q W Arafat
A M Davies

*Department of
Diagnostic Imaging,
The Robert Jones and
Agnes Hunt Orthopaedic
Hospital,
Oswestry,
Shropshire SY10 7AG,
United Kingdom.

Correspondence to:
Dr A M Davies.

exacerbations. Otherwise her general health was unremarkable.

Radiological findings

The initial anteroposterior pelvic radiograph (fig 1A) reveals an undisplaced fracture of the body of the left pubic bone, parallel to and about 1 cm lateral to the symphysis, with underlying osteopaenic bone. Four months later the appearance is of a destructive, mainly lytic lesion (fig 1B) whilst a further film ten months after the onset of symptoms demonstrates a more extensive destructive lesion with considerable callus formation (fig 1C). In addition, a broad, poorly defined band of sclerosis had developed in both sacral ala parallel with and adjacent to the sacroiliac joints.

Bone scintigraphy shows marked uptake at the site of the parasymphyseal lesion on the anterior view (fig 2, top) (partly obscured by activity within the adjacent bladder), while the posterior view shows bilateral, symmetrical wedge-shaped areas of increased activity in the sacral ala (fig 2, bottom).

Figure 2 Three hour bone scan images of the pelvis showing increased activity from the left parasymphyseal fracture (anterior image) and bilateral sacral insufficiency fractures (posterior image).

Computed tomography (CT) of the symphysis demonstrates the fracture of the body of the left os pubis with callus formation (fig 3). There is a little swelling of the associated soft tissues but no soft tissue mass.

Differential diagnosis

The initial radiographs are in keeping with a parasymphyseal insufficiency fracture. The later films show increasing lysis with callus and the appearances at this stage are suspicious of a malignant process, either metastatic disease or a primary bone tumour, for example, chondrosarcoma.

Final diagnosis: parasymphyseal insufficiency fracture with associated sacral insufficiency fractures.

Discussion

An insufficiency fracture is a stress fracture, occurring when normal forces are applied to weakened bone with reduced elastic resistance. The diagnosis is almost exclusively made in postmenopausal women with osteopaenic bone. It follows that any condition or treatment predisposing to osteopaenia will be a risk factor for insufficiency fractures, including rheumatoid arthritis, metabolic bone diseases including osteomalacia and rickets, steroid therapy, irradiation and previous surgery, particularly hip replacement.

The parasymphyseal insufficiency fracture has been relatively recently recognised, with the first three cases being reported in 1978,¹ all of which radiologically simulated malignancy (fig 1), as did later descriptions.²⁻⁴ Clinical diagnosis may be delayed, patients presenting with vague groin pain without history of significant trauma, with symptoms being attributed to coexisting arthritis or degenerative disease. Subsequent increased stress on already weakened bone leads to exacerbation of symptoms.

If radiographs are obtained early in the course of the disease (fig 1A), then the site and appearance are characteristic. However, the vague symptoms often mean that the initial radiograph is taken later in the course of the disease, during the healing phase. At this stage a combination of increasing lysis and callus formation leads to a destructive appearance which radiologically simulates malignancy (fig 1B, C). Considerable difficulty in making the correct diagnosis may arise, with surgical biopsy being undertaken as a result. Even pathologically, diagnosis can be difficult since there may be a confusing pattern of exuberant cartilage and disordered membrane formation,⁵ and erroneous histological diagnosis of chondrosarcoma has been reported.¹

The sinister radiological appearances are consequent on the delayed healing typical of the insufficiency fracture. This occurs as a result of a number of factors. Firstly, healing is intrinsically poor in the abnormal, osteopaenic bone. Secondly, since the fracture is often overlooked in the early stages, it is not immobilised. Repeated distraction at the frac-

ture site stimulates further disordered callus formation.

CT of the symphysis will show the fracture and callus with the absence of a significant soft tissue mass a valuable indicator of a benign process (fig 3).

Bone scintigraphy is a sensitive means of detection of a parasymphyseal fracture, appearing as an area of markedly increased uptake in the characteristic site, best seen on the anterior images (fig 2, top). Furthermore, scintigraphy will also detect other insufficiency fractures which may be present at a number of sites in the pelvic ring. These include the sacrum and various sites within the iliac bone (fig 2, bottom).⁶ The concomitant existence of parasymphyseal and other, frequently occult,

insufficiency fractures has recently been emphasised.⁷⁻⁹

Sacral insufficiency fractures in particular are now recognised as relatively common^{7 10 11} though often unsuspected,⁷ causing non specific low back pain. They are often overlooked on radiography since the findings are subtle, manifesting primarily as sclerosis secondary to trabecular compression and callus formation. Such fractures are difficult to detect in cancellous bone, particularly when osteopaenic. Furthermore the sacrum is an anatomically complex area and is often overlain by bowel gas shadows and vascular calcification. Their distribution is notably constant, vertical and parallel to the sacroiliac joints in the sacral ala and scintigraphy shows the characteristic

Figure 3 CT of the pubis showing a left parasymphyseal insufficiency fracture.

Figure 4 CT of the sacrum (different case) illustrating bilateral sacral insufficiency fractures (arrowheads) and a concomitant right iliac insufficiency fracture (open arrow).

symmetrical uptake in both sacral ala (fig 2, bottom), and sometimes also in the sacral body giving an 'H' shaped or butterfly appearance,¹¹ best seen on the posterior images. This appearance occurring with increased uptake in the parasymphyseal area is virtually diagnostic of insufficiency fracture.¹² In contrast, metastatic disease tends to cause a random pattern of multiple focal areas of uptake.¹¹ If the diagnosis is in doubt CT is valuable in confirming the fractures and excluding malignancy (fig 4).

Magnetic resonance imaging (MRI) is currently the most sensitive technique for imaging bone marrow and will show florid medullary signal changes at the site of insufficiency fractures.¹³ Whether MRI has a role in the detection and diagnosis of insufficiency fractures is debatable but it is important to recognise the appearances lest they be mistaken for evidence of metastatic disease.

Conclusions

The parasymphyseal insufficiency fracture is relatively uncommon. Diagnosis is often delayed and the radiographic appearances in the later stages may simulate a malignant lesion. A high index of clinical suspicion may avoid

unnecessary biopsy. Bone scintigraphy is the investigation of choice in detecting associated insufficiency fractures elsewhere in the pelvic ring.

- 1 Goergen T G, Resnick D, Riley R R. Post traumatic abnormalities of the pubic bone simulating malignancy. *Radiology* 1978; **126**: 85-7.
- 2 Casey D, Mirra J, Staple T W. Parasymphyseal insufficiency fractures of the os pubis. *Am J Roentgenology* 1984; **142**: 581-6.
- 3 Hall F M, Goldberg R P, Kasdon E J, Glick H. Post traumatic osteolysis of the pubic bone simulating a malignant lesion. *J Bone Joint Surg* 1984; **66(A)**: 121-6.
- 4 McGuigan L E, Edmonds J P, Painter D M. Pubic osteolysis. *J Bone Joint Surg* 1984; **66(A)**: 127-9.
- 5 Ackerman L V, Rosai J. *Surgical Pathology*, 5th ed. St Louis: C V Mosby, 1974: 1008.
- 6 Davies A M, Bradley S A. Iliac insufficiency fractures. *Br J Radiol* 1991; **64**: 305-9.
- 7 Cooper K L, Beabout J W, Sweet R G. Insufficiency fractures of the sacrum. *Radiology* 1985; **156**: 15-20.
- 8 De Smet A A, Neff J R. Pubic and sacral insufficiency fractures: clinical course and radiologic findings. *Am J Roentgenology* 1985; **145**: 601-6.
- 9 Davies A M, Evans N S, Struthers G R. Parasymphyseal and associated insufficiency fractures of the pelvis and sacrum. *Br J Radiol* 1988; **61**: 103-8.
- 10 Ries T. Detection of osteoporotic sacral fractures with radionuclides. *Radiology* 1983; **146**: 783-5.
- 11 Schneider R, Yacovone J, Ghelman B. Unsuspected sacral fractures: detection by radionuclide bone scanning. *Am J Roentgenology* 1985; **144**: 337-41.
- 12 Peh W C G, Gough A K S, Sheeran T, Evans N S, Emery P. Pelvic insufficiency fractures in rheumatoid arthritis. *Br J Rheumat* 1993; **32**: 319-24.
- 13 Brahme S K, Cervilla V, Vint V, Cooper K, Kortman K, Resnick D. Magnetic resonance appearance of sacral insufficiency fractures. *Skeletal Radiology* 1990; **19**: 489-93.