Scintigraphy in benign bone tumours

A report of 4 cases

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Summary

Four cases are presented to show the value of bone scintigraphy as an aid in the diagnosis of benign bone tumours. Scintigraphy is not only capable of localising these tumours but is also a useful monitor of local recurrence after surgery. In addition, a whole-body bone scan done at the same time will exclude active multifocal disease.

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Benign bone tumours are an important cause of pain and disability. The clinical picture varies with the site of the tumour and may mimic a multitude of other conditions including infection and malignant disease. Early detection and diagnosis are essential, since surgical extirpation is usually curative.

Four case histories are presented to illustrate the value of bone scintigraphy in the detection and localisation of benign bone tumours.

Case reports

Case 1

A 13-year-old girl presented with a 6-year history of low backache, which had become worse 6 months before admission to hospital. Physical examination revealed sensory loss in both legs in the stocking area and peri-anally, as well as a loss of lumbar lordosis. Dorsal and lumbar spinal radiography revealed no bony or paraspinal abnormality. Computed tomography (CT) of the lumbar spine and myelography were also non-contributory. A bone scan using technetium-99m methylene diphosphonate (^{99m}Tc MDP) was carried out and repeated 1 month later. Both studies showed a focus of increased activity in the fourth lumbar vertebra (L4) (Fig. 1 (left)). CT showed typical features of an osteoid osteoma in the lamina of L4 on the right (Fig. 1 (right)). The tumour was surgically removed and the diagnosis on histological examination suggested the strong probability of an osteoid osteoma.

Case 2

A 7-year-old boy presented with a 2-year history of intermittent neck pain with torticollis to the right side. Radiography of the cervical spine was reported to reveal no abnormality. Bone scintigraphy using ^{99m}Tc MDP showed an intense focus at the level of the third cervical vertebra (C3) in the region of the arch on the right side (Fig. 2 (left)). Reviewing the radiographs showed sclerosis in C3. CT demonstrated the presence of a tumour in the pedicle of C3. This was successfully curetted and the diagnosis on histological examination was a typical benign osteoblastoma.

Case 3

An 18-year-old boy presented to hospital with progressively worsening pain in the right buttock, which he related to a fall the previous year. Physical examination elicited an area of tenderness over the sacrum with an area of paraesthesia over the right buttock. Radiography, including CT, proved non-contributory and a biopsy specimen removed during surgical exploration of the lower sacral area was normal on histological examination. The patient's pain persisted and a bone scan was done 6 months later. An intense focus was visualised in the lower part of the sacrum on the right (Fig. 2 (centre)). CT subsequently demonstrated a destructive lesion of the body of the fourth sacral vertebra (S4). The tumour was surgically removed and the diagnosis on histological examination was an aggressive osteoblastoma. A repeat bone scan done 7 months later showed no abnormal activity in the sacral region.

Case 4

A 64-year-old patient presented to hospital with a painful right shoulder of 7 weeks' duration not relieved by analgesics or anti-inflammatory medication. Examination elicited tenderness of the right shoulder with some pain on movement. Radiography revealed stippled sclerosis in the head of the right humerus. Bone scintigraphy with ^{99m}Tc MDP showed a focus of increased activity in the right humeral head (Fig. 2 (right)). Scintigraphy was repeated a year later and no change was observed in the size or intensity of the focus. Whole-body scintigraphy showed no evidence of multifocal disease. A biopsy specimen of the right humeral head demonstrated features of benign enchondroma.

Discussion

Osteoid osteomas occur in young patients who usually present to hospital with pain. The pain is often atypical making a clinical diagnosis difficult, while the small size of the lesions (< 1,5 cm) renders one-third of them radiographically elusive.[1,2] Bone scintigraphy, on the other hand, will detect the presence of an osteoid osteoma with a sensitivity of almost 100%.[1] This is due mainly to the fact that the nidus is made up of new osteoid bone surrounded by highly vascularised osteogenic connective tissue.[1,3,4] All phases of the bone scintigraph — the dynamic, blood pool and delayed phases — show intense activity. The first case demonstrates the value of bone scintigraphy in localising the lesion for subsequent identification by CT. Interestingly, osteoid osteomas of the vertebrae are found chiefly in the arch or spinous process while the vertebral body is usually spared.[3]

Benign osteoblastomas are rare tumours that involve mainly vertebrae and long bones in young patients.[3] Larger than osteoid osteomas, these tumours are histologically similar and

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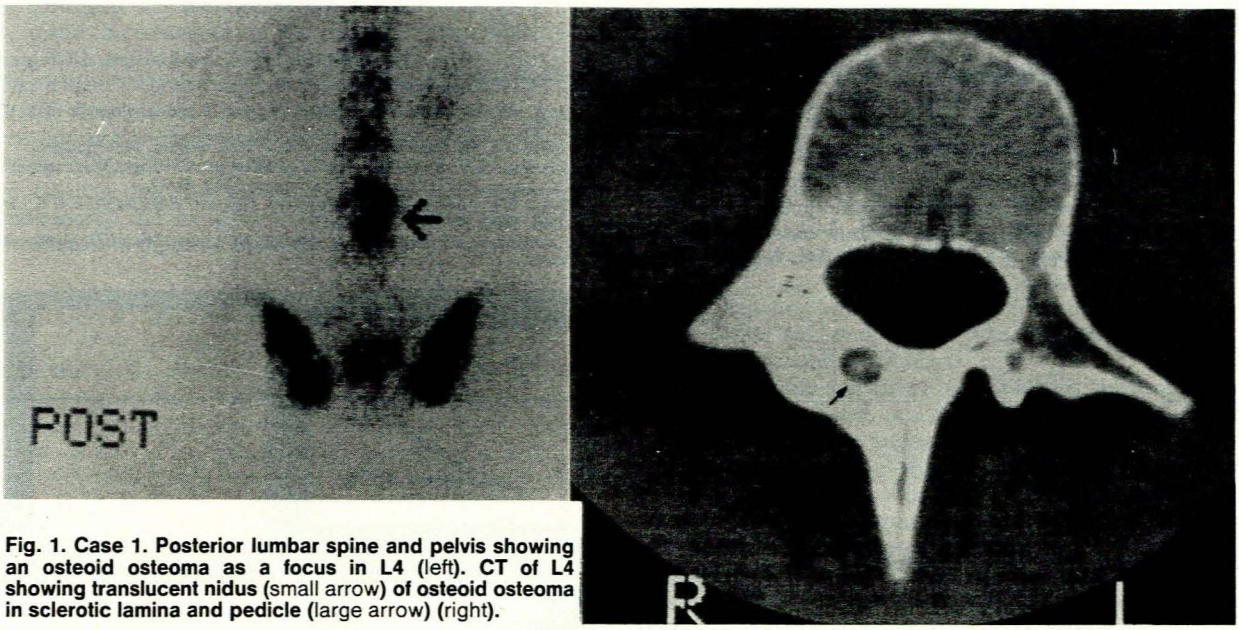

Fig. 1. Case 1. Posterior lumbar spine and pelvis showing an osteoid osteoma as a focus in L4 (left). **CT of L4 showing translucent nidus** (small arrow) **of osteoid osteoma in sclerotic lamina and pedicle** (large arrow) (right).

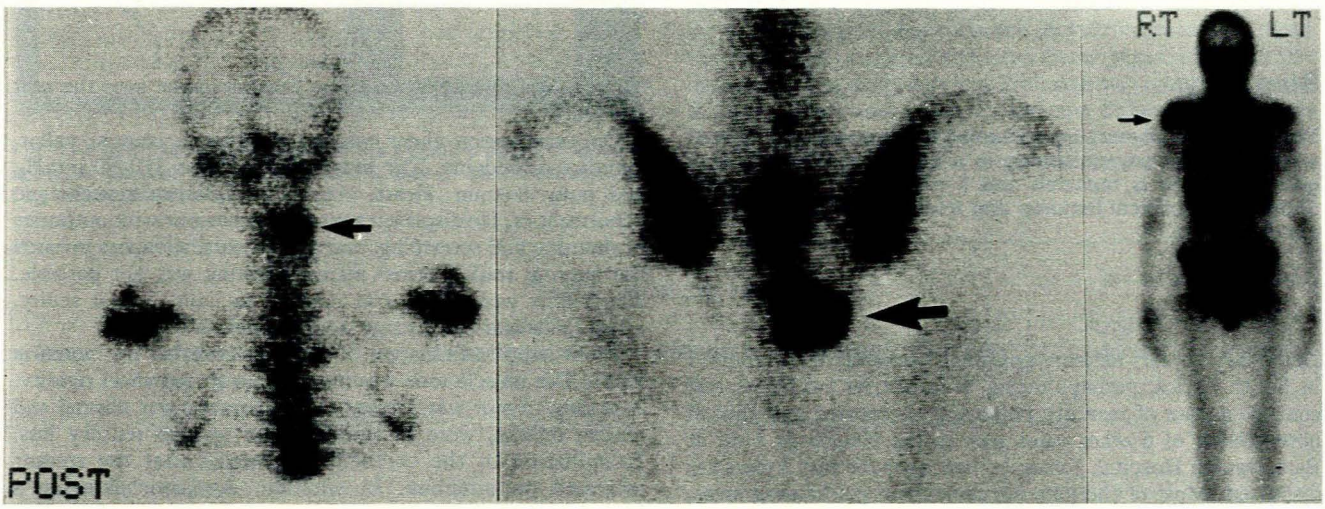

Fig. 2. Bone scans of the cervical region showing an osteoblastoma as an intense focus in C3 (case 2, left) **and of the lumbar-sacral region showing an aggressive osteoblastoma as an intense focus in the lower sacrum on the right (case 3,** centre). **A whole-body bone scan (anterior view) shows an enchondroma as a focus in the right humeral head (case 4,** right).

they too show intense uptake of ^{99m}Tc MDP because of abundant osteoid and highly vascular intertrabecular tissues.[2,3] The second case demonstrates the ability of the bone scan to localise the osteoblastoma and act as a guide for further diagnostic investigation such as CT. The third patient showed intense uptake of ^{99m}Tc MDP in an aggressive osteoblastoma situated in the lower sacrum. Again, a conventional radiographic search had proved fruitless. Furthermore, subsequent bone scans confirmed that the entire tumour had been removed and excluded a recurrence.

Enchondromas occur only in bones preformed in cartilage.[1] They usually involve the phalanges but long bones may be affected, as illustrated in case 4. Enchondromas may occur in young or older patients with an age range of 10 - 50 years. The tumour may remain asymptomatic for many years before the patient presents with pain and disability. The dense stippling noted on the radiographs in patient 4 is typical and represents the calcification and/or ossification of a lesion that is regressing.[5] In this patient scintigraphy demonstrated a tumour that concentrated the radiophosphate. However, this is not a consistent finding, since in enchondromas the bone scan may be normal during periods of quiescence.[2] The dynamic and blood pool images in patient 4 showed an absence of hyperaemia, a feature that distinguishes the enchondroma from the osteoid osteoma and osteoblastoma. Whole-body scintigraphy excluded multifocal disease. A repeat bone scan failed to demonstrate increased activity or an extension of the lesion, either of which may herald malignant change. Enchondromas in long bones are prone to undergo malignant change often after long periods of quiescence.[5]

Conclusion

The value of bone scintigraphy in localising benign bone tumours is illustrated by the above 4 cases. Indeed, the bone scan played an essential role in locating those tumours missed by conventional radiography and CT. Once scintigraphy had located the site of the tumour CT identification facilitated a rapid diagnosis. Moreover, bone scintigraphy may be of assistance when deciding whether the tumour has been totally excised or if a recurrence or multifocal disease is suspected.

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