

# OSTEOBLASTOMAS OF THE AXIAL SKELETON SHOWN BY SKELETAL SCANNING: CASE REPORT

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*Two patients with osteoblastoma of the axial skeleton showed intense uptake of  $^{99m}\text{Tc}$ -polyphosphate and  $^{99m}\text{Tc}$ -diphosphonate on skeletal scans. Although this lesion is uncommon, it should be included in the differential diagnosis for young patients who show abnormal accumulation of  $^{99m}\text{Tc}$ -phosphates in the axial skeleton.*

This communication describes two cases of benign osteoblastoma that were shown by labeled phosphate scanning. The findings suggest that this lesion must be considered in young patients with localized accentuated uptake of  $^{99m}\text{Tc}$ -phosphates in the axial skeleton.

## CASE REPORTS

**Case 1.** For 8 months a 5-year-old boy had had vague back pain, frequently awakening him at night, and increasing enuresis. His past medical history was unremarkable. Physical examination revealed a slight lumbar scoliosis to the right and a minimal weakness of the right hip flexers. Laboratory evaluations including CBC, UA, ESR, serum protein electrophoresis, skin test for TB, LE prep, uric acid, alkaline phosphatase, and rheumatoid factors were normal.

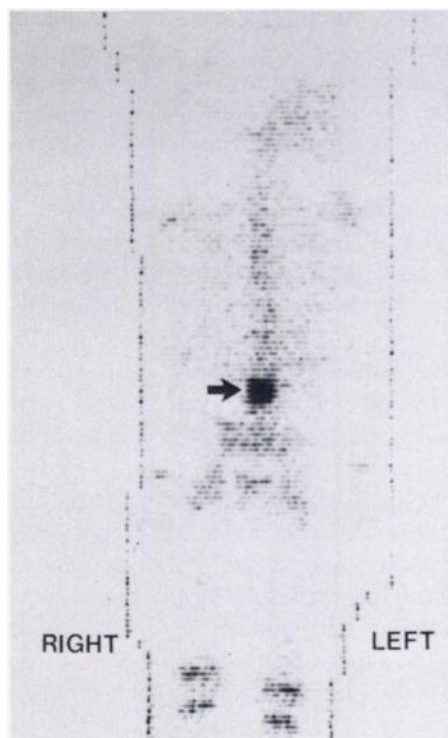
A skeletal scan was performed 3 hr after the intravenous administration of 3 mCi of  $^{99m}\text{Tc}$ -polyphosphate on a Model-54 Ohio-Nuclear Dual-Probe Rectilinear Scanner equipped with a 66-hole 3.5-in.-focal-length medium-resolution collimator (No. 53538-M). The radionuclide images showed marked concentration of activity at the third lumbar vertebra, L-3 (Fig. 1). Appropriate radiographs, including laminograms of the lumbar spine, revealed a destructive expansile lesion involving the right neural arch of L-3. Patchy areas of ossification were identified within the lesion but there was no evidence of fracture. The radiograph interpretation was that osteoblastoma was most likely; fibrous dysplasia and

aneurysmal bone cyst were considered less likely. Subsequent lumbar myelogram was normal. Since no cord compression was apparent, the referring physicians elected to observe the child.

The child was readmitted to the hospital 10 months later with increased back pain, soft-tissue fullness over the L-3 region on the right, increasing difficulty in forward bending, and hyperactive deep tendon

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**FIG. 1.** Case 1. Initial posterior bone scan showing marked uptake of  $^{99m}\text{Tc}$ -polyphosphate at L-3 (arrow).

reflexes. Radiographs of the lumbar spine showed an increase in the size of the L-3 neural arch lesion. Repeat skeletal scan showed greater concentration of  $^{99m}\text{Tc}$ -polyphosphate in the lesion than observed on the previous study (Fig. 2). Repeat myelogram revealed a large extradural defect at L3-4 encroaching upon the subarachnoid space posteriorly on the right.

Surgery revealed a 2-3-cm-diam tumor which involved the lamina and pedicle of L-3. The lesion extended cephalad deforming the lamina of L-2 and caudad deforming the lamina of L-4, and it pushed downward against the dural sac. The pathologic diagnosis was osteoblastoma.

**Case 2.** A 24-year-old white woman had had dyspareunia and vague perineal discomfort for 5 years prior to this admission. She had been examined numerous times by private physicians and was referred to the Medical Center with a presumptive diagnosis of psychophysiologic reaction. Her past medical history was unremarkable. Physical examination revealed tenderness to palpation of the perineum posterior to the rectum and anterior to the sacrum. Rectal examination revealed a firm mass posterior and extrinsic to the rectum. Radiographs of the pelvis and sacrococcygeal spine showed a well-circumscribed blastic expansile lesion involving the anterior lateral aspect of the fifth sacral segment, S-5.

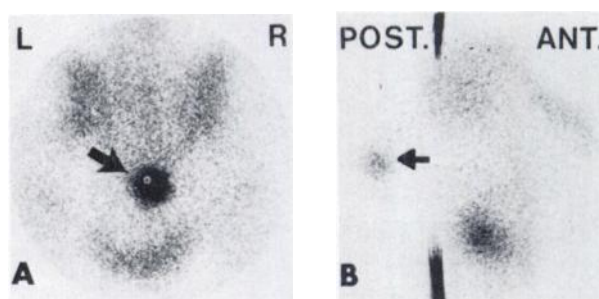
Six weeks after her initial examination she was admitted to the hospital. A skeletal scan following the administration of 10 mCi of  $^{99m}\text{Tc}$ -diphosphonate and using the same rectilinear scanner and collimator as in Case 1 showed an intense concentration of radioactivity in the distal sacrum. To confirm that this activity was not in the bladder, anterior and right lateral scintillation camera images, using a Searle Radiographics Pho/Gamma III HP scintillation camera equipped with a 15,000-hole LEAP low-energy collimator and accumulating 300,000 counts were obtained, verifying the distal sacral lesion (Fig. 3). Appropriate laminograms of the sacrum revealed a rounded sharply circumscribed 2-3-cm expansile blastic lesion of S-5. There was no evidence of fracture. The radiography interpretation was that this lesion most likely represented an osteoblastoma; osteochondroma and chordoma were considered less likely. A barium enema showed slight anterior displacement of the rectum. Routine blood values including alkaline phosphatase were normal. At surgery a 3-cm expansile lesion of S-5 was resected. The pathologic diagnosis was osteoblastoma.

#### DISCUSSION

Osteoblastomas are most commonly found in the axial skeleton during the first three decades of life



**FIG. 2.** Case 1. Second posterior bone scan 10 months later, showing increased accumulation of  $^{99m}\text{Tc}$ -polyphosphate at L-3 (arrow).



**FIG. 3.** Case 2. Anterior (A) and right lateral (B) scintillation camera images of bony pelvis showing lesion in terminal sacrum (arrows).

(1). Histologically these tumors are very vascular and show variable amounts of osteoid and ossification with actively proliferating connective tissue (1,2). Osteoid osteomas contain a nidus consisting of an interlacing network of disorganized osteoid trabeculae. The central part of the nidus may ossify and have vascular and fibrous connective tissue components. Frequently the nidus is surrounded by solid dense sclerotic bone. The histology and clinical manifestations of osteoid osteomas and osteoblastomas are very similar in the axial skeleton (1,2). Many times the pain caused by osteoblastoma is not intrinsic to the tumor, but secondary to pressure on adjacent structures or referred to a distant site because of impingement on spinal cord or nerve roots. This was shown in both of our cases.

Accumulation of  $^{99m}\text{Tc}$ -phosphates in skeletal lesions has been attributed variously to vascularity, the presence of immature collagen, phosphatase binding, and chemo-absorption on the hydroxyapatite crystal during osteoblastic activity (3-7). All of these processes are present in an osteoblastoma.

Gilday (8) has reported three cases of osteoid osteoma of the axial skeleton which were positive on skeletal imaging following administration of  $^{99m}\text{Tc}$ -diphosphonate. In each case the lesion had caused symptoms for at least 2 years and were undiagnosed prior to the scan localization.

With the advent of the  $^{99m}\text{Tc}$ -phosphate family as skeletal scanning agents, diminished radiation dose, better-quality skeletal images, and shorter scanning time are now possible (3). No longer is skeletal imaging reserved for those patients with known carcinoma. Numerous pathologic entities including primary benign and malignant bone tumors, metastatic disease, trauma, infection, and such tumor-like conditions as fibrous dysplasia, aneurysmal bone cysts, and histiocytosis may cause positive bone scans in the axial skeleton in children and young adults. We advocate routine skeletal scanning for all patients, including children, who have unexplained atypical or referred pain of suspected skeletal etiology to aid in the localization of disease processes so that the

most appropriate, definitive diagnostic study can then be obtained. Osteoblastoma should be strongly considered when a particularly intense localized accumulation of activity appears in the axial skeleton in young patients.

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