Bone Scanning in Osteolytic Paget's Disease: Case Report

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Technetium-99m polyphosphate bone scans of three elderly patients with osteolytic Paget's disease are presented. Similar findings of increased accumulation of the tracer in the region of diseased bone, and even greater uptake at the advancing edge of osteolysis, are seen in both the skull and long bones. The reason for this scintigraphic pattern is postulated from histologic findings of osteolytic Paget's disease.

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The radiographic appearance of osteolytic Paget's disease has been well described (1,2). The characteristic lytic phase in the skull—termed osteoporosis circumscripta—precedes cortical thickening and other proliferative changes. Paget's disease in the long bones begins at the subchondral margin and proceeds in a diaphyseal direction with an advancing wedge of osteolysis.

Although much has been written regarding the scintigraphic findings of advanced Paget's disease (3-5), little attention has been focused on the findings during the early osteolytic phase of the disease (5). We report three cases of early Paget's disease to show the scintigraphic findings.

METHODS

Patients were injected intravenously with 15 mCi of technetium-99m polyphosphate and scanned 2–3 hr later. Imaging was performed either with a dualprobe (5-in.) rectilinear scanner with collimators focusing at 3.5 in.,* or with a scintillation camera with a high-resolution, low-energy collimator.† For the rectilinear scans, the scan speed was adjusted to obtain an information density between 800 to 1000 counts/cm² with the upper probe over the sternum and the lower probe over the thoracic spine; total-body images were obtained with a 1:5 minification. For the scintillation camera, a 25% window was selected and centered over the 140-keV technetium

IN THREE PATIENTS OF TC-99m BONE SCANS IN THREE PATIENTS WITH OSTEOLYTIC PAGET'S DISEASE			
	Patient		
	1	2	3
Age	45	84	62
Sex	M	M	M
Distribution of abnormality:			
Scan	Skull	Skuli	Femur
Radiograph	Skull	Skull	Femur
Alk phos			
(nl 4.5-11 I.U.)	13.3	9.4	4.5



FIG. 1. Patient 1. (Top) Radiograph shows osteoporosis circumscripta in parieto-occipital area with advancing edge of osteoporosis (arrows). (Bottom) Bone scintiscan shows increased tracer uptake in corresponding area with greater increase at advancing edge (arrow).

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photopeak. For each image 200,000 counts were collected.

RESULTS (TABLE 1)

Two patients were admitted to the Veterans Administration Hospital for workup of chronic dementia. No previous history of Paget's disease was obtained. Routine skull films revealed osteoporosis circumscripta [Figs. 1 (top) and 2 (top)]. Bone surveys showed no additional evidence of Paget's disease. Abnormalities on the scintiscans correlated closely with the radiographic findings and showed increased tracer uptake throughout the lesion, with even greater uptake at the advancing edge of osteoporosis. The appearance resembled a "doughnut lesion" [Figs. 1 (bottom) and 2 (bottom)].

The third patient was evaluated for a prostatic nodule. The bone scan preceded the radiographs [Fig. 3 (left)] and was initially interpreted as showing a focal lesion in the left femur thought to represent metastatic disease. The augmented tracer uptake adjacent to the lesion was attributed to hyperemia, as has been reported previously in both neoplastic and infectious conditions (6). Subsequent radiographic examination of the femur [Fig. 3 (right)] showed the classical lesion of osteolytic Paget's disease without evidence of metastatic foci. The advancing wedge of osteolysis corresponded to the area of greatest uptake on the bone scan.

At operation, a well-differentiated carcinoma (grade 1B) was found. A radical lymph-node dissection revealed no evidence of metastatic disease.



FIG. 2. Patient 2. (Top) Skull film shows osteolytic Paget's disease in frontal region with advancing edge (arrows). (Bottom) Scintiscan shows abnormal accumulation of Tc-99m polyphosphate in frontal area. Note increased activity at advancing edge (arrow).



FIG. 3. Patient 3. (Top) Bone scan shows increased uptake in left femur distally with apparent focal accumulation in midfemur (arrow). Foci of increased uptake in lumbosacral spine corresponded to degenerative changes on radiographs. (Bottom) Distal left femur shows Paget's disease with flame-shaped advancing wedge (arrow) corresponding in position to area of greatest accumulation of tracer.

A 9-month followup radiograph showed no progression of the femoral lesion or evidence of metastasis.

DISCUSSION

Previously reported scintigraphic findings in Paget's disease include an increase in both the rate and the amount of tracer accumulation in the diseased bone, bone expansion, and evidence of bone-marrow replacement (4,5,7). Pagetoid bone is known to exhibit increased vascularity and abnormal osteoblastic activity (8).

Miller et al. (5) previously reported the scintigraphic findings in a patient with osteoporosis circumscripta. Focal areas of increased activity were noted in the advancing edge of the lesion compared with its central portion. Our three cases confirm this same finding in the lytic phase of Paget's disease both in the skull and the long bones. The increased accumulation of tracer in the advancing edge can be related to histologic findings. Early in the course of the disease, increased vascularity and cellularity of the marrow occur adjacent to the diseased bone. The surfaces of trabeculae in the spongiosa show numerous Howship's lacunae containing many osteoclasts as well as evidence of new bone production. Focal deposits of new bone can also be seen microscopically along the wall of the affected cortex. It is not until later in the disease that the vascularity diminishes to some degree and marrow replacement occurs (8).

The scintigraphic findings accompanying lytic Paget's disease include increased activity of the diseased bone with a greater accumulation of the tracer at the advancing edge. Such an appearance is characteristic and, when correlated with an appropriate radiographic examination, allows reliable diagnosis even in difficult cases.

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FOOTNOTES

* Ohio-Nuclear Collimator Model 24-L. † Searle Model HP.

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