Cold Areas in Bone Scanning

Photon-deficient ("cold") lesions on bone scans have been described recently as a newly recognized phenomenon of bone imaging (*1,2*). These photon-deficient areas correspond to a variety of disease processes including metastatic tumor, post-traumatic aseptic necrosis, and sickle cell sludging. Recently, we encountered a photon-deficient lesion that has not been previously reported.

A 34-year-old woman had a bone scan as part of a workup for osseous metastases in August 1975. Eleven years earlier, the patient had had a malignant melanoma removed from the right lower leg. At that time, a right inguinal node biopsy was negative. Ten years later, 1 year before the bone scan, she had a right groin dissection for nodal metastases. She had no history of previous trauma or radiotherapy to the spine, and she denied any symptoms referable to the axial skeleton. Pertinent laboratory data included normal serum calcium and alkaline phosphatase levels.

Anterior and posterior rectilinear scans of the torso were performed 3 hr after the intravenous injection of 15 mCi of ^{99m}Tc-diphosphonate, using a 5-in. dual-probe scanner (Ohio-Nuclear, Solon, Ohio) fitted with low-energy collimators (8.9 cm focal distance, 1.0 cm geometric radius), with 5:1 minification.

The posterior image showed a photon-deficient area in the region of the first lumbar vertebra (Fig. 1). On radiographs the L_1 vertebral body exhibited a general diminution of density and vertically oriented trabeculations separated by clear spaces. The x-ray features, which were unchanged in 18 months, were diagnostic of a cavernous hemangioma (*3*). The remaining vertebrae were normal. The upper lumbar spine, as seen on an oral cholecystogram, is shown in Fig. 2.

The considerable loss of bone secondary to replacement of the normal bone architecture by thin trabeculations probably accounts for the presentation of the hemangioma as a photon-deficient area on the scan. Residual bone uptake presumably is either normal or insufficiently increased to compensate for the loss of bone substance. Based on this observation, we think that the differential diagnosis of cold areas on bone scans should include hemangiomas of bone in addition to such previously reported causes as osteolytic metastases and arrest of intraosseous blood flow.

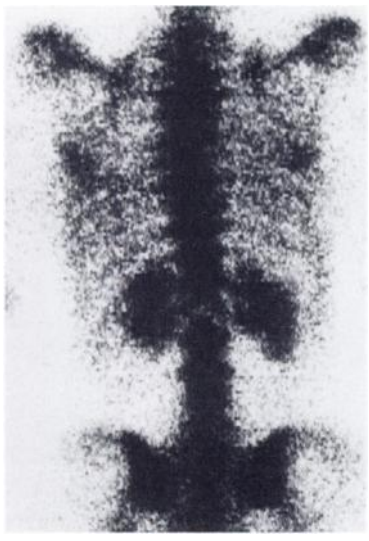

FIG. 1. Posterior rectilinear scan of torso shows cold area in region of first lumbar vertebra.

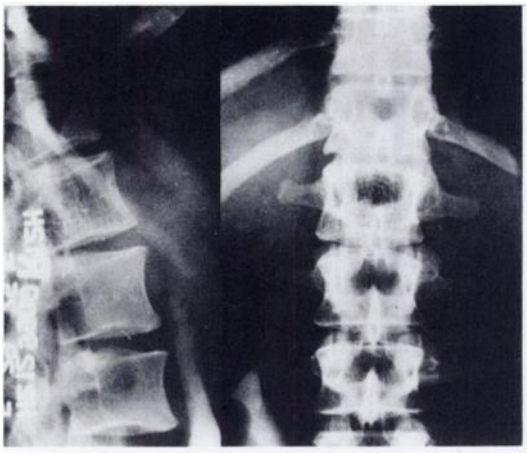

FIG. 2. Anterior and lateral projections of lumbar spine show general diminution of density and vertically oriented striations involving L_1 vertebral body. These changes are diagnostic of cavernous hemangioma.

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REFERENCES

1. GOERGEN TG, ALAZRAKI NP, HALPERN SE, et al.: "Cold" bone lesions: A newly recognized phenomenon of bone imaging. *J Nucl Med* 15: 1120–1124, 1974

2. SY WM, WESTRING DW, WEINBERGER G: "Cold" lesion on bone imaging. *J Nucl Med* 16: 1013–1016, 1975

3. SHERMAN RS, WILNER D: The roentgen diagnosis of hemangiomas of bone. *Am J Roentgenol Radium Ther Nucl Med* 86: 1146–1159, 1961

Incidence of Solitary Skull and Extremity Involvement in Whole-Body Scintigrams

Following our recent publication (*1*), in which the use of whole-body scanning was emphasized because of the widespread dissemination of osseous abnormalities throughout the skeleton (including the extremities), a number of inquiries were received from institutions imaging only the axial (vertebrae, thorax, pelvis) skeleton. Specifically, these questions were directed toward the incidence of skull or extremity

TABLE 1. INCIDENCE OF ONLY SKULL AND EXTREMITY ABNORMALITIES DETECTED WITH ^{99m}Tc-Sn-HEDP IN NONOSSEOUS MALIGNANT NEOPLASMS

Bone scan indication	Total	Abnormal	Skull	Extremities
Breast	368	247	12 (5%)	14 (6%)
Lung	230	147	2 (1%)	14 (10%)
Prostate	191	119	2 (2%)	11 (9%)
Hodgkin's	58	29	0	1 (3%)
Lymphoma	42	16	0	2 (12%)
Cervix	41	23	3 (13%)	4 (17%)
Rhabdomyosarcoma	39	22	1 (4%)	6 (27%)
Colon	37	21	3 (14%)	2 (10%)
Kidney	35	21	2 (10%)	3 (14%)
Bladder	35	15	1 (7%)	0
Melanoma	30	17	5 (29%)	4 (24%)
Rectum	23	14	0	1 (4%)
Thyroid	14	6	0	0
Total	1143	697	31 (4%)	62 (9%)

abnormalities without abnormal axial uptake of the bone agent (^{99m}Tc-Sn-HEDP).

We have retabulated our clinical data to determine the number of cases in which the only abnormality was reported in the skull or the extremities (Table 1). The overall incidence for solitary skull uptake was 4% and that for solitary extremity uptake was 9%. For solitary uptake in the extremities, upper involvement was limited to the humeri (15%), with one report of a solitary abnormality in the hand. The remaining solitary abnormalities in the extremities (85%) were distributed 70% to femora and 30% to tibias or fibulas.

The 5–10% incidence of skull or extremity uptake without involvement of the axial skeleton reemphasizes the desirability of whole-body scintiscans.

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REFERENCE

1. TOFE AJ, FRANCIS MD, HARVEY WJ: Correlation of neoplasms with incidence and localization of skeletal metastases: An analysis of 1,355 diphosphonate bone scans. *J Nucl Med* 16: 986–989, 1975

Cellular Site of $^{99m}TcO_4$ Secretion in the Stomach

I would like to comment on a letter to the editor by T. K. Chaudhuri (*1*) concerning the cellular site of the secretion of $^{99m}TcO_4$ in the stomach. The work of Meier-Ruge and Fridrich (*2*) was not quoted in its entirety. Their experiments not only showed selective secretion of pertechnetate by the parietal cells, but also a predominant secretion of iodide by the chief cells, with only small amounts of iodide being secreted by the parietal and mucus-secreting cells. This is astonishing in view of the many physiologic similarities betweeen iodide and pertechnetate. Because of this contrasting behavior of iodide and pertechnetate in the stomach, Meier-Ruge and Fridrich suggested that microautoradiography should be used with both tracers to distinguish parietal from chief cells.

I agree that further studies regarding the distribution of iodide and pertechnetate in the gastric mucosa are badly needed. A better understanding of the gastric excretion of pertechnetate might also offer an explanation for the disturbing observation that not all gastric-type mucosa contained in Meckel's diverticula are visualized by pertechnetate scanning (*3–5*).

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REFERENCES

1. CHAUDHURI TK: Cellular site of secretion of $^{99m}TcO_4$ in the stomach—A controversial point. *J Nucl Med* 16: 1204–1205, 1975

2. MEIER-RUGE W, FRIDRICH R: Die Verteilung von Technetium-99m und Jod-131 in der Magenschleimhaut. Ein Beitrag zur Methodik der Mikrohistoautoradiographie wasserlöslicher Isotope. *Histochemie* 19: 147–154, 1969

3. DUSZYNSKI DO, JEWETT TC, ALLEN JE: Tc^{99m} Na pertechnetate scanning of the abdomen with particular reference to small bowel pathology. *Am J Roentgenol Radium Ther Nucl Med* 113: 258–262, 1971

4. LEONIDAS JC, GERMANN DR: Technetium-99m pertechnetate imaging in the diagnosis of Meckel's diverticulum. *Arch Dis Child* 49: 21–26, 1974

5. WINTER PF: Unpublished data, 1975

Reply

I appreciate Dr. Winter's comments on our article (*1*). Since our major interest was the cellular localization of $^{99m}TcO_4$ in the stomach, we did not feel it necessary to dis-

FIG. 1. Autoradiograph (×800) of gastric mucosa of mouse (taken 15 min after injection of ^{99m}Tc-pertechnetate) shows localization of grains predominantly in mucus-secreting cells (arrow) of surface mucosa. Parietal and chief cells show very few or no silver grains.