

NUCLIDE ANGIOGRAPHY IN PAGET'S DISEASE OF THE SKULL: CASE REPORT

P. M. Fitzer

Riverside Hospital, Newport News, Virginia

Early-appearing and persistent uptake on nuclear angiography in a patient with early Paget's disease of the skull is described. The diagnosis of subdural hematoma may be ruled out at the time of brain scanning.

A recent report suggested the use of ^{99m}Tc -pyrophosphate bone scanning for differentiating subdural hematoma from early Paget's disease of the skull in patients with normal skull roentgenograms and a positive crescentic uptake pattern on ^{99m}Tc static brain scanning (1). This report describes a patient with classic early Paget's disease on skull roentgenograms, corresponding crescentic peripheral uptake on static ^{99m}Tc brain scanning, and early-appearing and persistent uptake on intravenous nuclide angiography. The findings on nuclide angiography allowed the diagnosis of subdural hematoma to be ruled out at the time of brain scanning.

CASE REPORT

RC, a 64-year-old male groundskeeper, presented with left hemiplegia of 12 hr duration. There was no history of head trauma, and no recent headache, stiff neck, or loss of consciousness were reported. He had been in good health previously except for mild hypertension and adult onset diabetes mellitus. Pertinent physical findings included blood pressure 170/90, and weakness of the left leg, arm, and left facial muscles with no loss of sensation. There was a positive Babinski sign on the left; reflexes were hyperactive on the left. The clinical impression was cerebrovascular accident involving the right middle cerebral artery. Skull roentgenograms showed lytic involvement of the left frontal bone and sclerosis of the facial bones (Fig. 1) and were thought to represent Paget's disease of bone. This was confirmed by pelvic roentgenograms showing classic changes of Paget's disease of bone, and by multiple markedly elevated serum alkaline phosphatase levels (average 330 IU; normal range, 30–125 IU).

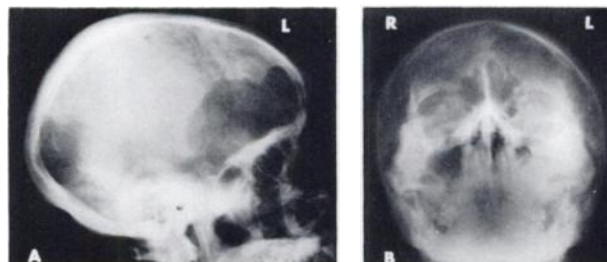


FIG. 1. Anteroposterior (A) and Water's (B) projection show lytic area in left frontal bone and sclerosis of facial bones.

Nuclide angiography and static brain scans were performed 20 hr after admission. A 15-mCi bolus of ^{99m}Tc -pertechnetate was given; a Pho/Gamma HP scintillation camera was used with image recording on the 70-mm Medical Electronic Diagnostic Corp. system. The nuclide angiogram showed early-appearing and persistent left frontal uptake (Fig. 2). Static scintiphotos 30 min later showed persistence of the left frontal uptake (Fig. 3). The scan findings were thought to represent the increased vascularity of Paget's bone. A subsequent ^{99m}Tc -polyphosphate bone scan (15 mCi, New England Nuclear kit) showed intense uptake in the facial bones and skull on the left (Fig. 4). Uptake was also noted in the pelvis in the area of Paget's bone seen on the roentgenogram.

DISCUSSION

The abnormal bone of Paget's disease is highly vascular (2,3). This has been postulated as the reason for the focal uptake seen on static brain scanning in patients with Paget's disease of the skull (4,5) and is the most likely cause for the persistent uptake during nuclide angiography described in this report.

Paget's disease of bone is not uncommon; it is

Received Nov. 27, 1974; original accepted Jan. 23, 1975.
For reprints contact: P. M. Fitzer, 501 Riverside Dr.,
Newport News, Va. 23606.

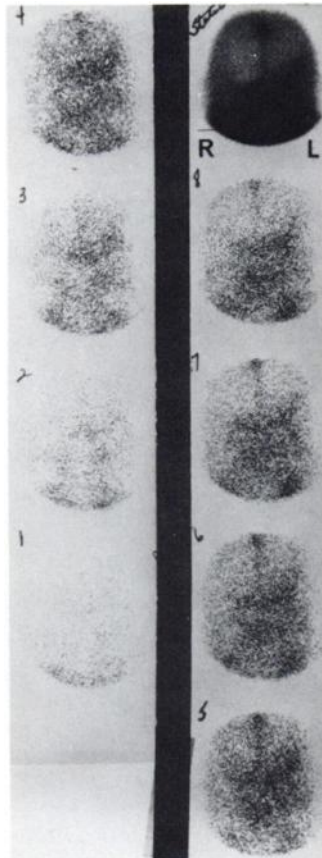


FIG. 2. Nuclide angiogram, anterior projection, and scintiphotos at 2-sec intervals. Note early appearance and persistence of left frontal uptake.

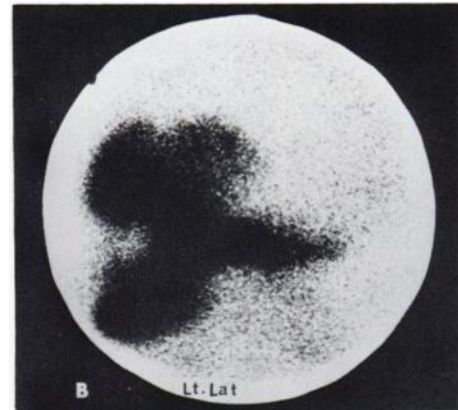
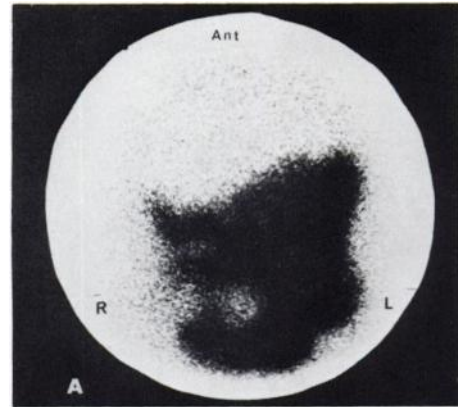


FIG. 4. Anterior (A) and left lateral (B) views of skull in ^{99m}Tc -polyphosphate scan. Intense uptake in left frontal bone and in left facial bones is evident.

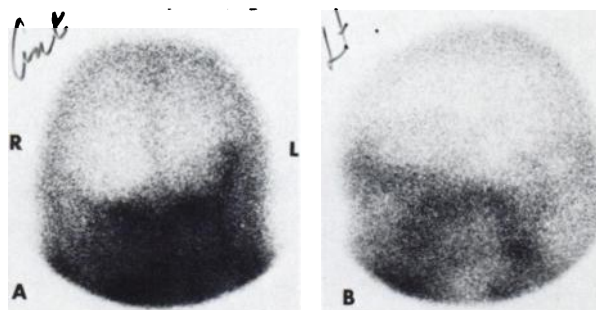


FIG. 3. Anterior (A) and left lateral (B) scintiphotos at 30 min after bolus injection. Left frontal uptake persists.

present in up to 3.7% of adults over 40 years of age, and the incidence of skull involvement in this group is as high as 67% (6,7). Abnormal Paget's bone may not be manifest on roentgenograms during the early lytic phase (8). Subdural hematoma is common in the same age group; clinical signs and symptoms may be quite minimal. Nuclide angiography would seem to be indicated for patients with suspected subdural hematoma and normal skull roentgenograms. Decreased peripheral uptake with medial

displacement of middle cerebral branches would tend to confirm the diagnosis of subdural hematoma (9-11)—early persisting peripheral uptake would suggest Paget's disease of bone and would rule out avascular subdural hematoma without the need for a bone scan.

Few other lesions show early-appearing and persistent uptake on nuclide angiography. Acute cerebrovascular accident commonly shows decreased peripheral uptake on nuclide angiography (9,10). Early increased uptake, however, may be noted in rare cases of cerebrovascular accident with the "luxury-perfusion syndrome" (12,13). Vascular malformations show early but usually not persistent uptake (9,10,14,15), and meningiomas show characteristic persistent uptake beginning late on nuclide angiography (9,16). Some meningiomas or highly vascular peripheral astrocytomas might be confused with Paget's bone on nuclide angiography (17,18) but could probably be differentiated by skull roentgenograms, bone scanning, or serum alkaline phosphatase levels.

As noted, the nuclide angiogram would seem to

be quite useful for differentiating Paget's disease of the skull and subdural hematoma in patients with positive static brain scans and normal skull roentgenograms. Bone scanning can also be utilized but this necessitates some delay for clearing of residual activity from the initial static brain scan and involves a second injection and imaging procedure. Thus, depending on the condition of the patient and the urgency of the clinical situation, bone scanning might be at least inconvenient. A positive bone scan in a patient with a positive static brain scan and normal skull roentgenograms still does not rule out intracranial abnormality—cerebrovascular accidents and cerebral neoplasms may concentrate the bone-scanning agent (19,20). Clinically it is often difficult to differentiate acute subdural hematoma from acute cerebrovascular accident. Although pronounced uptake at the margin of the lesion on the bone scan might suggest Paget's disease of bone (21), the nuclide angiogram could be more helpful.

Paget's disease usually produces a strikingly positive bone scan with characteristic multiple areas of involvement but monostotic disease occurs in 10% of patients (22). A positive bone scan, positive static brain scan, and normal skull roentgenograms might be a confusing combination in a patient with early lytic monostotic Paget's disease of the skull. The nuclide angiogram might provide the necessary clue.

ACKNOWLEDGMENTS

The author thanks Pat Democh, Paula Kornegay, and Peggy Rogers for their help. Thanks are also due to the Medical Photography Service of the Veterans Administration Hospital, Hampton, Virginia, and to the Visual Education Department, Medical College of Virginia, for preparation of the illustrations.

REFERENCES

1. PREIMESBERGER KF, LOKEN MK, SHAFER RB: Abnormal brain scan in Paget's disease of bone—confusion with subdural hematoma. *J Nucl Med* 15: 880-883, 1974
2. STEINBACH HL: Paget's disease. In *The Skull*, Newton TH and Potts DG, eds, St. Louis, CV Mosby, 1971, pp 755-756
3. RHODES BA, GREYSON ND, HAMILTON CR, et al: Absence of anatomic arteriovenous shunts in Paget's disease of bone. *N Engl J Med* 287: 686-689, 1972
4. MCAFEE JG, TAXDAL DR: Comparison of radioiso-

tope scanning with cerebral angiography and air studies in brain tumor localization. *Radiology* 77: 207-222, 1961

5. KIEFFER SA, LOKEN MK: Positive "brain" scans in fibrous dysplasia and other lesions of the skull. *Am J Roentgenol Radium Ther Nucl Med* 106: 731-738, 1969

6. SCHMORL G: Ueber Ostitis deformans Paget. *Virchows Arch [Pathol Anat]* 283: 694-751, 1932

7. COLLINS DH: Paget's disease of bone; incidence and subclinical forms. *Lancet* 2: 51-57, 1956

8. KHAIRI MRA, WELLMAN HN, ROBB JA, et al: Paget's disease of bone (osteitis deformans): symptomatic lesions and bone scan. *Ann Intern Med* 79: 348-351, 1973

9. FISH MB, POLLYCOVE M, O'REILLY S, et al: Vascular characterization of brain lesions by rapid sequential cranial scintiphotography. *J Nucl Med* 9: 249-259, 1968

10. MAYNARD CD, WITCOFSKI RL, JANEWAY R, et al: "Radioisotope arteriography" as an adjunct to the brain scan. *Radiology* 92: 908-912, 1969

11. FISH MB, KOCH RL, POLLYCOVE M, et al: Basis for accurate scintiphotographic detection of subdural hematoma. *J Nucl Med* 9: 316-317, 1968

12. SNOW RW, KEYES JW, JR: The "luxury-perfusion syndrome" following a cerebrovascular accident demonstrated by radionuclide angiography. *J Nucl Med* 15: 907-909, 1974

13. HANDA J: Dynamic aspects of brain scanning. Baltimore, University Park Press, 1972, p 138

14. HANDA J: Dynamic aspects of brain scanning. Baltimore, University Park Press, 1972, pp. 42-43

15. TYSON JW, WITHERSPOON LR, WILKINSON RH, et al: Accuracy of radionuclide cerebral angiograms in the detection of cerebral arteriovenous malformations. *J Nucl Med* 15: 953-958, 1974

16. COWAN RJ, MAYNARD CD, MESCHAN I, et al: Value of the routine use of the cerebral dynamic radioisotope study. *Radiology* 107: 111-116, 1973

17. HANDA J: *Dynamic Aspects of Brain Scanning*. Baltimore, University Park Press, 1972, p 131

18. STRAUSS HW, JAMES AE, HURLEY PJ, et al: Nuclear cerebral angiography. Usefulness in the differential diagnosis of cerebro-vascular disease and tumor. *Arch Intern Med* 131: 211-216, 1973

19. GRAMES GM, JANSEN C: The abnormal bone scan in cerebral infarction. *J Nucl Med* 14: 941-943, 1973

20. ARZOUMANIAN A, ROSENTHALL L: The combined use of radiopertechnetate and ^{99m}Tc-polyphosphate in distinguishing cerebral and calvarial lesions. *J Can Assoc Radiol* 25: 178-183, 1974

21. MILLER SW, CASTRONOVO FP, PENDERGRASS HP, et al: Technetium 99m labeled diphosphonate bone scanning in Paget's disease. *Am J Roentgenol Radium Ther Nucl Med* 121: 177-183, 1974

22. SHIRAZI PH, RAYUDU GVS, RYAN WG, et al: Paget's disease of bone: bone scanning experience with 80 cases. *J Nucl Med* 14: 450-451, 1973