Intraosseous Meningioma: Appearance on Bone Scintigraphy Over Five Years

Bedii Kanmaz, David E. Weissman, Gur Akansel, Mehmet Kitapci and B. David Collier

Departments of Radiology (Nuclear Medicine Section) and the Division of Cancer and Blood Diseases, Medical College of Wisconsin, Milwaukee, Wisconsin

While meningiomas are common intradural tumors, such lesions only rarely arise outside of the meninges. All meningiomas, however, may slowly enlarge causing concern for malignancy. We report the appearance of an intraosseous meningioma in the patient with a history of breast carcinoma where the lesion progressively enlarged over a period of 5 yr to reach approximately three times the original size.

J Nucl Med 1993; 34:961–962

Meningiomas most commonly occur as intradural tumors of the syncytial, fibroblastic or transitional type (*1*). Much less frequently, meningiomas occur in extradural regions with the lesions having been reported in the calvarium, scalp, paranasal sinuses, parotid glands, neck and skin (*2–10*). Detection of an intraosseous meningioma by bone scintigraphy has previously been reported (*11*). We report the appearance of such a lesion on sequential bone scintigrams involving the right frontoparietal region of the skull followed by bone scintigraphy with CT correlation over a period of 5 yr.

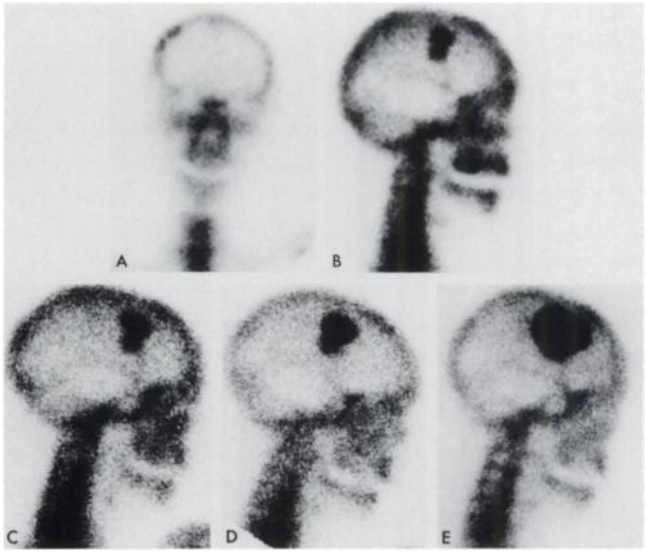

FIGURE 1. Bone scintigrams obtained initially (A), after 1 yr (B), after 2 yr (C), after 3 yr (D) and after 5 yr (E) show a smoothly marginated zone of uniformly intense increased uptake in the right frontoparietal region. Over time, the abnormality becomes more circular in configuration and enlarges in size by approximately a factor of three.

CASE REPORT

A 42-yr-old female who had undergone a modified right radical mastectomy for invasive ductal carcinoma 2 yr previously was referred for initial bone scintigraphy. The bone scintigraphy performed following intravenous injection of 740 MBq of ^{99m}Tc-methylene dyphosphonate (MDP) showed a smoothly marginated zone of uniformity with intense increased uptake in the right frontoparietal region (Fig. 1). The clinical decision was made at the patient's request to follow this lesion with sequential bone scintigrams. Bone scintigrams obtained 1, 2, 3 and 5 yr later showed the abnormality to enlarge progressively (Fig. 1). Plain film radiographs obtained for correlation with each of the bone scintigrams were normal as was the intravenous contrast-enhanced computed tomography (CT) scan obtained at the time of the 5-yr bone scan (Fig. 2). On each of the whole-body scintigraphic examinations, the only abnormality was located in the right frontoparietal region. Because of increasing concern for the possibility of a solitary, slowly enlarging bone metastasis of breast carcinoma, biopsy was undertaken shortly after the 5-yr bone scintigram. Biopsy revealed intraosseous meningioma of the transitional type.

DISCUSSION

Meningiomas account for approximately 15% of primary intracranial tumors. Characteristics of those intracranial meningiomas include: a rounded or globular form; attachment to meninges; spreading along the bony surface causing hyperostosis; detection by both radiography and scintigraphy (*12*). Meningiomas may also arise outside of the meninges from nests of arachnoid cells along the lines of fusion of the embryonic skull and spine or alternately from multipotential mesenchymal cells (*13*). Our review of the imaging literature uncovered a total of 25 reported cases of intraosseous meningiomas (*2,11,13–29*). On conventional radiographs these intraosseous lesions most frequently appear osteoblastic although they may by lytic. A limited number of cases have been reported on CT and magnetic resonance imaging (*13,29*), and we have found only one

Received Oct. 30, 1992; revision accepted Feb. 2, 1993.
For correspondence and reprints contact: Bedii Kanmaz, MD, Dept. of Radiology, Nuclear Medicine Section, Medical College of Wisconsin, Box 104, 8700 W. Wisconsin Ave., Milwaukee, WI 53226.

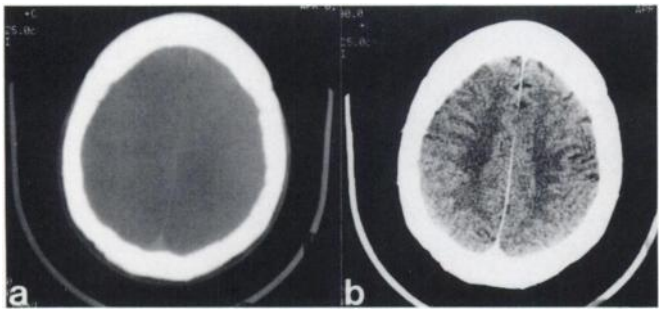

FIGURE 2. Transaxial intravenous contrast-enhanced CT scans through the center of the right frontoparietal abnormality displayed optimally for bone (A) [technique of Williams and Haughton (*30*)] and soft tissue (B) are normal. This CT exam was obtained following the most recent bone scintigram in Figure 1E.

case report on an intraosseous meningioma detected using bone scintigraphy (*11*). In addition, the relative sensitivity of different imaging modalities in detecting intraosseous meningioma does not appear to have been thoroughly investigated.

Our case report, in agreement with the previous scintigraphic report (*11*), found increased uptake of ^{99m}Tc-MDP at the site of the intraosseous meningioma. We demonstrated that the increase in the scintigraphic uptake persists as long as 5 yr with the lesion gradually enlarging to approximately three times the original size. Conventional radiographs were consistently negative during this period of time as was a contrast-enhanced CT examination performed at the time of the 5-yr bone scintigram.

Intraosseous meningioma should be added to the list of benign skeletal pathologies (e.g., fibrous dysplasia, Paget's disease, intracranial meningioma, osteoid osteoma, osteomyelitis, brown tumor, neurofibromatosis and eosinophilic granuloma) that may produce uniformly intense increased uptake on bone scintigrams, enlarge in size over time and cause clinical concern for a solitary enlarging bone metastasis.

REFERENCES

1. Morris JH. The nervous system. In: Cotran RS, Kumar V, Robbins SL, eds. *Robbins pathologic basis of disease*, 4th edition. Philadelphia: W.B. Saunders; 1989:1385–1449.
2. Ohaegbulam SC. Ectopic epidural calvarial meningioma. *Surg Neurol* 1979; 12:33–35.
3. Altinors N, Cetin A, Pak I. Scalp meningioma: case report. *Neurosurgery* 1985;16:379–380.
4. Nochomovitz LE, Jannotta F, Orenstein JM. Meningioma of the scalp: light and electronmicroscopic observations. *Arch Pathol Lab Med* 1985;109:92–95.
5. Shuangshoti S, Panyathanya R. Ectopic meningiomas. *Arch Otolaryngol* 1973;98:102–105.
6. Bagchi AK, Gupta KPS. Primary nasal meningioma. *J Indian Med Assoc* 1969;53:286–288.
7. Majoros M. Meningioma of the paranasal sinuses. *Laryngoscope* 1970;80: 640–645.
8. Farr HW, Gray GF Jr, Vrana M, Panio M. Extracranial meningioma. *J Surg Oncol* 1973;5:411–420.
9. Hoye SJ, Hoar CS Jr, Murray JE. Extracranial meningioma presenting as a tumor of the neck. *Am J Surg* 1960;100:486–489.
10. Lopez DA, Silvers DN, Helwig EB. Cutaneous meningiomas: a clinicopathologic study. *Cancer* 1974;34:728–744.
11. Zaritzky D, Cowan RJ. Intraosseous meningioma: an unusual radionuclide presentation. *J Nucl Med* 1977;18:943–944.
12. Front D, Israel O. Brain tumors. In: Front D, Barnes DB, Israel O, Bar-Sella P, Buell U, eds. *Radionuclide brain imaging*. Connecticut: Appleton Century Crofts; 1982:2–49.
13. Oka K, Hirakawa K, Yoshida S, Tomonaga M. Primary calvarial meningiomas. *Surg Neurol* 1989;32:304–310.
14. New GB, Devine KD. Neurogenic tumors of nose and throat. *Arch Otolaryngol* 1947;46:163–179.
15. Pendergrass EP, Hope JW. An extracranial meningioma with no apparent intracranial source: report of a case. *Am J Roentgenol* 1953;70:967–970.
16. Azar-Kia B, Sarwar M, Marc JA, Schechter MM. Intraosseous meningioma. *Neuroradiology* 1974;6:246–253.
17. Hamada H, Kadota H, Uetsuhara K, Asakura T, Igakura T. A case of extracalvarial meningioma. *No Shinkei Geka* 1977;5:633–639.
18. Ito M, Tomizawa H, Takagi E, Ishi S. Extracalvarial meningioma. *No Shinkei Geka* 1977;5:465–471.
19. McWhorter JM, Ghatak NR, Kelly DL Jr. Extracranial meningioma presenting as lytic skull lesion. *Surg Neurol* 1976;5:223–224.
20. Rahoria SK, Gulati DR. Intraosseous meningioma. A case report. *Neurology* (India) 1978;26:79–80.
21. Pearl GS, Takei Y, Parent AD, Boehm WM Jr. Primary intraosseous meningioma presenting as a solitary osteolytic skull lesion: case report. *Neurosurgery* 1979;4:269–270.
22. Konishi Y, Kadowaki C, Shiogai T, Ogashiwa M, Takeuchi K, Fukuzumi N. A case of osteoid osteoma with intraosseous meningioma. *No Shinkei Geka* 1984;12:1403–1408.
23. Palma L, Mercuri S, Ferrante L. Ectopic calvarial meningioma. *Surg Neurol* 1977;8:315–318.
24. Siegel GJ, Anderson PJ. Extracalvarial meningioma. *J Neurosurg* 1966;25: 83–86.
25. Turner OA, Laird AT. Meningioma with traumatic etiology. *Neurosurgery* 1966;24:96–98.
26. Waga S, Nishikawa M, Ohtsubo K, Kamijyo Y, Handa H. Extracalvarial meningiomas: two cases. *Neurology* 1970;20:368–372.
27. Wagman AD, Weiss EK, Riggs HE. Hyperplasia of the skull associated with intraosseous meningioma in the absence of gross tumor. Report of three cases. *J Neuropathol Exp Neurol* 1960;19:111–115.
28. Ito H, Takagi H, Kavano N, Yada K. Primary intraosseous meningioma: case report. *J Neurooncol* 1992;13:57–61.
29. Morrison MC, Weiss KL, Moskos MM. CT and MR appearance of a primary intraosseous meningioma. *J Comput Assist Tomogr* 1988;12:169–170.
30. Haughton VM. Scanning techniques. In: Williams AL, Haughton VM, eds. *Cranial computed tomography. A comprehensive text*. St. Louis: The C.V. Mosby Co., 1985:1–11.