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AJNR Am J Neuroradiol 1996, 17 (9) 1791-1793

<http://www.ajnr.org/content/17/9/1791>

This information is current as
of July 19, 2024.

Giant Cell Reparative Granuloma of the Cranial Vault

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Summary: We describe a case of giant cell reparative granuloma in the cranial vault, which is an extremely rare location for this entity. CT scans showed an enhancing skull tumor with no surrounding sclerosis in the frontal bone. MR images showed a mass isointense with gray matter on both T1- and T2-weighted images.

Index terms: Skull, neoplasms; Granuloma

So-called giant cell reparative granuloma, or central giant cell granuloma, is a rare nonneoplastic lesion, most often seen in the mandible and maxillary regions. The tumor usually occurs in the first and second decades and is more common in female subjects (1). A few cases of giant cell reparative granulomas have been reported elsewhere (2–11); we found one that was located in the cranial vault (5). The present case was revealed by magnetic resonance (MR) imaging.

Case Report

An 8-year-old boy had embryonal carcinoma of the retroperitoneum at the age of 3 years. He had been treated by chemotherapy, and the carcinoma had resolved completely. Three months before the present admission, he sustained trauma to the right frontal region when the teeth of a friend struck him. There was no external bleeding, but a mass arose at the site of the trauma, persisted, and increased gradually in size.

Cranial computed tomography (CT) revealed an osteolytic lesion without surrounding sclerosis on the right side of the frontal bone, filled with an enhancing soft-tissue attenuation mass (Fig 1A). MR imaging at 1.5 T showed that the majority of the lesion was isointense with gray matter but that the lesion was somewhat inhomogeneous with some areas of higher and lower signal intensities on both T1- and T2-weighted spin-echo pulse sequences (Fig 1B and C). The lesion enhanced intensely but inhomogeneously after administration of gadopentetate dimeglumine. There was also dural enhancement adjacent to the lesion (Fig 1D). Laboratory data showed no significant abnormalities.

With a preoperative diagnosis of a metastatic skull tumor, the patient underwent surgery for total removal of the lesion. A dark red, soft mass without a capsule was found occupying the defect of the frontal bone. The boundary between the mass and the pericranium was indistinct. The outer table and diploe were entirely destroyed; the inner table was partially destroyed. The edge of the bony defect was irregular. The dura mater beneath the lesion was not perforated.

Microscopically, the lesion was composed of granulation tissue with prominent infiltration of macrophages intermingled with numerous multinucleated giant cells, lymphocytes, and neutrophils. Small blood vessels were increased in number. The histopathologic diagnosis was giant cell reparative granuloma (Fig 1E). Follow-up MR imaging, performed 4 months after surgery, showed no recurrence.

Discussion

Giant cell reparative granuloma is a rare nonneoplastic lesion usually located in the mandible and maxilla (1). The pathogenesis of this tumor is unknown, but it is believed to result from posttraumatic intraosseous hemorrhage or periosteal reaction (5). Our patient had sustained a closed head trauma. However, the majority of patients with giant cell reparative granuloma have no apparent history of trauma relative to the site of the tumor. Giant cell reparative granuloma is characterized histologically by a loose, vascular stroma composed of oval and spindle-shaped fibroblastic cells with multiple areas of hemorrhage, abundant hemosiderin pigment, and marked fibrosis. The giant cells are multinucleated, but tend to have fewer nuclei than those in a giant cell tumor. In a giant cell tumor, the stroma is predominantly composed of plump round and oval cells. Fresh hemorrhage is slight to moderate, and hemosiderin deposits are rare and small (12). However, Stolovitzky et al (13) proposed the term *giant*

Received November 1, 1995; accepted after revision February 13, 1996.

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AJNR 17:1791–1793, Oct 1996 0195-6108/96/1709–1791 © American Society of Neuroradiology

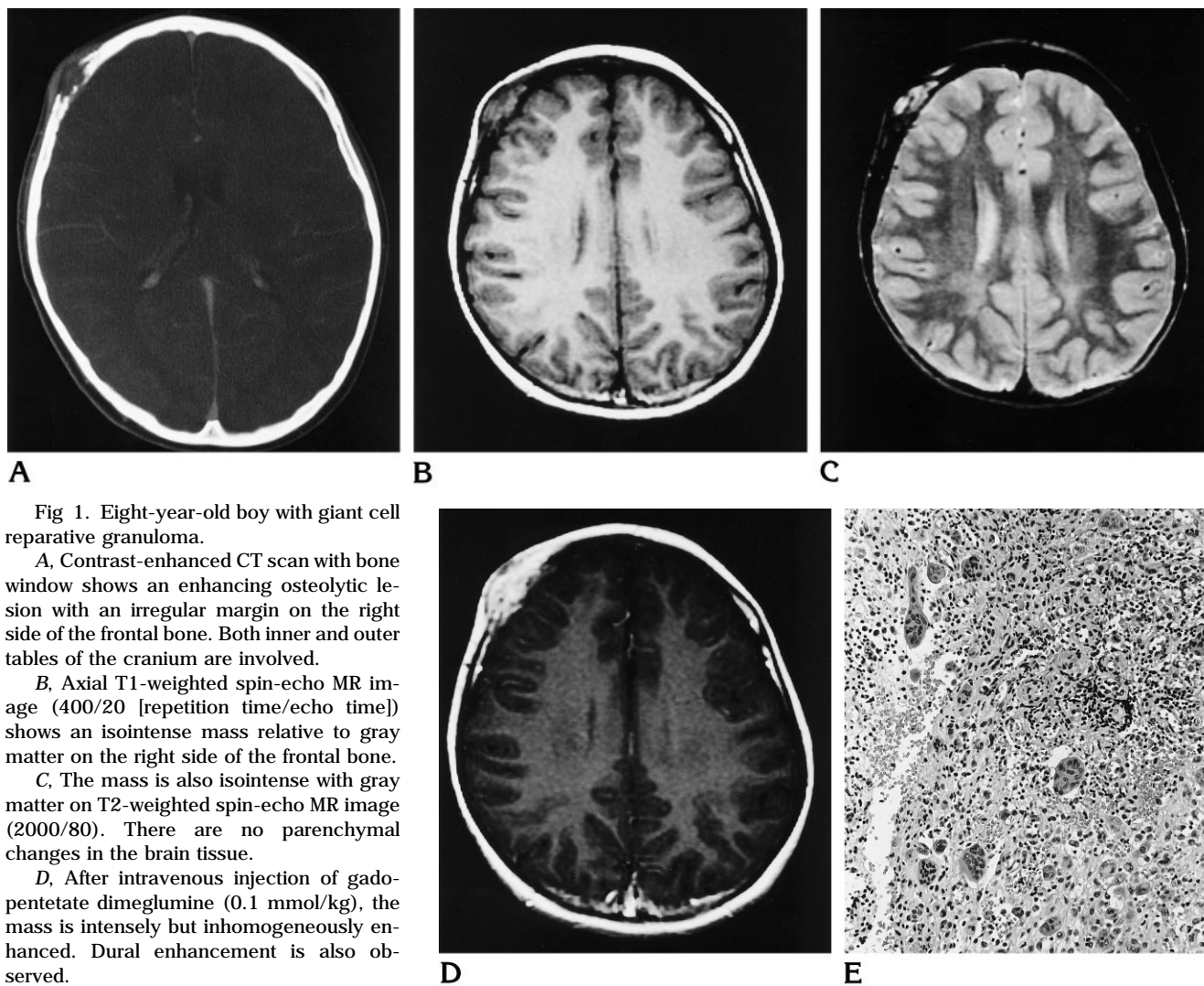


Fig 1. Eight-year-old boy with giant cell reparative granuloma.

A, Contrast-enhanced CT scan with bone window shows an enhancing osteolytic lesion with an irregular margin on the right side of the frontal bone. Both inner and outer tables of the cranium are involved.

B, Axial T1-weighted spin-echo MR image (400/20 [repetition time/echo time]) shows an isointense mass relative to gray matter on the right side of the frontal bone.

C, The mass is also isointense with gray matter on T2-weighted spin-echo MR image (2000/80). There are no parenchymal changes in the brain tissue.

D, After intravenous injection of gadopentetate dimeglumine (0.1 mmol/kg), the mass is intensely but inhomogeneously enhanced. Dural enhancement is also observed.

E, Photomicrograph shows granulation tissue with prominent infiltration of macrophages intermingled with numerous multinucleated giant cells, lymphocytes, and neutrophils. Small blood vessels are increased in number (hematoxylin-eosin, original magnification $\times 100$).

cell lesion, indicating that giant cell reparative granuloma of the jaws and giant cell tumor in other bone sites represent a continuum of a single disease process rather than completely separate entities.

Giant cell reparative granulomas found outside the jaw are extremely rare: we found 11 cases involving the skull region reported. Five of these were located in the temporal bones (2, 3, 8, 10), five were located in the region of the paranasal sinuses (6, 7, 9, 11), and one, described by Garza-Mercado et al (5), was in the frontoparietal region of an infant with a history of head trauma. The present case involved the frontal bone. At MR imaging, the lesion was isointense with gray matter on both T1- and

T2-weighted images, and enhanced intensely after administration of contrast medium. However, these findings are nonspecific. MR images of giant cell reparative granuloma are rare.

Felsberg et al (11) reported a case of giant cell reparative granuloma of the frontoethmoidal region in which the MR findings were quite similar to those of the present case. However, Nemoto et al (10) described an adult patient with a giant cell reparative granuloma of the temporal bone that was hypointense on both T1- and T2-weighted images and showed lack of contrast enhancement. These findings are quite different from those of the present case. It is therefore suggested that giant cell reparative granulomas have a wide spectrum of radiologic

features, consistent with their broad pathologic spectrum.

The differential diagnosis of a solitary osteolytic skull lesion with no surrounding sclerosis includes many pathologic conditions and normal variants. If a patient has a history of malignant tumor, as in the present case, a metastatic tumor is usually suspected. However, if there is no significant history, Langerhans cell histiocytosis may be considered the preoperative diagnosis.

Recently, several cases of cranial fasciitis in children with osteolytic skull lesions have been reported (14, 15). In some of these cases there was a relation between this entity and head trauma (15). Therefore, in children, if there is a predisposing factor, such as head trauma, cranial fasciitis should be included in the differential diagnosis. Cranial fasciitis of childhood is a benign fibroblastic process that arises from the deep fascial layers and periosteum of the skull. Microscopically, the lesion appears to be a proliferation of loosely arranged fibroblasts that most closely resemble nodular fasciitis (14). The histopathologic findings of the present case were quite different from the fibroblastic process. However, the radiologic features of giant cell reparative granuloma and cranial fasciitis of childhood are similar in some cases. Thus, although both giant cell reparative granuloma and cranial fasciitis of childhood are extremely rare, they should be included in the differential diagnosis of osteolytic skull lesions in a pediatric patient.

The radiologic diagnosis of these rare clinical entities is difficult. Although giant cell reparative granuloma of the cranial vault is not widely known by radiologists, it should be included in the differential diagnosis of osteolytic skull lesions that have no surrounding sclerosis and

that are isointense with gray matter on all MR sequences, especially in a patient in the first and second decades of life.

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