

Large Cavernous Hemangioma of the Frontal Bone

—Case Report—

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Abstract

A 53-year-old woman presented with a rare case of cavernous hemangioma of the frontal bone manifesting as right frontal stabbing headache and local swelling. Computed tomography revealed an extensive, well-defined, radiolucent, osteolytic lesion in the right frontal bone. The inner and outer tables of the skull were eroded and the lesion had compressed the brain parenchyma. Right frontal craniotomy was performed, and the lesion with a 1 cm-wide margin of surrounding uninvolved bone was removed. The defect was reconstructed with titanium mesh. The patient did well after the operation. The cosmetic results were satisfactory and follow up at 6 months post-surgery revealed no recurrence.

Key words: bone tumor, cavernous hemangioma, intraosseous hemangioma, skull

Introduction

Hemangiomas occur in patients of all ages, but most often present in middle age, with the peak around the fourth decade of life.^{6,11)} These neoplasms are histologically classified as cavernous and capillary types.^{5,15)} Cavernous-type hemangioma is an enlarging mass of blood-filled sinusoidal channels that erodes and displaces normal tissues. The bony trabeculae observed within these tumors are believed to be the result of osteoclastic remodeling and osteoblastic reinforcement in response to stress created by the enlarging vascular neoplasm. In contrast, capillary-type hemangiomas consist of multiple tufts of capillaries arranged in radiating loops or lobules.^{3,18)} Skeletal hemangiomas account for only 0.7% of all bone neoplasms, and most often occur in the vertebral column.

Intraosseous hemangiomas of the calvarium are rare benign tumors, usually of the cavernous type, which represent only 0.2% of all osseous neoplasms, and most often occur in the frontoparietal region.^{2,4,6)} Calvarial hemangiomas arise from vessels in the diploic space, and receive additional blood supply from branches of the external carotid artery that originate inside the skull vault. The middle meningeal and superficial temporal arteries

provide the main blood supply for these tumors.²⁾

We report a case of cavernous hemangioma of the frontal bone and discuss the radiological findings, differential diagnosis, and management of this lesion.

Case Report

A 53-year-old woman presented with stabbing headache in the right frontal region and local swelling. The swelling had been present for about 1 year. The patient's medical history was unremarkable apart from hypertension and hyperthyroidism. Physical examination revealed a palpable mass in the right frontal region that measured approximately 6 × 6 cm. The lesion was tender when pressure was applied, and the overlying skin was mobile. Neurological examination showed no abnormalities. Skull radiography revealed a well-circumscribed, radiolucent, osteolytic lesion in the right frontal region (Fig. 1). Cranial computed tomography (CT) demonstrated an extensive lesion that had eroded both tables of the right frontal bone. The mass had well-defined margins, and a mixed lytic and slightly sclerotic appearance. The CT scan revealed that the lesion was 8.5 cm wide and 3 cm deep, and had compressed the frontal lobe (Fig. 2). The mass showed heterogeneous enhancement with contrast administration, but there was no dural involvement.



Fig. 1 Skull radiograph showing a radiolucent osteolytic lesion in the right frontal bone.

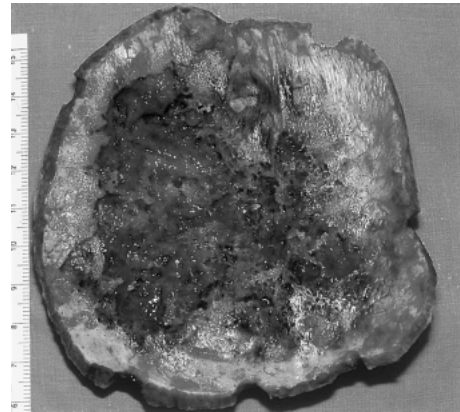


Fig. 3 Photograph of the surgical specimen including the recommended 1 cm-wide tumor-free margin. Note the erosion of the inner table of the frontal bone.

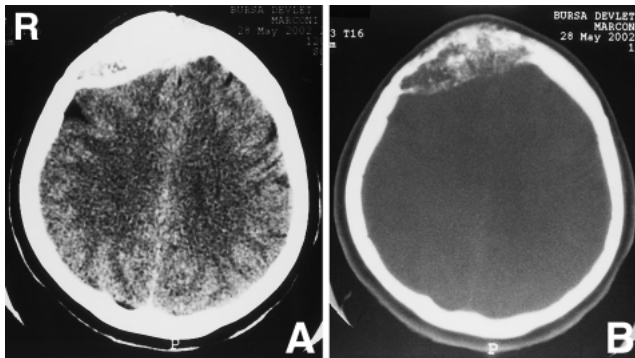


Fig. 2 (A) Cranial computed tomography (CT) scan demonstrating a large lytic lesion with honeycomb appearance in the right frontal bone. The lesion had compressed the frontal lobe. (B) Bone-window cranial CT scan showing a large lytic lesion involving the outer and inner tables of the right frontal bone.



Fig. 4 Postoperative skull radiograph showing the surgical site after reconstruction with titanium mesh.

Surgery was performed with en bloc resection of the lesion and additional removal of a 1 cm-wide margin of the surrounding uninvolved bone (Fig. 3). The defect was reconstructed with a titanium-mesh implant (NORMED, Tuttlingen, Germany) (Fig. 4).

Histological examination of the surgical specimen revealed multiple endothelium-lined vessels of varying sizes embedded in fibrolipomatous tissue. The diagnosis was cavernous hemangioma (Fig. 5).

The patient did well after the operation. The cosmetic results were satisfactory and follow up at

6 months post-surgery revealed no recurrence.

Discussion

Most hemangiomas of the calvarium are the cavernous type, the most common sites of development are the frontal and parietal bones, and the temporal and occipital bones are less frequently affected.^{4,13)} A review of the literature since 1975 documented 40 cases of cavernous hemangioma of the frontal bone during this period.⁶⁾

Radiography of the cranium reveals an oval or

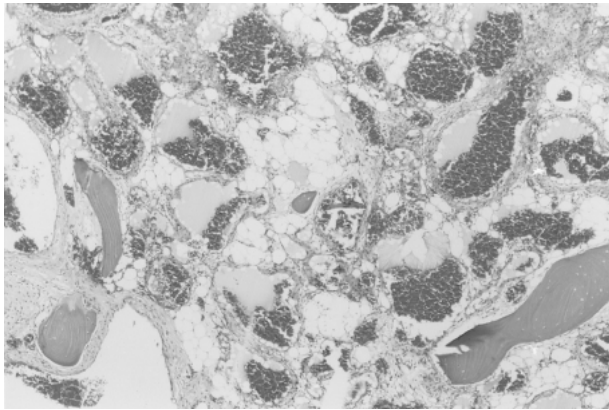


Fig. 5 Photomicrograph of the surgical specimen showing the typical appearance of cavernous hemangioma. HE stain, $\times 40$.

roundish lesion that features a honeycomb or scalloped appearance in the direct view, and a sunburst pattern of trabeculation radiating from a common center in the tangential view.^{14,18)} CT confirms these findings and provides more detail of the intracranial extension.¹⁰⁾ In most cases, the outer table of the cranium is eroded and the inner table is intact.¹⁷⁾ In our case, the inner table was also eroded and the lesion had compressed the brain parenchyma.

T_1 - and T_2 -weighted magnetic resonance (MR) imaging may show intraosseous hemangioma as an area of a mottled hyperintensity. Chemical shift images and histological studies have revealed that fatty tissue, which is a major component of these tumors, can cause high signal intensity on T_1 -weighted images. Slow flow or pooling of blood can also cause high signal intensity on T_2 -weighted images. Rapid serial MR imaging with bolus contrast injection reveals focal enhancement during the early phase, which spreads throughout the entire lesion in the late phase.¹²⁾ These features may be characteristic of intraosseous hemangioma.¹⁾ However, MR imaging may not reveal an identifiable flow void in all cases, and the MR imaging findings do not always suggest hemangioma.⁹⁾

Calvarial cavernous hemangiomas may mimic other neoplasms, and the differential diagnosis encompasses all conditions in which firm, slow-growing masses can arise in the skull, including fibrous dysplasia, meningioma, osteoma, osteogenetic sarcoma, aneurysmal bone cyst, cholesteatoma, Paget's disease, osteotitis fibrosa cystica, hyperparathyroidism, eosinophilic granuloma, dermoid cyst, and multiple granuloma.^{7,14)} Meticulous radiological and clinical investigation is essential to rule out all other possible diagnoses. Cavernous heman-

gioma may occur in association with other forms of neoplasia.^{6,16)} However, the review suggests that concomitant occurrence of cavernous hemangiomas with other tumors is coincidental.⁶⁾

The current treatment of choice for hemangioma is surgical excision.⁸⁾ Significant hemorrhage is often a problem, and this can make surgical removal difficult. It is important to prepare for considerable bleeding during the operation. In addition to excising the tumor, resection of a 1-cm margin of uninvolved bone is recommended. Reconstruction of the defect with titanium mesh often yields favorable cosmetic results, as seen in our patient.

The two other therapeutic options for this type of skull tumor are curettage and radiation therapy. Curettage can also involve excessive blood loss and disturbance of hemostasis, and carries a higher risk of recurrence than excision.¹¹⁾ Radiation therapy may arrest the progression of tumor growth, but does not reduce the size of the mass.^{5,11)}

This case is important because of the rarity of cavernous hemangioma of the calvarium. The observed erosion of both tables of the bone was of particular interest in our patient, since most of these tumors are detected at much earlier stages.

As stressed above, excessive blood loss may cause difficulties during surgery for removal of cavernous hemangiomas, and the surgeon must prepare for this possibility. To prevent recurrence, removal of the lesion plus a 1 cm-wide margin of uninvolved bone is always recommended. Titanium mesh reconstruction of the calvarium yields favorable cosmetic results.

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