

## **Cavernous Hemangioma of the Skull Presenting with Subdural Hematoma**

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**Abstract**

Cavernous hemangioma of the calvarium is a very rare disease, and patients usually present with headaches or a visible skull deformity. Few reports of patients presenting with intradiploic or epidural hemorrhages are found in the literature. No cases of an intradural hemorrhage from a cavernous hemangioma of the skull have been reported to date. We present the case of a 50-year-old male with a symptomatic subdural hematoma resulting from a cavernous hemangioma of the calvarium that hemorrhaged and eroded through the inner table of the skull and dura. The patient went to the operating room for evacuation of the subdural hematoma and resection of the calvarial lesion. Post-operatively, the patient had an immediate relief of his symptoms and did not have a clinical or radiological recurrence. Calvarial cavernous hemangiomas should be considered in the differential diagnosis of non-traumatic subdural hematomas. Additionally, skull lesions that present with intracranial hemorrhages must be identified and resected at the time of hematoma evacuation to prevent recurrences.

## Introduction

Cavernous hemangioma of the skull is a rare pathologic diagnosis, accounting for 0.2% of benign skull lesions.<sup>2</sup> Cavernous hemangiomas are commonly found in the middle decades of life, and the peak incidence is in the fourth or fifth decade.<sup>6</sup> In the skull, these lesions grow between the outer and inner tables, are supplied by the branches of the external carotid artery in the diploic space, are usually solitary, and typically occur in the frontal or parietal bones.<sup>2,4,6</sup> In a review of the literature of cavernous hemangiomas of the skull, Heckl, et al.,<sup>4</sup> found that the lesion could occur in almost any skull region including, in descending order of incidence, frontal, temporal, parietal, mandibular, zygomatic, nasal, maxillary, occipital, sphenoid, clival, and ethmoidal. Typically, cavernous hemangiomas grow slowly before they cause symptoms of pain or a visible or palpable skull deformity; however, they can cause a variety of symptoms depending on the location of the lesion<sup>6,8,9</sup> Few reports of cavernous hemangiomas presenting with intradiploic or epidural hemorrhages have been made.<sup>5,8,9</sup> We present the unique case of a patient with a calvarial cavernous hemangioma that resulted in a large subdural hemorrhage and review the literature on patients with skull cavernous hemangiomas presenting with hemorrhage.

## Case Report

*History.* This 50-year-old man presented to our hospital with one week of increasing headaches, nausea, left arm weakness with poor coordination, and difficulty ambulating secondary to a “clumsy” left leg. His exam was significant for mild proximal

strength weakness in both the left arm and leg, with marked pronator drift of the left upper extremity. The patient's PT, PTT, and INR were in the normal range.

*Imaging.* On computed tomography (CT) scans, an extra-axial, frontal-parietal hypodense fluid collection was visible on the right, representing a chronic subdural hematoma (*Fig. 1b*). The fluid collection was associated with an expanding calvarial lesion in the right high parietal bone that had eroded through the inner table of the skull and was well marginated with associated sclerosis (*Fig. 1a,b*). On magnetic resonance (MR) imaging, a large right subdural hematoma with late subacute signal features and evidence of a more acute superimposed hemorrhage were apparent. Numerous internal locules were present, representing typical evolution of a large, organized hematoma. We also found a right parietal diploic space expansile lesion measuring 3.5 x 1.3 cm that was hyperintense on both T1 and T2 sequences and enhanced after administration of gadolinium contrast (*Fig. 1c,d*). The calvarial lesion had signal-scalloped cortical margins and a heterogeneous internal signal, and it followed the signal of the subdural hematoma on all imaging sequences. Figure 1c demonstrates a communication between the lesion and the subdural hematoma that suggests that a dural perforation was present and that the skull lesion resulted in the subdural hematoma.

*Hospital Course.* The patient went to the operating room for evacuation of the subdural hematoma and resection of the calvarial lesion. Dark stippling of the bone surface was obvious at elevation of the myocutaneous skin flap (*Fig. 2a*). A 3-cm craniotomy centered on the skull lesion was performed, and the lesion was excised with clear margins. Complete erosion through the inner table had occurred (*Fig. 2b*). Additionally, the dura was eroded through immediately subjacent to the skull cavernous

hemangioma, making the subdural space contiguous with the calvarial lesion (*Fig. 2c*). Although Figure 1c suggested that the hematoma was located in the epidural space, surgery confirmed the presence of a subdural hematoma. “Motor-oil” fluid drained under considerable pressure after removal of the bone flap (*Fig. 2c*). The dura was opened completely and the subdural hematoma was evacuated. Subdural membranes indicated the acute-on-chronic nature of the subdural hemorrhage, and they were not resected. Cranioplasty was performed and a subdural drain was left in place for 24 hours. Post-operatively, the patient noted immediate relief of symptoms, and he had a normal neurologic examination with complete recovery of his motor weakness. He was discharged home on post-operative day three, after an uneventful post-operative course. Post-operative and follow-up images showed an interval resolution of the subdural hematoma.

*Pathology.* Macroscopically, the bone had a purple-red blush or discoloration 3.5 x 3.0 cm on the outer surface. The inner table of the calvarium was completely eroded centrally over an area 1.2 x 1.1 cm. The defect was surrounded by a purplish blush associated with multiple, small, confluent pits. The inner table was markedly thinned around the large central defect for approximately 1.0 cm. The margins of the bone were free of the discoloration. Microscopic exam revealed blood-filled sinusoidal channels lined with a single layer of flattened endothelial cells mixed with bony trabeculae (*Fig. 2d*). The histological diagnosis was a cavernous hemangioma.

## **Discussion**

Cavernous hemangioma of the skull is a rare pathologic diagnosis.<sup>2</sup> Typically, cavernous hemangiomas grow slowly before they cause symptoms including pain or a

visible or palpable skull deformity. These lesions can cause a variety of symptoms depending on the location.<sup>6,8,9</sup> We present the unique case of a patient with a calvarial cavernous hemangioma that resulted in a subdural hemorrhage.

Although most patients with cavernous hemangiomas present with pain or local skull deformities, there have been a few reports in the literature of epidural or intradiploic hemorrhages occurring spontaneously or after minimal trauma.<sup>5,8,9</sup> Usually, cavernous hemangiomas erode the outer table and are confined by the inner table, and, despite their enlargement and subsequent erosion of the surrounding bone, the inner table remains intact.<sup>4,6,8,9</sup> Uemura, et al.,<sup>9</sup> described a patient with a calvarial cavernous hemangioma presenting with an epidural hemorrhage in which the inner table was completely eroded and the lesion was in direct contact with an intact dura. It is hypothesized that the epidural hematomas from cavernous hemangiomas occur because of fragile vessels contacting the dura through the pores of the inner table or from minor trauma, causing fracture of an already thinned inner table.<sup>8,9</sup> Interestingly, isolated cases of extra-axial hematomas from other skull lesions including an Ewing's sarcoma,<sup>10</sup> an epidermoid,<sup>1</sup> a hemangioendothelioma,<sup>7</sup> and metastasis from hepatocellular carcinoma<sup>3</sup> have been reported, but in these cases the dura remained intact, leading to epidural hemorrhage.

Unlike previous cases of cavernous hemangiomas and other skull lesions with hemorrhage contained by an intact dura, in the current case, the lesion eroded through the dura. It is possible that the pressure from an intradiploic hemorrhage resulted in the perforation of the dura and remaining inner table, resulting in the subdural hematoma. Also unique, the patient had no history of recent or remote trauma, suggesting a more gradual process. Blood products and numerous subdural membranes of various ages

indicated hemorrhage into the subdural space on several occasions. We hypothesize that multiple hemorrhages over time weakened the dura, leading to its erosion.

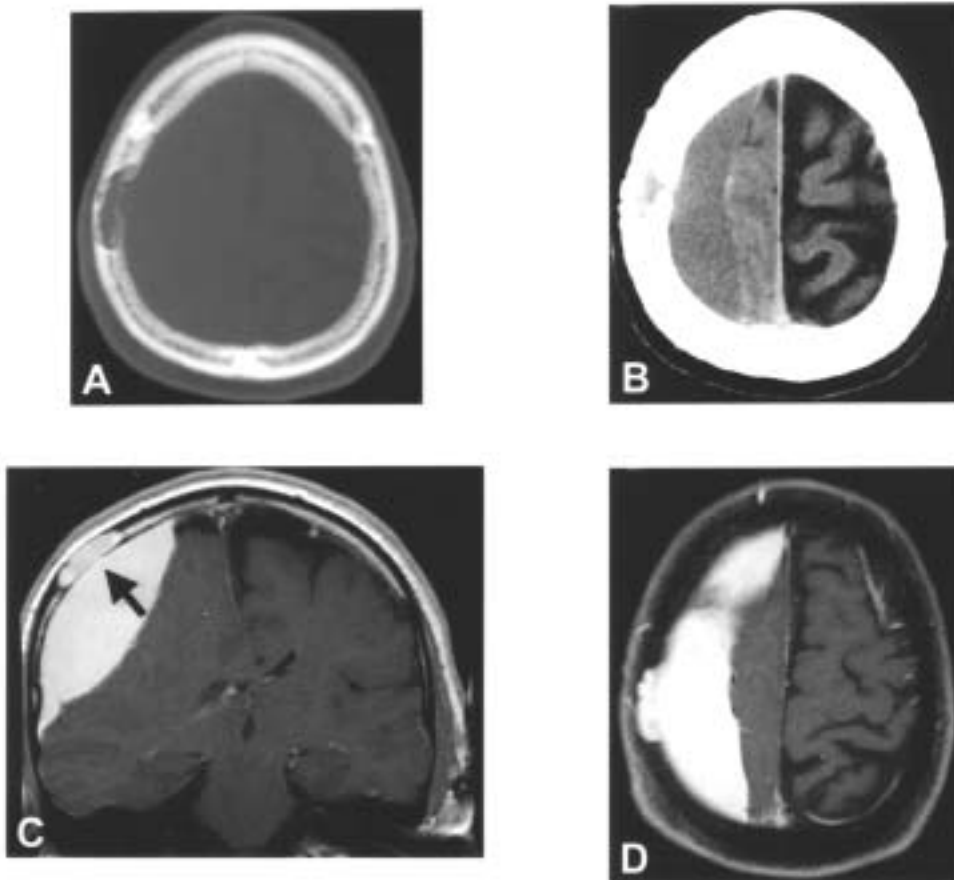
Overall, a cavernous hemangioma of the calvarium should be considered in the differential diagnosis of a non-traumatic subdural hematoma. If a patient presents with an extra-axial hemorrhage and has an associated skull lesion, resection of the skull lesion with clean margins at the time of evacuation of the hematoma is necessary. If the fluid collection is evacuated without simultaneous resection of the calvarial mass, the patient may have subsequent hemorrhages and symptomatic events.

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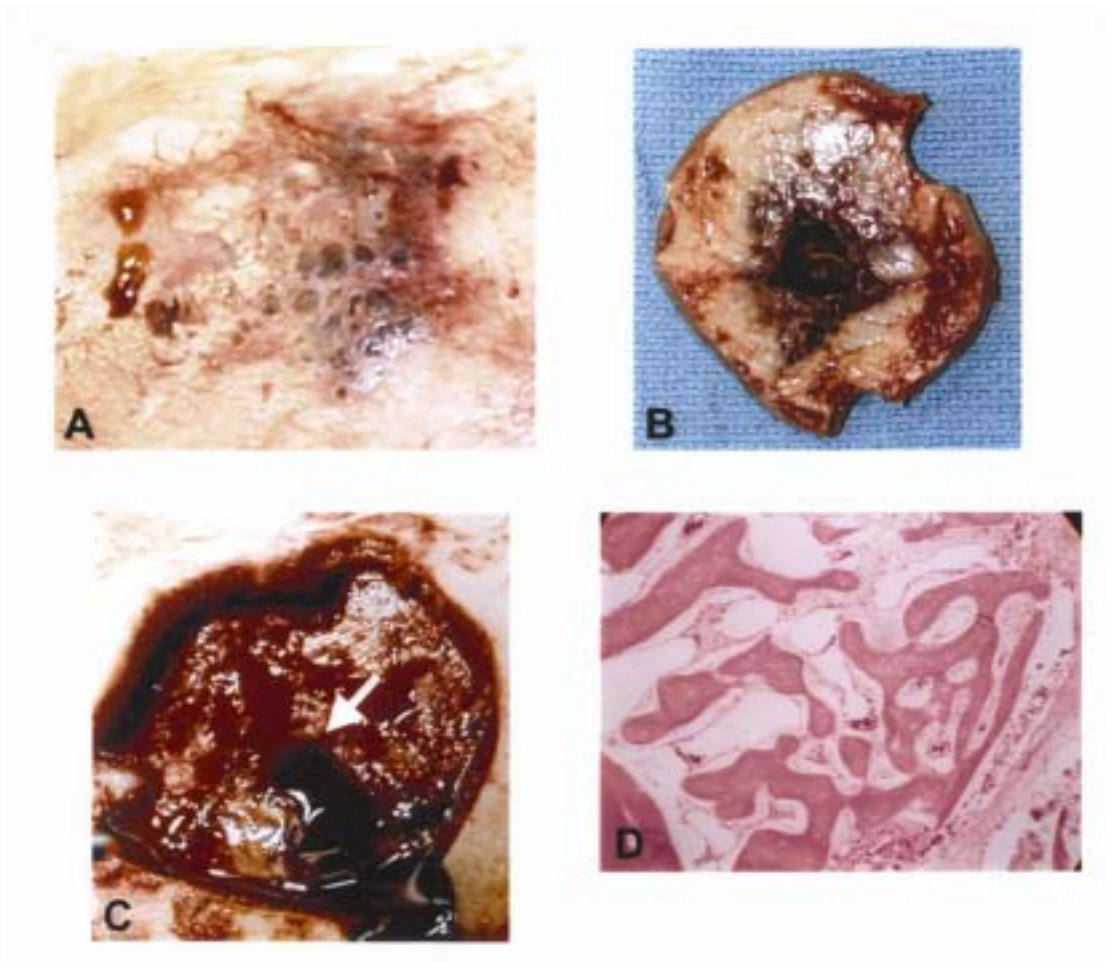
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**Figures**

**Figure 1.** *a:* CT scan with bone window displays a calvarial lesion that has eroded through the inner table of the skull. An associated lesion is seen in the intradiploic space. *b:* Brain window demonstrates an extra-axial, frontal-parietal hypodense fluid collection on the right. *c:* Coronal T<sub>1</sub>-weighted MR image displays a skull lesion that is in communication (*arrow*) with an extra-axial fluid collection; they have the same hyperintense signal. *d:* Axial T<sub>1</sub>-weighted MR image with gadolinium enhancement of both the calvarial lesion and the fluid collection.



**Figure 2.** Intra-operative photographs demonstrate a purple-red blush or discoloration of the outer calvarial surface. *a*: Complete erosion of the inner table of the calvarium. *b*: Erosion through the dura making the subdural space contiguous with the calvarial lesion. *c*: Subdural fluid draining from the dural defect (*arrow*) after removal of the bone flap. *d*: Photomicrograph of the skull lesion demonstrates blood-filled sinusoidal channels lined with a single layer of flattened endothelial cells mixed with bony trabeculae. H & E, original magnification X 200.