

## Vertex Epidural Hematomas: Considerations in the MRI Era

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*Two cases of vertex epidural hematomas are described to illustrate their unique diagnostic and treatment problems. Due to its specific location, a correct diagnosis of the intracranial hematoma was delayed in the first case. Quantitative analysis of the hematoma volume was performed in the second case. We would like to emphasize the usefulness of the magnetic resonance imaging and quantitative analysis of vertex epidural hematoma in choosing treatment options in such patients.*

*Key Words: Vertex epidural hematoma, MRI*

### INTRODUCTION

Vertex epidural hematoma (VEDH) represents an uncommon subtype of epidural blood collection, and the reports on this condition have been limited in number. Several unique features of epidural hematoma at this location necessitate special consideration from its usual counterpart. The clinical manifestation of VEDH is usually nonspecific and nonlocalizing, and it may be missed by conventional axial computed tomographic (CT) scanning (Pomeranz et al., 1984; Plotkin and Burke, 1994). We describe two cases of surgically managed VEDH, one of which we performed an image analysis for the quantification of the hematoma which tends to be underestimated in horizontal CT scanning.

### CASE REPORT

#### Case 1

A 33-year-old man presented to the outpatient department complaining of severe, generalized headache and vomiting. Four days earlier, he had fallen

from a motorcycle while his riding in a drunken state. He experienced a brief loss of consciousness, after which he was hospitalized at a local emergency clinic for a day and discharged. The clinician had interpreted his cranial CT scan as unremarkable and for this he was discharged for observation. During the following three days, the patient experienced a worsening headache and several bouts of vomiting. At admission to our department, he revealed an unremarkable medical history. At the time of examination, his mental status showed drowsiness with preservation of cognitive functions. Neurological examination revealed bilateral papilledema and hyperactive deep tendon reflexes. He had no external scalp wound. The vital signs were within normal ranges. No remarkable findings were noted on his simple skull X-rays. CT scan revealed a round hyperdense hematoma in the bi-parietal area and the coronal reconstruction clearly demonstrated a large hematoma collection (Fig. 1). Paired free bone flap were made near the midline over the parietal area and about 100cc of the epidural clot was evacuated (Fig. 2). There was no active bleeding site around the sagittal sinus. The patient became fully alert immediately after the operation. Following several days of uneventful recovery period he was discharged at the end of the second week.

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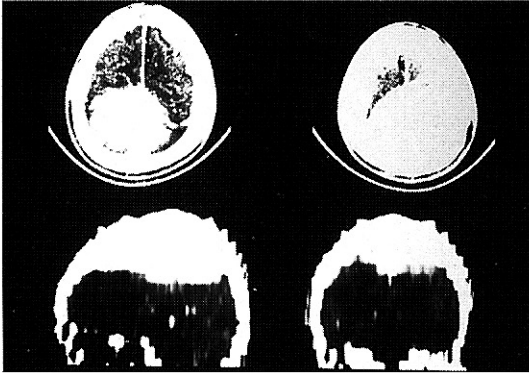


Fig. 1. Horizontal CT scans without contrast enhancement shows vertex hyperdensity(upper). Coronal reconstruction from the axial CT scans clearly demonstrates the vertex epidural hematoma(lower).

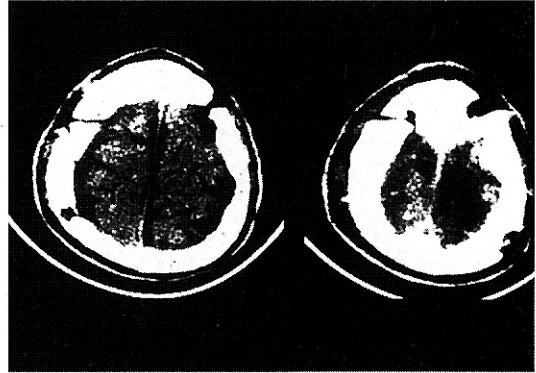


Fig. 2. Postoperative CT scan shows complete evacuation of the hematoma.



Fig. 3. Two most higher axial CT scans demonstrates vertex epidural hematoma. It was thought to be a small clot. Linear skull fracture involving left frontal bone was also noted(arrow).

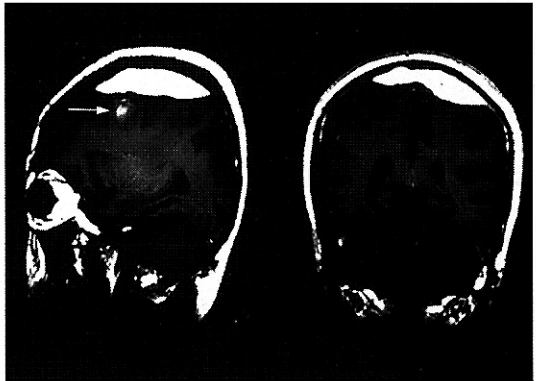


Fig. 4. Preoperative MRI, T1-weighted image. Subacute stage of the vertex epidural hematoma and frontal hemorrhagic contusion(arrow) are clearly defined.

### Case 2.

A 39-year-old man was referred for hospitalization because of intracranial hematoma diagnosed by a local clinician. Three days before presentation the patient had slipped and fallen down in his bathroom, striking his head against the hard edge of the bathtub. At that time he had a loss of consciousness lasting about 10 minutes and recovered. On awakening, he noted mild generalized headache and painful scalp swelling around the occiput. He went to the local clinic three days after the accident due to the worsening of his headache. Neurological evaluation there revealed a linear skull fracture involving the left frontal bone extending to

parietal region and hyperdense hematoma at the vertex(Fig. 3). He also had no remarkable medical history. His vital signs were stable. On physical examination, tender swelling of the left sided parieto-occipital scalp, about 5 cm in diameter, was noted. The patient was fully alert and there was no neurological deficit. We regarded the hematoma as a small epidural clot and had treated the patient conservatively. Over the next several days of admission, the intensity of the patient's headaches waxed and waned. On the 14th day of admission his headache became severe and he experienced repeated bouts of vomiting. On neurological examination, he revealed bilateral papilledema and hy-

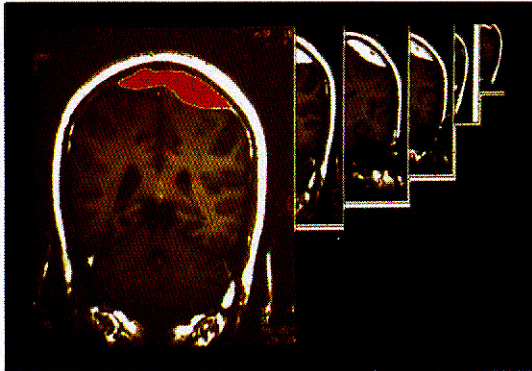


Fig. 5. Quantification of the hematoma was performed with coronal MRI slices using computed software. The estimated volume of the hematoma was about 47cc.

peractive deep tendon reflexes. Brain MRI was performed and clearly demonstrated the subacute epidural hematoma at the vertex with hemorrhagic contusion at frontal lobe (Fig. 4). An image analysis using ImagePro® software was performed to estimate the amount of the hematoma (Fig. 5). The hematoma volume was estimated to be 47cc. We decided to treat the patient surgically but he refused the operation. On 17th day of admission, the patient newly developed a mild leg weakness in both sides and revealed bilateral transient ankle clonus. The patient agreed to have an operation at that time. Under local anesthesia, a 1.5 cm diametered burr hole was made at the left parietal bone 1 cm apart from the midline. The epidural clot was removed via this burr hole using weak suction connecting to 7-French relaton catheter. Underlying brain rapidly expanded to leave a small gap between the dura and skull (Fig. 6). Postoperatively, he was without a headache and was discharged seven days after his operation.

## DISCUSSION

Epidural hematoma of the vertex has been an uncommon posttraumatic finding and poses a special diagnostic problem. In 1968, Gallagher and Browder reported their clinical experience with 167 patients with epidural hematoma. Only one case among their series was found to have a bilateral clot crossing over the superior sagittal sinus. In 1979, Borzone et al. reported 14 cases of VEDH en-

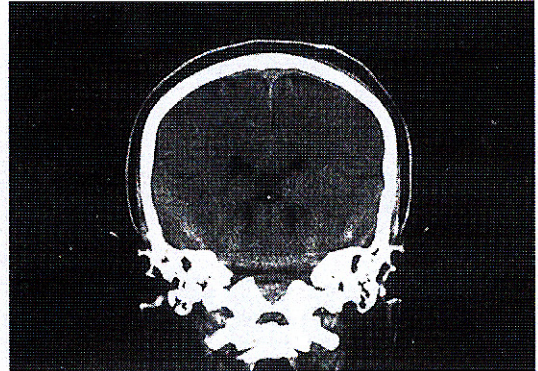


Fig. 6. Postoperative coronal CT scan through the vertex demonstrates near complete evacuation of the hematoma.

countered during 12-years of experience and this may be the largest series in the literature. They described diagnostic angiographic features of VEDH as avascular area, shifting of the vessels, and slowing of the cerebral circulation. Because of the "blind spot" location of VEDH, many authors emphasized the diagnostic difficulties in their individual cases in the CT era (Pomeranz et al., 1984; Plotkin and Burke, 1994). VEDH may be misinterpreted as an artifact or even omitted in conventional horizontal CT slices. As in the first case described here the coronal reconstruction from axial scan is very important to verifying the VEDH. To avoid diagnostic pitfalls, all the CT slices for head injury patients should be obtained until the bone of vertex is definitely identified. In subacute to chronic cases the patients definitely benefit from MRI scanning as in the second case reported in this paper. Since the amount of the hematoma is not infrequently misregarded as a small one, quantification using image analysis is thought to be important for choosing therapeutic strategy. In the modern MRI era, there is only one case of vertex epidural hematoma which was diagnosed by MRI scan (Ramesh and Sivakumar, 1995). We believe that an MRI scan is not only very useful for the detection of hematoma at the "blind spot" but also helpful in deciding therapeutic strategies.

The clinical manifestation of VEDH has several characteristics owing to its unusual location of the hematoma. Because the hematoma overlies the superior sagittal sinus and venous lacunae, it dis-

turbs the venous pathway and compromise the absorption of the cerebrospinal fluid. Hence most of the cases of VEDH present mainly with signs and symptoms of increased intracranial pressure (IICP). Additionally, the hematoma may compress the rolandic area resulting in bilateral motor weakness mainly affecting lower extremities. As described here, many of the reported VEDH had slow progressive courses (Alexander, 1961 ; Stevenson et al., 1964). Those might result from the fact that the bleeding source is of venous origin and the hematoma cause a gradual rise in ICP without profound lateralizing signs.

Concerning treatment it is evident that operative intervention is not required in all cases. Several authors reported good outcomes in their patients with conservative treatment. Some authors believed that a hematoma in the epidural space, to be of surgical significance, should weigh at least 25gm (Alexander, 1961). Additional consideration should be taken into an account for deciding therapeutic modalities. Even a small clot can cause significant neurological problems because VEDH has an entirely different pathophysiologic mechanism. Similar to our experience of the two cases, urgent operation may not be required but close clinical observation is mandatory to choose an appropriate therapeutic

strategy. Some authors have recommended craniotomy in treating VEDH (Alexander, 1961 ; Borzone et al., 1979). More conservative trephination, as described here in the second case, may have a role in the selected patients. The prompt good response to the operation can be anticipated because the main symptoms and signs are not related to parenchymal damage.

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