



# Vertex Venous Epidural Hematoma: A Case Report

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## Abstract

Epidural hematomas are blood collections in the subdural space that typically occur secondary to head trauma. Generally, epidural hematomas result from arterial bleeding, but on infrequent occasions, they may be secondary to venous bleeding. We present a case of epidural hematoma due to venous bleeding resulting from traumatic disruption of the superior sagittal sinus.

**Keywords:** trauma, epidural hematoma, venous bleeding

## Introduction

Head trauma can occur in various settings including traffic accidents, falls, and assaults, and can result in various complications, including epidural hematoma (EDH). While EDHs are typically arterial in origin, a small subset is due to disruption of venous vasculature. These hematomas present clinically similar to arterial EDH but on imaging, frequently present in locations unseen in their arterial counterparts and with different features, including the occasional crossing of suture lines.<sup>1</sup> This case report examines one atypical venous cause of epidural hematoma and the effective management of such a presentation.

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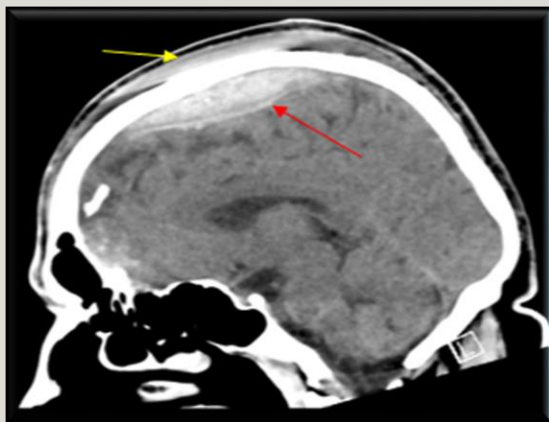
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## Case Presentation

In December 2021, a 47-year-old Hispanic male was transferred to a local hospital from a free-standing emergency department. The previous night, the patient awoke and got out of bed complaining of nausea. He attempted to walk to the bathroom but collapsed and hit his head. His wife found him on the floor, unconscious. She called 911, but upon EMS arrival, the patient, now conscious but confused, refused EMS transportation. He failed to improve, and hours later, his wife convinced him to go to a free-standing emergency department. A head CT was performed and noted an acute nondisplaced calvarial fracture at the vertex with acute epidural hematoma along the falx, a parafalcine traumatic subdural hematoma, and evidence of traumatic subarachnoid bleeding.

He was transferred to the local hospital for urgent neurosurgical evaluation. Repeat CT of the head was consistent with prior imaging. No immediate surgical intervention was recommended. Tranexamic acid and levetiracetam were initiated for traumatic brain injury. Repeat CT of the head the following day was unchanged. Internal medicine was consulted for syncopal workup, which was largely benign. Outpatient follow-up with cardiology was recommended to the patient.

The patient continued to improve and was discharged on hospital day 7 with instructions to return to the clinic in two weeks. A follow-up CT of the head demonstrated a decrease in both the size and radio density of the previous EDH consistent with resolving hematoma and interval resolution of scattered traumatic subarachnoid hemorrhage.

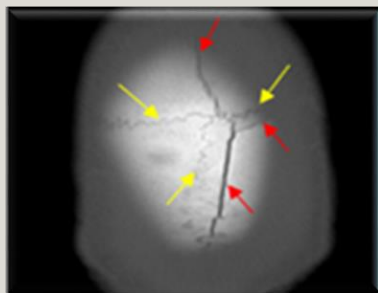


**Figure 1a:** Sagittal view

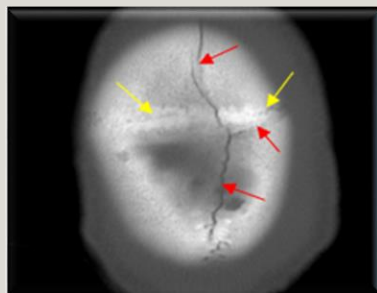


**Figure 1b:** Coronal view

**Figure 1:** Head CT without contrast taken on initial presentation demonstrating the vertex epidural hematoma. The red arrow points to the venous epidural hematoma, and the yellow arrow to a traumatic subcutaneous hematoma



**Figure 2a:** Axial view



**Figure 2b:** Slightly inferior axial view

**Figure 2:** Axial view of the head CT (bone window) taken on initial presentation demonstrating the vertex fracture. The red arrows point to the fractures and the yellow arrows point to the normal physiologic sutures.



**Figure 3:** Coronal view head CT without contrast taken on presentation demonstrating the vertex fracture. The red arrow points to the fracture.

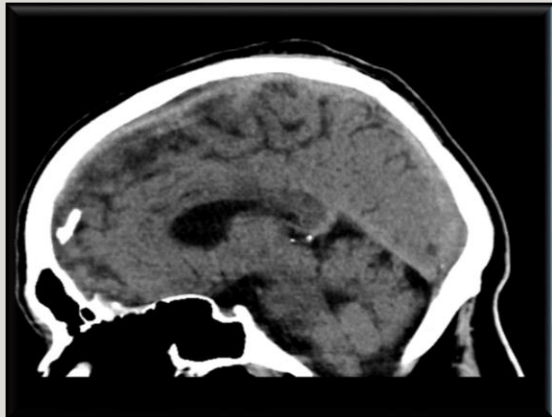


Figure 4a: Sagittal view



Figure 4b: Coronal view

Figure 1: Head CT without contrast taken at 2-week follow up.

The patient presented for additional follow-up two months after discharge from the hospital. He was doing well, and repeat head CT showed mild bilateral inferior and medial frontal lobe post-traumatic encephalomalacia with no additional evidence of large territory cerebral edema.

## Discussion

Epidural hematomas occur in roughly 2% of all head injuries.<sup>2</sup> Classically, they result from arterial bleeding from a damaged middle meningeal artery into the endosteal layer between the skull's inner surface and the dura's outer surface.<sup>3</sup> They present as a hyperdense biconvex "lens" shape that is limited by cranial sutures. On rare occasions, this pathology may be the result of venous bleeding. In these cases, damage to the dural venous sinuses is the precipitating injury.<sup>1</sup> These venous epidural hematomas characteristically occur in three locations: the anterior, middle cranial fossa, likely due to damage of the sphenoparietal sinus along the greater wing of the sphenoid; the occipital posterior fossa due to damage to the transverse sinus; and the vertex, as

seen in the patient presented, secondary to damage to the falx and the enclosed superior sagittal sinus.<sup>1,4,5</sup> These vertex venous EDHs are one of the few occasions in which an epidural hematoma will cross suture lines since the sagittal suture is disrupted, but they are quite rare. One retrospective analysis in India found that vertex epidural hematomas comprised only 0.47% of all epidural hematomas analyzed from 1995 to 2012.<sup>6</sup>

Stereotypically, epidural hematomas present with an initial loss of consciousness, a lucid interval, and deterioration with symptoms including headache, confusion, drowsiness, and seizures.<sup>7,8,9</sup> Hematoma expansion can lead to increased intracranial pressure (ICP), which may result in the Cushing reflex or uncal herniation with compression of the oculomotor nerve and, subsequently an ipsilateral dilated pupil. An eventual sequela of such a presentation without immediate intervention is brain herniation and death. The most common symptom of vertex epidural hematoma is severe headache.<sup>6</sup> Some patients may present with symptomatic elevated ICP and

pure lower limb weakness without sensory involvement. Ramesh et al., noted that none of the patients with a vertex epidural hematoma presented with any cranial nerve involvement; however, one previous case report described a patient with a unilateral oculomotor nerve palsy in the setting of vertex EDH.<sup>6,10</sup>

Head CT remains the most common imaging modality used to identify epidural hematomas. This imaging is fast, widely available, and effective in the identification of most epidural hematomas.<sup>11</sup> However, up to 8% of acute epidural hematomas may not be identified on an initial CT.<sup>2,12,13</sup> This may result from EDH secondary to venous bleeding due to slower accumulation of blood. Brain MRI is slower and more expensive than CT but more sensitive for the identification of intracranial bleeding. It is beneficial in identification of epidural hematoma located at the vertex.<sup>2,14</sup>

Epidural hematomas require immediate neurosurgical evaluation, but management varies on a case-to-case basis.<sup>14,15</sup> In 2006, the Surgical Management of Traumatic Brain Injury Author Group stated that an epidural hematoma with any of the following features should be managed surgically: GCS <9 and pupillary abnormalities, hematoma volume greater than 30 mL, and/or hematoma expansion leading to elevated ICP or neurologic deterioration.<sup>7</sup> Surgical management in cases of vertex EDH involves a wide craniotomy to the margins of the hematoma with evacuation and control of the bleeding.<sup>6</sup> Superior sagittal sinus tears can be directly sutured or controlled with hemostatic devices. Ramesh et al., found that over 80% of patients with a vertex epidural hematoma improved with conservative medical management.<sup>6</sup> These patients should have a full neurologic assessment every one to two hours for at

least the first 24 hours after presentation and repeat head CT 6 to 8 hours after initial imaging and in all patients with neurologic deterioration.<sup>7,16</sup> The patient presented in this case was managed similarly conservatively. He had a largely benign clinical course without evidence of deterioration. Follow-up imaging showed gradual resolution of his vertex EDH and a positive clinical outcome.

## Conclusion

While venous epidural hematomas, such as the one presented in this case, happen much less frequently than their arterial counterparts, limited literature suggests that they can generally be managed conservatively and result in benign clinical outcomes. That said, identification and monitoring of the hematoma with imaging are essential in guiding clinical decision-making.

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