

# Unexpected Epidural Hematoma Following Endoscopic Resection of a Colloid Cyst in the Third Ventricle

Zahir Ilias\*, Stitou Kaoutar

Department of Neurosurgery, University Hospital of Fez, Morocco

## ABSTRACT

A postoperative epidural hematoma (EDH) is a serious and concerning complication, typically occurring at the site of the operation following intracranial surgery. We report a case of EDH after surgery for a colloid cyst of the third ventricle via an endoscopic approach. The patient was promptly managed and showed excellent results. Although the exact mechanism of distant postoperative EDH is unknown, surgeons should be cautious about the speed of intracranial pressure reduction and implement basic procedures to prevent this dangerous complication in brain tumor surgery.

**Keywords:** epidural hematoma, complication, colloid cyst, endoscopic approach

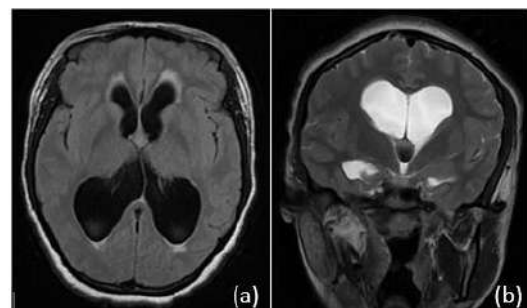
## INTRODUCTION

Brain computed tomography plays an important role in the early detection of postoperative intracranial hematomas after craniotomy(1). However, postoperative epidural hematomas (EDHs) remain a concerning complication in neurosurgical practice. The incidence of postoperative EDHs was 1.0%(2). Postoperative EDHs can develop regionally, adjacent to, or distant from the operative site. However, adjacent EDHs have rarely been described in detail in the literature(2). The exact mechanism of remote postoperative EDH development is unclear; however, several hypotheses have been proposed. Most often, a sudden drop of intracranial pressure (ICP), developed by the excessive loss of a substantial volume of cerebrospinal fluid (CSF) during surgery, is pointed to as a significant cause of remote EDH.

### Illustrative Case

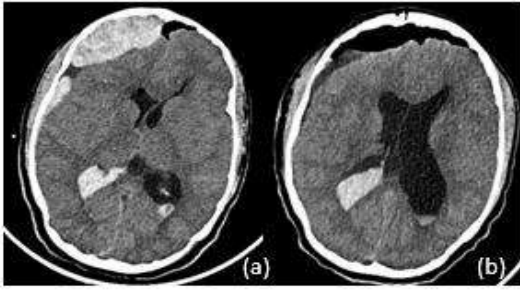
A 25-year-old woman was admitted to our service for the management of severe headaches with bilateral decreased visual acuity. Investigations revealed a colloid cyst of the third ventricle responsible for active bi-ventricular hydrocephalus (Figures 1 (a, b)). Our team decided to perform a complete excision of the colloid cyst via endoscopic approach through a right frontal trepanation hole. The patient was extubated with a Glasgow Coma Scale (GCS) score of 15. Clinical examination was normal.

A CT scan was performed 18 hours later, revealing a significant right frontal epidural hematoma with a maximum thickness of 25mm, causing subfalcine and amygdaloid herniation, located at the site of the first surgery (Figure 2 (a)). It is important to note that the coagulation profile, including prothrombin time and international normalized ratio (INR), was normal. The epidural hematoma remained asymptomatic, but due to its size, we decided to evacuate it immediately. The patient underwent urgent frontal craniotomy. During the procedure, no bleeding source could be identified. The postoperative CT scan showed complete evacuation of the hematoma (Figures 2(b) and 3). The patient was extubated, with a GCS of 15, and a normal physical examination.

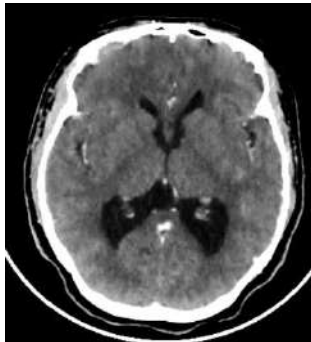


**Figures 1 (a,b):** Preoperative brain MRI, axial FLAIR (a) and coronal T2 (b), showing a colloid cyst of the third ventricle causing active biventricular hydrocephalus.

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**Figure 2 :** (a) Brain CT scan 18 hours after the initial surgical procedure showing a large right frontal epidural hematoma causing subfalcine herniation. (b) Postoperative CT scan demonstrating complete evacuation of the hematoma



**Figure 3 :** Non-contrast follow-up brain CT scan at 1 month showing parenchymal recovery along the wall and a reduction in hydrocephalus..

## DISCUSSION

Postoperative intracranial hematomas are occasional urgent complications following craniotomies for various neurosurgical procedures(2,3). CT scanning has facilitated their detection(4). The overall incidence of postoperative intracranial hematomas after craniotomy requiring surgical evacuation has been reported as 1.1%, with hematomas being intraparenchymal in 43%, subdural in 5%, and epidural in 33%(3). There are reports of postoperative epidural hematomas after CSF shunt(5), extraventricular CSF drainage(7), and ventriculography(6). Post-craniotomy epidural hematomas can be classified as regional, adjacent, or distant based on their relationship to the previous craniotomy site(2). There are reports describing epidural hematomas remote from the craniotomy site(2,5). Wolfsberger reported a case of multiple supratentorial epidural hematomas after posterior fossa surgery(5). It is curious why the epidural hematoma developed adjacent to the craniotomy site when there was no hematoma beneath the previous craniotomy flap. The pathogenetic mechanisms of post-craniotomy adjacent epidural hematomas have

been discussed in the literature. Sudden lowering of intracranial pressure (ICP) or rapid drainage of ventricular CSF results in brain collapse. This may exert a suction force on the structures between the dura and the skull. Losing brain support causes the dura mater to contract due to its own elasticity, separating from the skull(2). Detaching the collagenous fixations of the dura from the inner table of the skull may initially cause bleeding into the epidural space from dural and diploic veins. As the hematoma enlarges and the distance between the dura and bony arterial channels increases, dural arteries may also tear(8,9). The accumulation of blood further promotes dural separation, forming a larger epidural hematoma. Finally, the epidural hematoma may extend downward from the craniotomy site due to gravity into the dependent area. Yacubian et al. explained that not only mechanical shifting of the brain due to CSF drainage but also the repositioning of the brain into its normal position, rectifying disturbed venous circulation, may cause hemorrhage(10). Haft et al. suggested that the upright position on the operating table may promote the stripping of the dura mater from the skull(7). Thiagarajah suggested that hypertension can cause hemorrhage at the operative site by disrupting hemostasis and autoregulation, and by damaging the blood-brain barrier(11). Gerlach et al. reported that decreased Factor XIII activity was associated with an increased risk of postoperative hemorrhage after intracranial surgery(12). The separation of the dura from the calvarial skull due to sudden brain collapse is thought to have contributed to the development of adjacent epidural hematomas in the 7 patients in this report. Preoperative ventricular dilatation was observed in 3 of them. In another, a VP shunt for hydrocephalus was complicated by recurrent adjacent epidural hematomas. Accidental perforation of the cranial vault by a headrest pin caused an adjacent epidural hematoma in case 7. Although postoperative coagulopathy was found in cases 3 and 8, their INR was normalized after fresh frozen plasma (FFP) transfusion. It is uncertain whether their elevated INR played any causal role in the formation of the epidural hematoma. A Factor XIII assay was not performed in our cases. All hematomas were located in dependent areas and were mainly composed of a fluid component. This suggests that the epidural blood clots extended downward.

To prevent adjacent epidural hematomas, the authors suggest that the separation of the dura beneath the craniotomy edge should be as narrow as possible at the time of the craniotomy. Sudden brain collapse should be avoided, particularly in patients with preoperative ventricular dilatation. It is recommended to fill the subdural space with normal saline to prevent significant brain displacement and the development of epidural hematomas. They also suggest performing immediate postoperative brain CT routinely after craniotomy. In our case, the brain CT was performed within 6 hours of the craniotomy. The epidural hematoma was diagnosed and treated without much delay, and the patient showed a good outcome.

#### **CONCLUSION:**

Intra-operative rapid drainage of ventricular CSF or severe brain collapse can cause a postoperative epidural hematoma adjacent to the previous craniotomy site. After craniotomies for brain tumors or intracranial aneurysms, when significant brain collapse occurs, immediate postoperative brain CT is essential to detect and manage an unexpected event such as adjacent epidural hematoma.

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