

# Supratentorial hematoma during infratentorial surgery: A short series of three cases

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## ABSTRACT

Distant site hematoma formation may complicate an otherwise uneventful surgery. The authors describe three cases of such unexpected complications, while operating upon infratentorial lesions in prone position. Pathophysiology behind such complications and changes in intraoperative monitoring is discussed, along with all the previously reported cases. Of the three cases, there was one death, while rest of the two cases made eventless recovery. Meticulous hemostasis, isolation of operative site, avoidance of cerebrospinal fluid over-drainage during surgery may prevent such a complication. Careful interpretation of vital-monitoring may indicate the occurrence of such a complication.

**Key words:** Distant site hematoma, posterior fossa surgery, prone position

## INTRODUCTION

Intraoperative or postoperative hematoma distant from the primary surgical site occurs rarely, and often lead to fatal outcome. Extradural (EDH) or subdural (SDH) hematoma formation on the contralateral side of surgery is described among both trauma and non-trauma patients. After trauma, the brain remains in a dynamic state for a prolonged period, explaining delayed intracranial hematoma formation, sometimes distant from the primary surgical site. The pathophysiology behind such a complication in a non-traumatic brain may be different. The present report describes three such cases, along with literature review.

## CASE REPORT

There were 3 cases (2 females, 1 male; mean age 20.3 years), who had unexpected cerebellar bulge while undergoing posterior fossa surgery. All patients had presented with symptomatology suggestive of raised ICP. Baseline hematological, biochemical, and coagulation

parameters were within normal range. Radiological work-up included CT scans and MRI scans for all patients [Figures 1 and 2]. All underwent sub-occipital craniectomy (head fixed in Mayfield clamp in case 1, while 4-pin sugita head rest in rest 2 cases) in prone position, without any cerebrospinal fluid (CSF) diversion surgeries. Intraoperatively, the surgery remained eventless till the dura was opened. In case 1 and 2, there was unrelenting cerebellar bulge, just after CSF release from cistern magna. After subtotal excision of tumor [Figure 1a], the patient (case 1) was put on mechanical ventilation. Postoperative CT scan revealed bilateral frontal and parietal EDH [Figure 1b]. No intervention was performed as there were no brain stem reflexes. In case 2, even before positioning the microscope, there was inappropriate cerebellar bulge. There were significant cardiac rate changes observed on monitor. The tumor protruding out of 4<sup>th</sup> ventricle was excised, releasing 4<sup>th</sup> ventricular CSF [Figure 1c]. As the cerebellar bulge was unrelenting, surgical wound was hastily closed, patient made supine, and taken up for CT scan on portable ventilator without anesthesia reversal. CT scan showed a massive left-sided supratentorial mixed density EDH [Figure 1d], which was successfully evacuated and patient was ventilated for 24 hours. Patient made an eventless recovery thereafter. In Case 3, surgery remained uneventful till the total excision of tumor [Figures 2a and b]. At the time of securing tumor bed hemostasis, the cerebellum started bulging. Immediate postoperative CT scan showed right-sided SDH [Figure 2c], which was successfully managed non-surgically [Figure 2d].

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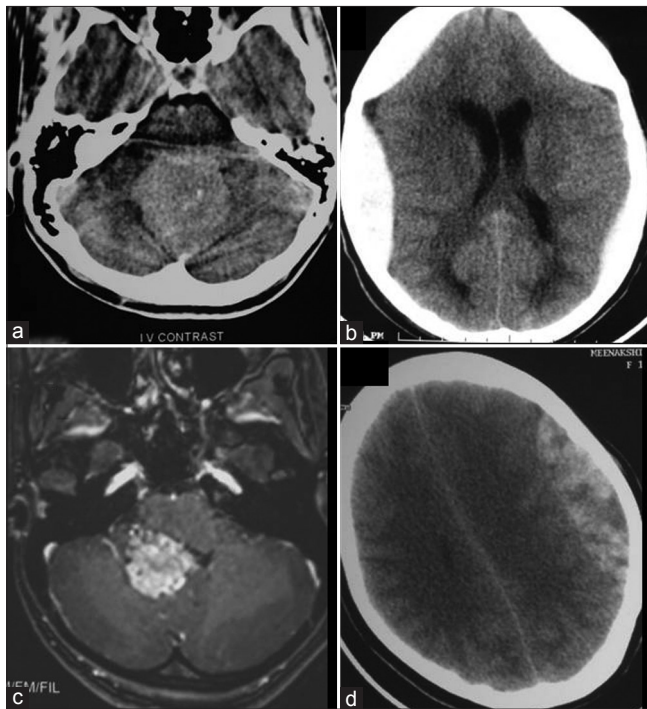
## DISCUSSION

Distant site hematoma formation in a non-traumatic brain in a prone position is occasionally noted. English literature describes six such cases<sup>[1-6]</sup> [Table 1].

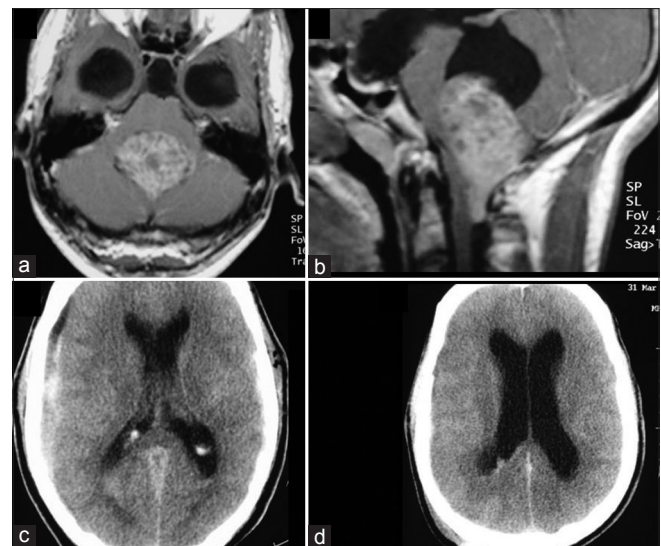
In the present report, none of the cases underwent CSF diversion surgeries, prior to definitive tumor surgeries. In case 1 and 2, it was the rapid release of CSF from cisterna magna which lowered the ICP, prompting supratentorial EDH formation.<sup>[5]</sup> Inappropriate cerebellar bulge in posterior fossa surgery may also occur due to acute hydrocephalus or intratumoral bleed, besides anesthetic causes. Cardiorespiratory changes are part

of posterior fossa surgery, especially when performed in prone position. We observed a close co-relation of these changes with intraoperative events, substantiated with immediate radiological findings and suggest modification of surgical plan during surgery (case 2).

Ventricular drain placement, so as to salvage the uncontrolled situation probably accentuated the EDH in such cases. Pin site vault injury, coagulation abnormalities may also account for such complications. Sudden cardiorespiratory changes during posterior fossa surgery should be cross-checked with surgical findings, with great caution. Whenever inappropriate changes, like bradyarrhythmia, blood-pressure fluctuations occur along unordinary surgical findings like cerebellar bulge, it heralds a serious complication. During such a situation, surgeon may decide to abandon the surgical procedure. Such heart-rate changes, just after dural opening, should alert the surgical team toward distant site hematoma, rather than brain-stem damage.



**Figure 1:** (a) Case 1, Axial CT scan showing midline posterior fossa tumor (b) Case 1, Postoperative CT scan showing a bilateral frontal and parietal EDH after posterior fossa surgery (c) Case 2, Contrast-enhanced MRI scan showing 4<sup>th</sup> ventricular choroid plexus papilloma (d) Case 2, Axial section of CT scan, performed after rapid closure of primary operative site, showing a massive mixed-density left-sided EDH



**Figure 2:** (a, b) Case 3, Contrast-enhanced MRI scan (axial and sagittal section) showing a large fourth ventricular tumor, ependymoma (c) Case 3, Postoperative CT scan showing right-sided SDH (d) Case 3, Follow-up CT scan showing completely resolved SDH

**Table 1: Distant site extracerebral hematomas reported after posterior fossa surgery in prone position**

| Author/year                                    | Age/Sex   | Primary surgery                                      | Distant hematoma   | Management    | Outcome          | Pathophysiology |
|--|-----------|--|--------------------|---------------|------------------|-----------------|
| Tjan <i>et al.</i> (1980) <sup>[1]</sup>       | -         | Posterior fossa tumor + shunt                        | Bifrontal EDH      | —             | Satisfactory     | Rapid ↓ ICP     |
| Suzuki <i>et al.</i> (1982) <sup>[2]</sup>     | 45/F      | CVJ meningioma                                       | Bilateral EDH      | Surgery twice | Satisfactory     | Rapid ↓ ICP     |
| Chandra <i>et al.</i> (2002) <sup>[3]</sup>    | 25/F      | Occipital parafalcine meningioma                     | Bifrontal EDH      | Surgery       | Satisfactory     | Rapid ↓ ICP     |
| Porto <i>et al.</i> (2002) <sup>[4]</sup>      | 3.10/12/F | Cerebellar malignant rhabdoid tumor                  | Lower thoracic SDH | Conservative  | Satisfactory     | Blood spillover |
| Wolsberger <i>et al.</i> (2004) <sup>[5]</sup> | 31/F      | 4 <sup>th</sup> ventricular choroid plexus papilloma | Bilateral EDH      | —             | Satisfactory     | —               |
| Hicdonmez <i>et al.</i> (2005) <sup>[6]</sup>  | 43/F      | Posterior fossa tumor                                | Thoracic SDH       | Surgery       | Partial recovery | Blood spillover |
| Present case 1                                 | 15/F      | Medulloblastoma                                      | 4-quadrant EDH     | —             | Death            | Rapid ↓ ICP     |
| Present case 2                                 | 27/F      | 4 <sup>th</sup> ventricular choroid plexus papilloma | Left parietal EDH  | Surgery       | Satisfactory     | Rapid ↓ ICP     |
| Present case 3                                 | 19/M      | 4 <sup>th</sup> ventricular ependymoma               | Right SDH          | Conservative  | Satisfactory     | Blood spillover |

EDH - Extradural hematoma; SDH - subdural hematoma; CVJ - Craniovertebral junction; ICP - Intracranial pressure

Abrupt decrease in ICP and consequential rupture of a bridging vein remains the most accepted cause behind such a complication. SDH, remote from the primary surgery site, probably occurred due to snapping of bridging veins in supratentorial compartment after rapid release of CSF from infratentorial compartment. Spillage of blood from primary surgical site can occur only through tentorial hiatus. This pathway of blood spillover seems plausible, only after CSF over-drainage to the extent, that potential space gets created at the tentorial hiatus, for the blood to shift compartments. Meticulous hemostasis, isolation of operative site, and avoidance of CSF over-drainage during surgery may prevent such a complication.<sup>[2,4]</sup> The best intraoperative strategy is to get an immediate CT scan, preferably without anesthesia reversal and rule out a surgical lesion distant from the primary surgical site.

First case expired soon after the CT scan, not providing any opportunity for surgical evacuation. Only Case 2 underwent hematoma evacuation, as the authors got alerted, just at outset of cerebellar bulge. The patient could be salvaged primarily due to rapid second surgical intervention. "Distant site SDH" may or may not warrant surgical evacuation, depending upon clinical status.

## CONCLUSION

Intraoperative cerebellar bulge, co-relating with unresponsive changes in vital parameters remains a subtle indicator of a "distant site haematoma." Distant site EDH

is more likely, if cerebellar bulge occurs just after dural opening. It is better not to proceed with surgery whenever such a situation is encountered. In all such situations, the patient should undergo immediate CT scan, even if abandoning the primary surgery is required.

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