Supratentorial Intracerebral Hematoma as a Rare Complication of Posterior Fossa Surgery in Prone Position: A Case Report with Review of Literature

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Abstract
Supratentorial intracerebral hematoma is a rare complication after posterior fossa tumor surgery in prone positioning. Although rare, its occurrence may cause significant impact on survival of the patient. We had described this rare complication and their possible pathophysiology in this report. A 52-year-old male with fourth ventricle epidermoid tumor with noncommunicative hydrocephalus was presented to us in drowsy condition in emergency department. Right-sided medium pressure ventriculoperitoneal surgery was performed in emergency. After shunt surgery patient become conscious and oriented. Total excision of tumor was done via suboccipital craniotomy in prone positioning after preanesthesia fitness. Patient extubated from anesthesia and was conscious but after 2 hours patient condition deteriorated. Patient was intubated again and taken on ventilatory support. Postoperative plain computed tomography brain showed total excision of tumor with left temporal lobe hematoma. Patient was managed conservatively and his condition improved in 3 weeks' periods. Supratentorial intracerebral hematoma after posterior fossa surgery in prone positioning is a rare complication. Despite the rarity of this complication, it is still challenging as it may lead to significant morbidity and mortality.

Keywords
► supratentorial
► intracerebral hematoma
► posterior fossa
► complication
► prone position

Introduction
Supratentorial intracerebral hematoma remote from the operative site after posterior fossa tumor surgery in prone positioning is a rare complication. Its occurrence may cause significant morbidity and mortality.¹⁻³ Incidence of supratentorial hemorrhage after posterior fossa surgery is 0.4 to 1.6%.⁴ A few cases have been reported in the literature; however, the exact cause could not be located.³⁻⁵ In this article, we report a case of supratentorial hematoma developed after posterior fossa tumor removal in prone positioning. We have made an attempt to find out the pathophysiology and the possible ways to prevent this complication. The work has been reported according to SCARE 2020 criteria. Written consent was taken from the
patient’s attendant for publication of this case report and accompanying images.

**Case Report**

A 52-year-old male presented to us with history of progressive headache from 1 year. Patient also having recurrent vomiting from last 7 days. On admission patient was drowsy. Plain computed tomography (CT) brain done on emergency basis showed a large hypodense mass of size 5.89 × 4.3 cm in the fourth ventricle. It was associated with noncommunicating hydrocephalus with periventricular lucency. Right-sided medium pressure ventriculoperitoneal shunt surgery was done in emergency. After shunt surgery, patient became conscious and oriented to time, place, and person.

On neurological examination, his higher mental function, cranial nerve, motor and sensory system examination were normal. There was slight gait ataxia on cerebellar examination. Contrast magnetic resonance imaging findings were suggestive of a large epidermoid tumor in the fourth ventricle (►Fig. 1). Patient was prepared for surgery and suboccipital craniotomy in prone position with total excision of tumor was done. Intraoperative period was uneventful. Immediately after surgery, patient was extubated and conscious and oriented. After 2 hours of surgery, patient condition deteriorated and patient reintubated and took on ventilatory support. Postoperative plain CT brain was done and it showed left temporal intracerebral hematoma with total excision of tumor (►Fig. 2). Tracheostomy was done on postoperative day 3. Gradually patient neurological condition improved and he became conscious and weaned from ventilatory support on postoperative day 6. Patient developed chest infection that was managed conservatively with intravenous antibiotics. Tracheostomy tube was removed on postoperative day 22 and patient was discharged from the hospital.

**Discussion**

Operative site hematoma may occur after surgery but remote hemorrhage mostly of intracerebral is rare. Only few cases were reported in the literature and the cause of this particular complication was not clear in majority of cases. We have summarized these cases in ►Table 1. The following pathophysiologies have been proposed.

In the previous reported cases, most were operated in sitting position, hematoma developed within hours of surgery, and majority of the cases either died or had severe disability (►Table 1). The sitting position can reduce the arterial blood flow, causing ischemia and after the return to the supine position, the hypertension can lead to

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**Fig. 1** (A) Magnetic resonance imaging (MRI) brain T1-weighted (T1W) axial image showing large hypointense mass lesion filling whole of fourth ventricle. (B) MRI brain T2W axial image showing large hyperintense mass. (C) MRI brain T1 contrast axial image showing no enhancement. (D) MRI brain T1 contrast sagittal image showing tumor filling whole of the fourth ventricle. (E) MRI brain T1 contrast coronal image showing tumor filling whole of the fourth ventricle and insinuating bilaterally into foramen of Luschka. (F) MRI brain with diffusion weighted imaging showing minimal diffusion restriction.
hemorrhage in the cerebral parenchyma previously affected by ischemia.\textsuperscript{3,8} CSF drainage during posterior fossa surgery in sitting position may cause decrease in intracranial pressure and rupture of ventricular ependymal wall and intraventricular hemorrhage.\textsuperscript{9} Tondon and Mahapatra\textsuperscript{3} and Vrettou et al\textsuperscript{10} reported that coagulation disorder can be the cause of intracerebral hematoma at a distance from operative site. Seiler and Zurbrügg\textsuperscript{11} and Standefer et al\textsuperscript{12} had reported hypertension as a cause of supratentorial intracerebral hemorrhage following suboccipital craniectomy.

Fig. 2 Postoperative plain computed tomography brain axial image (A) showing total excision of tumor, (B) left temporal intracerebral hematoma with right-sided shunt tube in situ, and (C) resolving hematoma in left temporal region.

Table 1 Previous reported cases of supratentorial hematoma after posterior fossa surgery

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>Age/sex</th>
<th>Primary pathology</th>
<th>Position</th>
<th>Approach</th>
<th>Site of hematoma</th>
<th>Hematoma diagnosis</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haines et al\textsuperscript{2}</td>
<td>1978</td>
<td>65/F 55/F 41/F 64/F</td>
<td>TGN GPN Atypical TGN Anesthesia dolorosa</td>
<td>Sitting</td>
<td>RM craniectomy</td>
<td>(R) O (R) BG (R) FP (L) F</td>
<td>Within hours</td>
<td>Mod D Death Mod D Mild D</td>
</tr>
<tr>
<td>Cartier-Giroux et al\textsuperscript{9}</td>
<td>1980</td>
<td>55/F</td>
<td>Metastatic breast cancer</td>
<td>Sitting</td>
<td>SO craniectomy</td>
<td>(R) BG</td>
<td>Day 3</td>
<td>Death</td>
</tr>
<tr>
<td>Standefer et al\textsuperscript{12}</td>
<td>1984</td>
<td>55/NA 59/NA</td>
<td>Parotid cancer metastasis Meningioma</td>
<td>Sitting</td>
<td>SO craniectomy</td>
<td>T BG</td>
<td>NA</td>
<td>Death Death</td>
</tr>
<tr>
<td>Harder et al\textsuperscript{6}</td>
<td>1985</td>
<td>44/F 51/F 58/M</td>
<td>Meningioma Acoustic neuroma Meningioma</td>
<td>Sitting</td>
<td>SO craniectomy</td>
<td>(L) FP B/L FT (L) P</td>
<td>NA</td>
<td>Severe D Death Mod D</td>
</tr>
<tr>
<td>Seiler and Zurbrügg\textsuperscript{10}</td>
<td>1986</td>
<td>66/F 64/F 59/F</td>
<td>Acoustic neuroma Meningioma Acoustic neuroma</td>
<td>Lateral Sitting Sitting</td>
<td>SO craniectomy</td>
<td>(R) P (L) P (R) P</td>
<td>Within hours</td>
<td>Severe D Death Severe D</td>
</tr>
<tr>
<td>Bucciero et al\textsuperscript{5}</td>
<td>1991</td>
<td>46/M</td>
<td>Hemangioblastoma</td>
<td>Sitting</td>
<td>So craniectomy</td>
<td>TP (L)</td>
<td>Within hours</td>
<td>NA</td>
</tr>
<tr>
<td>Kalkan and Eser\textsuperscript{8}</td>
<td>2006</td>
<td>63/F</td>
<td>Meningioma</td>
<td>Sitting</td>
<td>SO craniectomy</td>
<td>FP (R)</td>
<td>Within hours</td>
<td>NA</td>
</tr>
<tr>
<td>Tondon and Mahapatra\textsuperscript{3}</td>
<td>2004</td>
<td>34/F 50/F</td>
<td>Acoustic tumor Pons tumor</td>
<td>NA</td>
<td>RM craniectomy SO craniectomy</td>
<td>O BG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vrettou et al\textsuperscript{10}</td>
<td>2010</td>
<td>60/F</td>
<td>Hemangioblastoma</td>
<td>Prone</td>
<td>SO craniectomy</td>
<td>F with IVH</td>
<td>Within hours</td>
<td>Severe D</td>
</tr>
<tr>
<td>Agrawal et al\textsuperscript{1}</td>
<td>2010</td>
<td>47/F</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>T (R)</td>
<td>3 hours</td>
<td>NA</td>
</tr>
<tr>
<td>de Albuquerque et al\textsuperscript{9}</td>
<td>2015</td>
<td>23/F</td>
<td>Ependymoma</td>
<td>Lateral</td>
<td>SO craniectomy</td>
<td>F &amp; P (L)</td>
<td>Within hours</td>
<td>Death</td>
</tr>
<tr>
<td>Salunke et al\textsuperscript{13}</td>
<td>2016</td>
<td>35/M 7/M</td>
<td>Acoustic neuroma Posterior fossa tumor</td>
<td>Lateral Prone</td>
<td>RM craniectomy SO craniectomy</td>
<td>(L) P</td>
<td>12 hours Day 2</td>
<td>Severe D Death</td>
</tr>
</tbody>
</table>

Abbreviations: BG, basal ganglia; D, disability; F, frontal; GPN, glossopharyngeal neuralgia; IVH, intraventricular hemorrhage; L, left; NA, not available; O, occipital; P, parietal; R, right; RM, retromastoid; SO, suboccipital; T, temporal; TGN, trigeminal neuralgia.
In most of the previous reports, posterior fossa surgery was performed in sitting position that is why we are doing posterior fossa surgery in prone positioning to decrease the probability of this complication. Salunke et al.\textsuperscript{13} also suggested to perform posterior fossa surgery in prone position to decrease this type of rare complication.

Our case was operated in prone positioning, the possible mechanism for this rare complication may be the occlusion of carotid artery in the neck by improper positioning of the head, which leads to intraoperative infarction and hemorrhage in the infarcted brain after repositioning the patient. Previous cases reported by Harders et al,\textsuperscript{6} Vrettou et al,\textsuperscript{10} and Pandey et al\textsuperscript{14} had described this possible mechanism for this rare complication in his case operated in prone position for posterior fossa tumor. Our case is unique, as our case had neither hypertension nor coagulation disorder and the operative positioning was prone. Most of the previous studies (\textsuperscript{►}Table 1) had reported this complication in sitting position and in this case it occurred in prone positioning.

On reviewing the literature, we found that the type of tumor (epidermoid cyst) and approach had no relation with this complication. Despite the rarity of this complication, it is still challenging as it may lead to significant morbidity and mortality.

\textbf{Conclusion}

Supratentorial intracerebral hematoma after posterior fossa surgery in prone position is a rare complication. Despite the rarity of this complication, it is still challenging as it may lead to significant morbidity and mortality. The possible mechanism for this rare complication in prone positioning may be the occlusion of carotid artery in the neck by improper positioning of the head that leads to intraoperative infarction and hemorrhage in the infarcted brain after repositioning the patient. The type of tumor and approach had no relation with this complication.

\textbf{Conflict of Interest}

None declared.

\textbf{References}