Cerebellar Hemorrhage after Burr Hole Drainage of Supratentorial Chronic Subdural Hematoma

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Cerebellar hemorrhage is an unusual complication of supratentorial neurosurgery. To the best of our knowledge, only three case reports have described the occurrence of cerebellar hemorrhage after burr hole drainage for the treatment of chronic subdural hematoma (SDH). We present the case of a patient with this rare postoperative complication of cerebellar hemorrhage after burr hole drainage of a chronic SDH. Although burr hole drainage for the treatment of chronic SDH is rare complication, it is necessary to be aware of the possibility of cerebellar hemorrhage after supratentorial surgery, even with limited surgery such as burr hole drainage of a chronic SDH.

KEY WORDS: Cerebral hemorrhage · Subdural hematoma · Craniotomy · Complication · Supratentorial.

INTRODUCTION

Cerebellar hemorrhage is an unusual but increasingly recognized complication of supratentorial neurosurgery\(^{4,7}\). Most cases describe this remote cerebellar hemorrhage in relation to craniotomy for cerebral tumor resection, aneurysm surgery, intracranial hematoma decompression and temporal lobe resection requiring brain retraction and removal of CSF at the time of surgery.

To our knowledge, only three reported cases have previously described the occurrence of cerebellar hemorrhage after burr hole drainage of a chronic subdural hematoma (SDH)\(^{3,6,14}\). Several preoperative and medical risk factors may predispose patients to cerebellar hemorrhage after supratentorial surgery. However, the etiology of this complication remains unclear. We report a case of cerebellar hemorrhage after burr hole drainage of a chronic SDH and review the reported cases to discuss possible etiologic mechanisms.

CASE REPORT

A 53-year-old woman who was previously healthy complained of right leg weakness lasting for one week. There had been no prior head trauma. Due to a gradually developing gait disorder, magnetic resonance imaging of the brain was performed, and the results showed a chronic bifrontal subdural hematoma (Fig. 1). She had been taking metformin under the diagnosis of diabetes mellitus for 3 years. There was no history of arterial hypertension or hemorrhagic diathesis. Preoperative coagulation parameters (prothrombin time, partial thromboplastin time, anti-thrombin III, bleeding time, platelet count) were normal. Surgery was performed under general anesthesia with the patient in the supine position, without head rotation. Frontal burr holes were drilled on each side. The hematoma was slowly decompressed, and the subdural space was gently irrigated with warm isotonic saline to evacuate the hematoma. Irrigation was continued until clear fluid returned. At the end of the operation, a subdural frontal closed drainage system with out negative pressure was placed on each side. The procedure was completed without any obvious complications. The patient’s perioperative blood pressure remained within normal range. The patient developed a strong headache, dizziness, nausea and vomiting after being transported to the neurosurgical intensive care unit. Computed tomo-
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A CT scan taken 6 hours after the operation demonstrated adequate drainage of the subdural hematomas, and it also revealed a new hemorrhage within the left cerebellar hemisphere (Fig. 2). The total drainage from the subdural space was 100 mL on the right side and 120 mL on the left side. Because the fluid in the connecting catheter was clean and pulsated with the patient's heart beat, the drainage system was clamped. On the second day after the operation, the patient immediately developed a severe headache upon transient opening of the drainage system, which was removed 3 days after the surgery. The patient improved gradually with bed rest and hydration. CT scan performed 14 days after the operation showed resolution of the cerebellar hemorrhage (Fig. 3). There was no abnormal finding on conventional angiography (Fig. 4). The patient was discharged 3 weeks after surgery with the recovery of leg weakness.

**DISCUSSION**

Postoperative hemorrhage is a feared complication of neurosurgery. Much effort is focused on minimizing the risk of postoperative hemorrhage through careful hemostasis intraoperatively and tight control of coagulation parameters perioperatively. Previous studies reported that the incidence of postoperative hematoma was 0.8% after 4,992 craniotomies, including burr hole trephination, and 1.1% after 6,668 neurosurgical procedures of any kind. Hemorrhage remote from the site of surgery is an increasingly recognized complication of neurosurgery. Infratentorial surgery can lead to supratentorial hemorrhage and vice versa. Remote cerebellar hemorrhage is a rare complication of neurosurgery. Approximately, 60 cases of craniotomy complicated by cerebellar hemorrhage have been documented.

We performed a PubMed search using the key words “hemorrhage”, “remote hemorrhage”, “cerebellar hemorrhage”, “subdural hematoma”, and/or “burr hole craniotomy”. The characteristics of our case and 3 cases of remote cerebellar hemorrhage after burr hole trephination for chronic SDH are summarized in Table 1. These cases were not related to high blood pressure, underlying vascular malformation or neoplasm, though postoperative hypertension may have been transient and gone unnoticed. Although cases 1 and case 2 were treated with temporary external ventricular drainage for acute hydrocephalus, the prognosis was generally good. The patient in case 3 had a low platelet count and died due to massive cerebellar hemorrhage after the third evacuation for the treatment of SDH.
Our case seemed to be associated with overdrainage of CSF during perioperative period. The patient was fully recovered following bed rest and hydration.

The mechanism of remote cerebellar hemorrhage is unknown, but it is suspected to be multifactorial. The previously proposed mechanisms include intracranial hypotension through removal of the supratentorial mass, altered coagulation profile, postoperative hypertension, excessive head rotation coupled with hyperextension leading to obstruction of the ipsilateral jugular vein, overdrainage of CSF – via removal leading to a shift in the intracranial contents with resultant tearing, compression or an increase in the transmural pressure of cerebellar draining veins or cerebellar parenchymal vessels. It has been considered that stretching of the cerebellum and cerebellar veins, which can occur during surgery that requires brain retraction or excessive CSF loss, may cause transient occlusion of the vermician veins increasing the venous pressure resulting in venous hemorrhage. Postoperative repositioning of patients with intra- and extradural drains may lead to negative intracranial pressure causing a suction effect on the brain and cerebellum. The transcranial pressure gradient precipitates damage to the draining cerebellar venous system. Expansion of the CSF spaces, depending on the size of the resection cavity or the size of the drained subdural fluid compartment reduces intracranial pressure and may furthermore cause increased mobility of the intracranial structures.

In our case, a relatively large amount of fluid was drained for 6 hours, and the patient immediately developed a severe headache and vomiting when the drainage system was reopened. The fact that normal angiograms followed this complication suggests that it is not arterial in origin. Further, the thin-walled veins should be more susceptible to indirect injury. Continuous drainage could lead to negative intracranial pressure causing a suction effect on the brain and cerebellum, which seems to be associated with rupture of the small supracerebellar veins and capillary bed with venous bleeding.

**Table 1. Patient characteristics with cerebellar hemorrhage after burr hole evacuation of chronic subdural hematoma**

<table>
<thead>
<tr>
<th>Ref.</th>
<th>Age/Sex</th>
<th>Presenting symptoms</th>
<th>Diagnosis</th>
<th>Past history</th>
<th>Surgery</th>
<th>Amount of treatment</th>
<th>Treatment for cerebellar hemorrhage</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>49/F</td>
<td>Headache</td>
<td>Bilateral chronic SDH</td>
<td>-</td>
<td>One burr hole on each side</td>
<td>20 cc for 4 hrs</td>
<td>EVD</td>
<td>Full recovery</td>
</tr>
<tr>
<td>14</td>
<td>73/F</td>
<td>Hemiparesis</td>
<td>Right chronic SDH</td>
<td>Hepatitis</td>
<td>Two burr holes</td>
<td>40 cc for 6 hrs</td>
<td>EVD</td>
<td>Unable to walk unaided</td>
</tr>
<tr>
<td>1</td>
<td>79/M</td>
<td>Mentality change</td>
<td>Right chronic SDH</td>
<td>Atrial fibrillation</td>
<td>One burr hole (3 times)</td>
<td>ND</td>
<td>Poor general condition</td>
<td>Death</td>
</tr>
<tr>
<td>Our case</td>
<td>62/F</td>
<td>Hemiparesis</td>
<td>Bilateral chronic SDH</td>
<td>Diabetes mellitus</td>
<td>One burr hole on each side</td>
<td>220 cc for 6 hrs</td>
<td>Rest and hydration</td>
<td>Full recovery</td>
</tr>
</tbody>
</table>

EVD : extraventricular drainage, ND : not described, Ref. : references, SDH : subdural hematoma

**CONCLUSION**

We report a case of cerebellar hemorrhage after burr hole drainage of chronic SDH. Although a rare complication, it is necessary to be aware of the possibility of cerebellar hemorrhage after supratentorial surgery, even with limited surgery such as burr hole drainage of a chronic SDH. Cerebellar hemorrhage should be considered when neurological deterioration occurs after evacuation of chronic SDH.

**References**