Remote Cerebellar Hemorrhage Following Thoracic Spinal Surgery
—Case Report—

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Abstract

A 51-year-old man underwent surgery for ossification of the ligamentum flavum at the T9-T10 levels. Intraoperatively, the dura was opened unintentionally and a subcutaneous suction drain was placed. The patient complained of severe headache and nausea postoperatively. Brain computed tomography obtained 3 days after the surgery demonstrated remote cerebellar hemorrhage and hydrocephalus. Suboccipital decompression, C1 laminectomy, and ventriculostomy were performed and his symptoms subsided 2 months later. Remote cerebellar hemorrhage following spinal surgery is extremely rare, but may occur after any type of spinal surgery resulting in dural tear or intradural manipulation. Early diagnosis is particularly important for the treatment of remote cerebellar hemorrhage following spinal surgery.

Key words: complication, dural tear, remote cerebellar hemorrhage, spinal surgery

Introduction

Remote cerebellar hemorrhage occasionally occurs distant from the surgical site after cranial surgery and may be a life-threatening complication.2,13,16) The incidence of remote cerebellar hemorrhage associated with craniotomy is 0.2–4.9%.2,13,16) Recently, spinal surgery has also been reported to cause remote cerebellar hemorrhage.2,4) Although the pathophysiological mechanism of remote cerebellar hemorrhage is unknown, intraoperative or postoperative loss of cerebrospinal fluid (CSF) seems to be involved. We report another case of remote cerebellar hemorrhage following spinal surgery.

Case Report

A 51-year-old man developed paraparesis with paresthesia in both legs, and visited a local hospital. Spinal computed tomography (CT) revealed ossification of the ligamentum flavum (OLF) at the T9-T10 levels (Fig. 1A). He underwent T9-T10 laminectomy and resection of the OLF (Fig. 1B) in the prone position via a posterior approach. Intraoperatively, the dura was opened unintentionally, and was watertight repaired. A closed subcutaneous suction drain was placed. The patient was neurologically intact, but complained of severe headache and nausea postoperatively. His symptoms did not improve after up to 460 ml of serous fluid was removed through the suction drain over 18 hours. He was suspected to have low intracranial pressure syndrome, and sec-
Second surgery was performed to repair the CSF leakage. The dura mater was re-exposed, but no apparent CSF leak point was detected. Following the second surgery, he remained drowsy. Brain CT obtained 2 days after the second surgery revealed bilateral cerebellar hemorrhages facing the tentorium and obstructive hydrocephalus (Fig. 2). The patient was then transferred to our institution. He had only bilateral cerebellar ataxia, but his level of consciousness gradually deteriorated. Laboratory studies including platelet count, prothrombin time, and partial thromboplastin time found no abnormalities. Digital subtraction angiography did not show any vascular lesions in the cerebellum. The patient underwent suboccipital decompression, C1 laminectomy, and ventriculostomy. The postoperative course was uneventful and cerebellar ataxia completely subsided 2 months later.

**Discussion**

Fifteen cases of remote cerebellar hemorrhage following spinal surgery have been reported, including the present case (Table 1).\(^1\)\(^,\)\(^3\)\(^,\)\(^12\)\(^,\)\(^14\)\(^,\)\(^15\) The exact pathophysiological mechanism of remote cerebellar hemorrhage is unknown, but a venous origin and intra- or postoperative CSF loss may be involved.\(^2\) During spinal surgery, the dura mater was opened in all cases (Table 1). This may suggest that CSF loss is one of the most important factors regarding remote cerebellar hemorrhage. Two cases of remote cerebellar hemorrhage with spinal surgery suggested that

![Computed tomography scans of the brain 3 days after the spinal surgery revealing bilateral cerebellar hemorrhages facing the tentorium.](image)

**Table 1** Summary of cases of remote cerebellar hemorrhage following spinal surgery

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Author (Year)</th>
<th>Age (yrs)/Sex</th>
<th>Diagnosis</th>
<th>Type of spinal surgery</th>
<th>Intradural manipulation/durotomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chadduck (1981)(^4)</td>
<td>59/M cervical spinal stenosis</td>
<td>laminectomy</td>
<td>transdural exploration</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Mikawa et al. (1994)(^10)</td>
<td>75/M atlantoaxial subluxation</td>
<td>revision fusion</td>
<td>durotomy</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Andrews and Koci (1995)(^1)</td>
<td>36/M lumbar scoliosis</td>
<td>Harrington rod placement</td>
<td>occult dural injury</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Satake et al. (2000)(^14)</td>
<td>62/M cervical intramedullary tumor</td>
<td>removal of the tumor</td>
<td>intradural manipulation</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Morandi et al. (2001)(^11)</td>
<td>34/M cervical schwannoma</td>
<td>removal of the tumor</td>
<td>intradural manipulation</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Friedman et al. (2002)(^1)</td>
<td>43/M thoracic herniated disk</td>
<td>transpedicular removal of the disk</td>
<td>opening of the dura</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Thomas et al. (2002)(^13)</td>
<td>56/F lumbar spinal stenosis</td>
<td>laminectomy and fusion removal of the tumor</td>
<td>intradural manipulation</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Karaeminogullari et al. (2005)(^1)</td>
<td>73/F lumbar spinal stenosis</td>
<td>laminectomy, facetectomy, and fusion</td>
<td>dural tear</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Farag et al. (2005)(^9)</td>
<td>43/F lumbar spinal stenosis</td>
<td>laminectomy and fusion</td>
<td>probably dural tear</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Brockmann et al. (2005)(^3)</td>
<td>52/M lumbar spondylolisthesis</td>
<td>fusion</td>
<td>probably dural tear</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Nakazawa et al. (2005)(^12)</td>
<td>74/F cervical intradural extramedullary tumor</td>
<td>removal of the tumor</td>
<td>intradural manipulation</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Konya et al. (2006)(^9)</td>
<td>48/F lumbar spinal stenosis</td>
<td>laminectomy and fusion</td>
<td>dural tear</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Chalela et al. (2006)(^9)</td>
<td>62/F lumbar spinal stenosis</td>
<td>laminectomy and fusion removal of the OLF</td>
<td>dural tear</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Present case</td>
<td>51/M thoracic OLF</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

OLF: ossification of the ligamentum flavum.

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caudal cerebellar displacement or sag due to intraoperative loss of CSF may cause transient stretching and occlusion of the superior cerebellar veins, which drain in the cephalad direction into the deep venous system. In the present case, brain CT demonstrated a streaky bleeding pattern in the superior aspect of the cerebellum, which is termed the ‘zebra sign’ indicating a characteristic pattern of remote cerebellar hemorrhage which is discrete from an arterial bleeding. This bleeding pattern is considered to the same, as that following craniotomy. The incidence of remote cerebellar hemorrhage following spinal surgery might be higher than expected because postoperative brain CT is not routinely performed after spinal surgery, and cranial lesions are unlikely to be considered.

In the present case, brain CT was performed 3 days after the first surgery. Retrospectively, it should have been obtained earlier. However, symptoms such as headache and nausea in the postoperative period may be associated with low intracranial pressure syndrome. In addition, these symptoms are not so specific to indicate brain CT and to suggest cerebellar hemorrhage. In our case, intracranial lesion seemed unlikely because the patient had not received anticoagulant or antiplatelet therapy, and his blood pressure remained normal throughout the perioperative period.

Remote cerebellar hemorrhage may occur after any type of spinal surgery resulting in dural tear or intradural manipulation. Intra- or postoperative CSF leakage may be among the causative factors of remote cerebellar hemorrhage. Therefore, use of suction drains should be considered if the dura mater is injured. Moreover, the occurrence of remote cerebellar hemorrhage is important to consider if the patient complains of severe headache, vomiting, or unexplained neurological deterioration following spinal surgery. Most reported cases were managed conservatively, but large hematoma and acute hydrocephalus require surgical treatment. Early diagnosis is particularly important for the treatment of remote cerebellar hemorrhage following spinal surgery.

References


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