Bilateral Late Remote Cerebellar Hemorrhage as a Complication of a Lumbo-Peritoneal Shunt Applied After Spinal Arteriovenous Malformation Surgery

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Abstract

Background/Objective: Cerebellar hemorrhage is a very infrequent and unpredictable complication of spinal surgery. To the best of our knowledge, cerebellar hemorrhage resulting from the insertion of a lumbo-peritoneal shunt through which cerebrospinal fluid (CSF) is slowly drained has not been documented to date.

Methods: Case report.

Results: A 47-year-old woman presented with lower extremity weakness. Spinal arteriovenous malformation was diagnosed, and she underwent surgery. Her neurologic status improved; however, CSF collected subcutaneously as a cyst and leaked 21 days after surgery. The patient underwent urgent surgery during which the dural defect was repaired and a lumbo-peritoneal catheter was put in place to treat the CSF leakage. The lumbo-peritoneal drainage system was removed when bilateral cerebellar hemorrhage was seen 12 days later. Physical therapy was stopped, and conservative treatment was initiated consisting of bed rest, analgesics, sedatives, and careful monitoring of blood pressure. The patient's headache gradually resolved; physical therapy was restarted to rehabilitate this patient with paraparesis.

Conclusions: Remote cerebellar hemorrhage seems to be life threatening and entails significant morbidity. Cerebellar symptoms, and even a late sudden headache after spinal surgery, may be signs of remote cerebellar hemorrhage, which is a rare complication.

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Key Words: Cerebellar hemorrhage; Spinal arteriovenous malformation; Paraparesis; Cerebrospinal fluid; Lumbo-peritoneal shunt; Spinal surgery

INTRODUCTION

Cerebellar hemorrhage is a very infrequent and unpredictable complication of spinal surgery. Cerebellar hemorrhage remote from the zone of surgery is most frequently associated with supratentorial craniotomy (1–3). The underlying pathophysiology of intracerebellar hemorrhage after spine surgery has not been well described. There is a growing consensus that the phenomenon is probably a manifestation of cerebellar venous infarction and hemorrhage. Cerebellar “sag,” which is a result of cerebrospinal leakage, has been proposed to cause stretching and occlusion of the

superior vermian veins (2,4–6). We report cerebellar hemorrhage in a patient in whom a lumbo-peritoneal shunt was inserted to treat cerebrospinal fluid (CSF) leakage that occurred after spinal surgery for arteriovenous malformation.

CASE REPORT

A 47-year-old woman presented with back pain and progressive lower extremity weakness for 3 months. For the past 15 days, she had been unable to move her lower extremities. Neurologic examination showed progressive paraparesis. The patient had no history of predisposing factors for bleeding, such as arterial hypertension, trauma, a coagulation disorder, or recent infection. Thoracic magnetic resonance imaging (MRI) showed a vascular abnormality at the T12 to L1 level (Figure 1a). Digital subtraction angiography (DSA) confirmed arteriovenous malformation (Figure 1b). The patient underwent a T12, L1, L2 laminoplasty; after opening the dura

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Figure 1. (a) Thoracic MRI showed a vascular abnormality at the T12 level. (b) A DSA confirmed arteriovenous malformation.

mater, the abnormal artery and vein were identified on the basis of DSA by bipolar coagulator.

Physical therapy began after surgery. The patient was able to move her lower extremities better than before the operation. CSF collected subcutaneously as a cyst, which stretched and thinned the skin, and CSF leaked 21 days after surgery. The patient underwent urgent surgery. The dural defect was repaired, and a lumbo-peritoneal catheter was put temporarily in place to treat the CSF leakage. The surgery was successful, and CSF leakage stopped. Twelve days postoperatively, she developed a severe occipital headache and mental confusion. Neurologic examination showed no new findings. However, cranial MRI showed early subacute bilateral intraparenchymal cerebellar hemorrhage (Figure 2). The lumbo-peritoneal drainage system was removed. Physical therapy was stopped, and conservative treatment was initiated, including administration of analgesic and sedatives, regulation of blood pressure, and bed rest. Her headache gradually resolved, and physical treatment was resumed.

DISCUSSION

Remote cerebellar hemorrhage after supratentorial craniotomy, even after spinal surgery, is a very infrequent complication. Remote cerebellar hemorrhage after supratentorial craniotomy is most common in those from 30 to 60 years of age (7), and incidences range from 0.08% to 0.29% (3,7). This complication is extremely rare compared with remote cerebellar hemorrhage after a supratentorial procedure. This complication after spinal surgery was first reported by Chaddock (8) in 1981. It

Figure 2. Cranial MRI showed bilateral late acute-early subacute parenchymal cerebellar hemorrhage. (a) Axial gradient T1-weighted images showing a slightly isointense-hyperintense late acute hemorrhage in the right cerebellar hemisphere and a hyperintensity early subacute hemorrhage in the left cerebellar folia. (b) Axial gradient T2-weighted images showing right and left cerebellar hyperintensity in the both cerebellar hemisphere folia. (c) Coronal FLAIR images show bilateral paraneural cerebellar hyperintense lesions.

occurred after a cervical laminectomy when the dura opened widely while the patient was in a sitting position. Many predisposing factors have been proposed in the literature, such as sex (5), transient hypertensive peaks (9,10), blood coagulation (11), a hitherto hidden malformation (12), and intraoperative positioning of the patient that might culminate in a venous thrombosis of the straight sinus (13). However, Marquardt et al (3) showed that, apart from sex, none of the predisposing factors are normally associated with spontaneous cerebellar hemorrhage.

The underlying pathophysiology of remote cerebellar hemorrhage has not been definitively described, and no major factors have been highlighted thus far. A major factor associated with the development of this phenom-

enon after spine surgery, as well as after supratentorial surgery, seems to be intracranial hypotension caused by excessive CSF drainage. Intracranial hypotension is an increase in the transluminal venous pressure, resulting in blood vessel rupture (13,14). Another explanation could be cerebellar sag, which in turn causes stretching and occlusion of the superior vermician veins (6). Acute intraoperative CSF leakage as a result of accidentally or surgically opening the dura mater during spinal operation may lead to a critical hemorrhage in the cerebellum. In all cases reported in the literature, 1 common feature was that the remote cerebellar hemorrhage after spinal surgery occurred during or immediately after surgery. The second common feature was that CSF leakage occurred acutely after opening or tearing of the dura mater during the operation. Unusual characteristics of this case are that the cause of cerebellar hemorrhage was not CSF leakage after the initial surgery, and the hemorrhage occurred after insertion of the lumbo-peritoneal shunt. The patient did not suffer cerebellar hemorrhage symptoms after the initial operation, and was free of cerebellar hemorrhage until 12 days after lumbo-peritoneal shunt placement. Development of an acute occipital headache and mental confusion and cranial MRI findings indicated that the cerebellar hemorrhage probably occurred shortly before onset of symptoms or a few days before observing the symptoms.

MRI findings were compatible with late acute and/or early subacute stages of parenchymal cerebellar hemorrhage. We know that noncontrast computed tomography (CT) is a superior diagnostic examination that is routinely used to diagnose intracranial lesions (3). However, there is evidence in the literature of CT-negative cases of intracerebral hemorrhage. Also, alternative imaging techniques such as gradient echo MRI sequence can enhance the ability of MRI to detect acute parenchymal cerebral and cerebellar hemorrhage (15). In this case, the diagnosis was clarified by MRI, so noncontrast CT was not needed to confirm the diagnosis. Therefore, acute CSF leakage during the first operation and postoperatively did not cause the cerebellar hemorrhage.

Lumbo-peritoneal shunt for treatment of CSF leak is in practice to use temporary CSF diversionary techniques to assist in CSF leak repairs. Even though it is appreciated that the lumbo-peritoneal shunt provides low-volume CSF drainage, it is a more invasive procedure than a lumbar drain. Our policy is to repair the dorsal defect initially and to apply a lumbo-peritoneal shunt temporarily. To the best of our knowledge, an incidence of cerebellar hemorrhage resulting from the insertion of a lumbo-peritoneal shunt through which CSF is slowly drained has not been documented to date.

Remote cerebellar hemorrhage seems to be life threatening and entails significant morbidity. Cerebellar symptoms, and even a late sudden headache after spinal surgery, may be signs of remote cerebellar hemorrhage. Therefore, it is essential to be aware of this rare potential complication.

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