Case Report

Cerebellar Hemorrhage after Supratentorial Surgery for Treatment of Epilepsy: Report of Two Cases

Teeradej Srikijvilaikul MD*,
Tayard Deesudchit MD**

** Division of Neurosurgery, King Chulalongkorn Memorial Hospital*
*** Department of Pediatrics, King Chulalongkorn Memorial Hospital*

Hemorrhage occurring at regions remote from the operative site is an infrequent complication. Although the mechanism remains unclear, previous reports implicate over drainage of cerebrospinal fluid as the predominant mechanism. The authors report two cases of cerebellar hemorrhage after supratentorial surgery. Two young patients underwent left hemispherectomy and fronto-temporal resection for the treatment of refractory hemispheric and multiregional epilepsy. The hemorrhage manifested early in the immediate postoperative period as delayed awakening. The diagnosis was established by computed tomography. Treatment consisted in external ventricular drainage in case 1 and conservative treatment in case 2. Both patients recovered without major neurological deficits. Early detection and awareness of this complication may help to avoid further neurological morbidity and mortality.

Keywords: *Cerebellar hemorrhage, Complications, Epilepsy surgery, Remote hemorrhage*

J Med Assoc Thai 2007; 90 (6): 1221-4
Full text. e-Journal: *http://www.medassocthai.org/journal*

Postoperatively hemorrhages usually occur at the site of the operation but it can be presented at sites remote from the operation site. Rare, but potentially life threatening complication of supratentorial or spinal surgery is cerebellar hemorrhage[1-12]. Higher incidences have been found following neurosurgical procedures for unruptured aneurysm repair and temporal lobectomy for intractable epilepsy[2,4-7,9,11,12]. The authors now report two such cases; they represent 1.1% of the surgical resections for the treatment of epilepsy at the authors' institution from January 1, 2004 through December 31, 2005.

Case Report

Case 1

A 12-year-old girl presented with medically refractory epilepsy characterized by 2-3 generalized tonic seizures per day since she was born. She had a history of fronto-ethmoidal encephalomeningocele repair and left ventriculoperitoneal shunt (V-P) insertion at another hospital when she was 9 months of age. The left V-P shunt was later dislodged. On examination, she was aphasic and had right spastic hemiparesis. Video-electroencephalographic (EEG) monitoring showed slow spike waves lateralized to the right. Magnetic resonance imaging (MRI) showed a left frontal cyst and severe volume loss of the left cerebral hemisphere (Fig. 1). The patient received phenobarbital, lamotrigine, and topiramate before surgery.

She underwent surgery on December 26, 2005. During surgery, the left frontal cyst wall was entered, a large amount of cerebrospinal fluid (CSF) was suddenly drained, and a left modified anatomical hemispherectomy was performed. Redivac drain was placed subgaleal. Postoperatively, she did not awaken from anesthesia and exhibited two generalized tonic-clonic seizures. CT scan demonstrated bilateral blood in the sulci of the upper surface of the cerebellum like zebra-pattern hemorrhage, small right frontal hemorrhage and right hemispheric edema with midline shift to the left (Fig. 2). She was normotensive and there was no evidence of coagulopathy. She was treated conserva-

Correspondence to : Srikijvilaikul T, Division of Neurosurgery, King Chulalongkorn Memorial Hospital, Patumwan, Bangkok 10330, Thailand. Phone & Fax: 0-2256-4105, E-mail: srikijt @yahoo.com

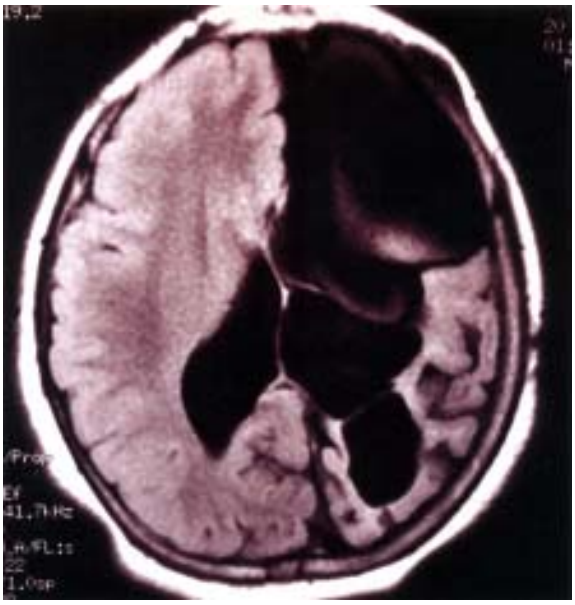

Fig. 1 Preoperative T1-weighted MRI showing left frontal cyst and severe volume loss and cerebral atrophy of the left hemisphere

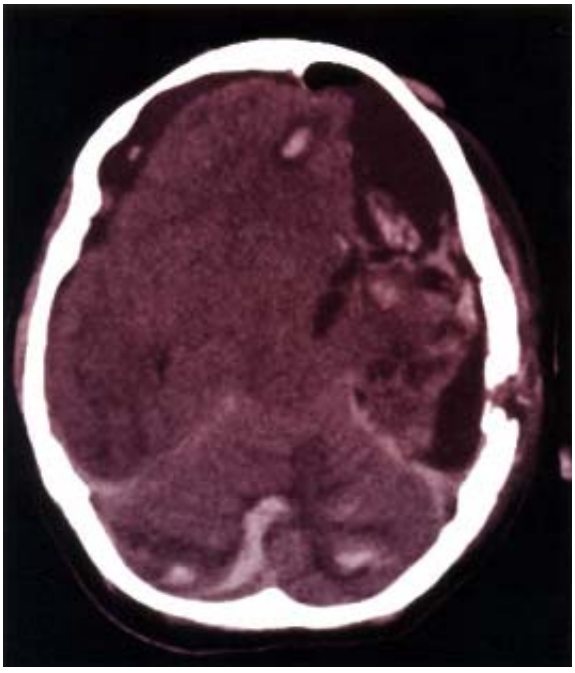

Fig. 2 Immediate postoperative CT scan showing cerebellar hemorrhages facing the tentorium, small intracerebral hemorrhage at right frontal and generalized brain edema with midline shift to the left

tively with steroid and mannitol and redivac drain was removed. She gradually improved but was not fully conscious. Follow-up CT scan 1 week later showed decreased brain edema and increased ventricular size. A right V-P shunt was performed 2 weeks after the first surgery. Histological examination revealed gliosis and cerebral atrophy. Her neurological examination returned to pre-operative baseline and she remained seizure-free for six months.

Case 2

A 15 year-old male patient presented with a history of complex partial seizures since he was 10 years of age. Physical and neurological examinations were normal. The 24-hour video EEG monitoring showed epileptiform discharges and seizure onset at the right frontotemporal region. MRI revealed an arachnoid cyst at right sylvian and right hippocampal sclerosis (HS). The patient was receiving phenytoin and topiramate.

On July 29, 2004, the patient underwent a craniotomy for right frontotemporal lobectomy with intra-operative electrocorticography (EcoG). Subgaleal drain was placed at the end of the surgery. In the immediate postoperative, he was somnolent. CT scan of the head showed zebra-pattern hemorrhage of cerebellar hemispheres. There was no laboratory evidence of coagulopathy and his blood pressure was normal. The patient was treated conservatively and exhibited gradual improvement during a 10-day period. He had mild dysarthria and ataxia. Follow-up CT scans showed resolution of cerebellar hemorrhage, his ataxia and dysarthria had resolved. The patient has been seizure-free since the operation. Histopathological examination revealed mild cortical dysplasia and hippocampal sclerosis.

Discussion

Remote cerebellar hemorrhage (RCH) after supratentorial surgery is a rare complication in neurosurgery. The underlying mechanism is still unknown. Most of these cases involved opening of the CSF cisterns or ventricular systems such as for aneurysm surgeries, parasellar tumors, and lobectomies for the treatment of epilepsy[1-8]. The resection of nonexpanding tissues, such as in lobectomies for the treatment of epilepsy, was reported to be associated with RCH higher than other supratentorial procedures[3,9].

Friedman et al[2] postulated that the mechanism was cerebellar sag as a result of CSF hypovolemia, causing transient occlusion of superior bridging veins and consequent hemorrhagic infarction. Honegger et

al[3] demonstrated that the cerebellar hemorrhage was a postoperative event and suggested postoperative suction drainage was a predominant causative factor resulting in trantentorial pressure gradient led to cerebellar hemorrhage from venous bleeding. Koller et al[4] proposed that CSF loss intra-operatively and postoperatively might lead to parenchymal shifts or a critical increase of transmural venous pressure with subsequent vascular disruption and hemorrhage. K nig et al[5] suggested intracranial hypotension and coagulation disorders as possible factors. Papanastassiou et al[6] theorized that venous obstruction from dislocation of the dependent part of cerebellum might cause hemorrhagic infarction.

Although the pathomechanism of this complication remains unclear, most authors have agreed on two facts: 1) RCH is of venous origin, and 2) RCH is a result of intra- and postoperative loss of CSF. The bleeding pattern includes blood in the sulci of one or both cerebellar hemispheres and vermis facing tentorium. Brockmann et al[13] described this cerebellar bleeding pattern as 'zebra sign'.

In both patients, large amounts of CSF were definitely loss during the operation in all patients. Patient 1 had a rapid loss of CSF during decompression of the cysts while in patient 2, the operations involved opening of the cisterns and ventricular systems. Both patients were young and otherwise healthy. Blood pressure, platelets count and coagulation were normal in both patients. Postoperative CSF drainage from subgaleal drain may play an additional role. Both patients had decreased levels of consciousness. They were less alert than expected after surgery and one patient experienced generalized seizures. These suggest that RCH may developed intra-operatively or in the immediate postoperative.

RCH after supratentorial surgery is associated with a significant morbidity and mortality[4,6] but some reports found benign outcomes following RCH[2,9]. In literature review, prognosis after RCH mostly depends on the severity of hemorrhage and patient age[14].

In conclusion, RCH after supratentorial craniotomy for epilepsy surgery is an infrequent complication. Although the pathomechanisms are still not understood. A rapid loss of CSF within a short period during surgery should be avoided and drainage should be discontinued immediately if this complication occurs. Difficulty in awakening from anesthesia is the important key to early diagnosis and this might help avoid further aggravation of complications associated with RCH.

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เลือดออกที่สมองส่วนหลังภายหลังจากผ่าตัดรักษาโรคลมชัก: รายงานผู้ป่วย 2 ราย

ธีรเดช ศรีกิจวิไลกุล, ทายาท ดีสุดจิต

เลือดออกในสมองในตำแหน่งที่ไกลจากตำแหน่งผ่าตัดพบได้น้อย ถึงแม้กลไกการเกิดยังไม่ทราบแน่ชัด แต่พบว่าการสูญเสียน้ำหล่อเลี้ยงสมองและไขสันหลังเป็นปัจจัยสำคัญ รายงานนี้นำเสนอผู้ป่วยเลือดออกในสมองส่วนหลังหลังจากการผ่าตัดเพื่อรักษาโรคลมชัก 2 ราย การวินิจฉัยในระยะแรกและคำนึงถึงโอกาสที่จะเกิดภาวะนี้จะช่วยลดอัตราตายและความพิการทางระบบประสาทได้
