Acta Neurochir (Wien) (2006) 148: 993–996
DOI 10.1007/s00701-006-0800-y

*Acta Neurochirurgica*
Printed in Austria

*Case Report*

# Cerebellar haemorrhage after non-traumatic evacuation of supratentorial chronic subdural haematoma: report of two cases

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Received November 9, 2005; accepted March 22, 2006; published online June 29, 2006


## Summary

Cerebellar haemorrhage is an unusual complication of supratentorial neurosurgery. Several causative pre-operative factors and medical risk factors may predispose patients to cerebellar haemorrhage, however its etiology remains still unclear.

Only two case reports have previously described the occurrence of cerebellar haemorrhage after subdural haematoma evacuation by burr-hole trepanation. We present two patients with this rare postoperative complication of minor supratentorial neurosurgery and possible underlying pathophysiological mechanisms are discussed. Our two cases support the post- rather than per-operative pathogenetic hypothesis. Although the complication is associated with a significant morbidity and mortality, most cases follow a benign course.

*Keywords:* Cerebellum; complication; intracranial haemorrhage; subdural haematoma; supratentorial.

## Introduction

Cerebellar haemorrhage is an unusual, but increasingly recognized complication of supratentorial neurosurgery, with 52 cases reported in the literature since 1977 [5, 7]. Most cases describe this remote cerebellar bleeding in relation to craniotomy for cerebral tumour resection, temporal lobe resection or aneurysm surgery. Only four case reports have previously described the occurrence of cerebellar haematoma after subdural haematoma evacuation by craniotomy [4, 7] of which two cases after burr-hole trepanation. Several causative pre-operative factors and medical risk factors that may predispose patients to cerebellar haemorrhage are discussed. However its etiology remains still unclear and neither the constitution of the affected patients nor specific intra-operative conditions can predict the occurrence of this rare and sometimes serious complication [7]. We present two patients with postoperative cerebellar haemorrhage after treatment of a chronic subdural haematoma with irrigation and drainage through two burr holes.

## Case report

*Case 1*

A 49-year-old woman, previously healthy, complained of progressive holocranial headaches for two weeks. There had been no prior head trauma. Because of a gradually developing gait disorder a CT-scan of the head was performed, which showed a chronic bifrontal subdural haematoma (Fig. 1). Spontaneous intracranial hypotension was suspected as a possible cause of the spontaneous occurrence of the bilateral subdural haematoma in this relatively young patient. The brain MRI failed to show the characteristic downward displacement of the neural structures or meningeal thickening with contrast enhancement and spontaneous intracranial hypotension was thus rejected. There was no history of arterial hypertension or hemorrhagic diathesis. Pre-operative coagulation parameters (PT, PTT, AT-III, bleeding time, platelet coagulation) were normal. Surgery was performed under general anesthesia with the patient in supine position, without head rotation. Frontal and parietal burr holes (two on each side) were drilled, through which the haematoma was slowly decompressed and the subdural space was gently irrigated with tepid isotonic saline to evacuate the haematoma. Irrigation was continued until only clear fluid returned. At the end of the operation a subdural frontal closed drainage system was placed on each side. The subdural 7 mm silicon drains were connected to an empty fluid bag. The fluid bag was fixed to the head side of the bed at the level of the patient's head. Drainage rate was controlled by gravity. The patient was restricted to bedrest in the supine position. The procedure was completed without any obvious complications. Peri-operative blood pressure remained within normal range. The immediate postoperative course was uncomplicated,

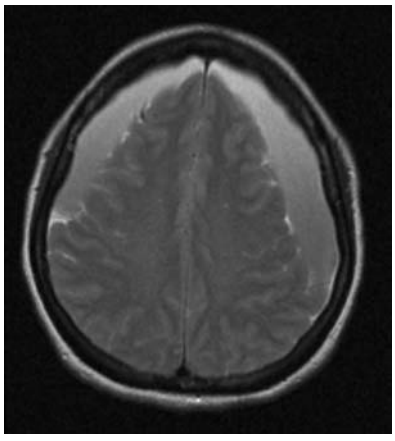

Fig. 1. Case 1: Pre-operative protondensity-T2 MRI of the brain showing a bifrontal subdural haematoma

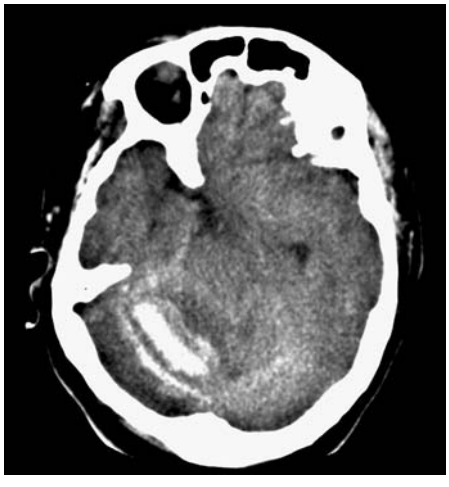

Fig. 2. Case 1: Postoperative CT-scan of the brain showing right sided, transversely oriented, cerebellar haemorrhage

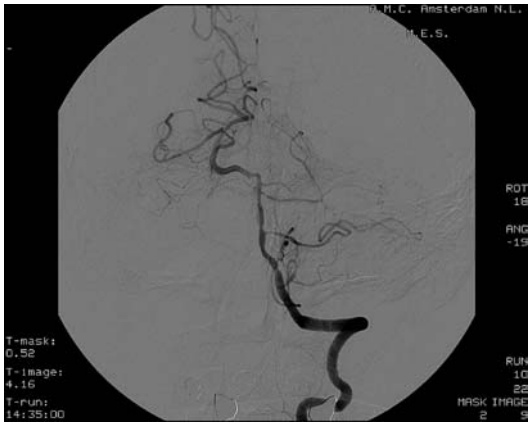


Fig. 3. Case 1: Cerebral angiography showing caliber-changes of the great cerebral arteries

the total drainage from the subdural space was 20 ml in 4 hours. But 6 hours after the operation the patient suddenly developed a heavy headache and slurred speech. On neurological examination cerebellar signs with right sided ataxia were detected. A CT-scan demonstrated adequate drainage of the subdural haematomas, but also revealed a new haemorrhage within the upper vermis cerebelli and right cerebellar folia (Fig. 2). Compression of the fourth ventricle caused secondary obstructive hydrocephalus for which external ventricular drainage was needed. Cerebral angiography showed no evidence of an underlying cerebellar arteriovenous malformation, but revealed extensive caliber-changes of the great cerebral arteries suggestive of cerebral vasculitis (Fig. 3). However, for the diagnosis of cerebral vasculitis there was no further support, with normal CSF-examinations, absence of white matter lesions on MRI-scanning and normal pathology of the leptomeninges and brain on a frontal biopsy. A postoperative reactive vasospasm was suspected which was left untreated. The patient improved gradually. She was discharged 3 weeks after surgery, without neurological complaints or deficits on examination.

*Case 2*

A 73-year-old man who received acenocoumarol for atrial fibrillation was admitted to another hospital with hepatitis caused by hepatitis-C infection resulting in hepatic dysfunction. Because of decreased consciousness and a mild left sided hemiparesis a CT-scan of the head was performed revealing a right-sided chronic subdural haematoma. The preoperative laboratory results showed signs of hepatic failure, such as elevated serum aminotransferases and increased coagulation parameters (PT, PTT, AT-III, bleeding time, platelet coagulation). After the coagulation was optimized through infusion of prothrombin-complex the chronic subdural haematoma was treated under local anesthesia with irrigation of the subdural space through frontal and parietal burr holes followed by continuous subdural drainage via a silicone 4 mm-tube in the subdural space. This drain was connected to a closed collection system and fixed in the previously described manner. The patient was restricted to bedrest in the supine position. The direct postoperative course was without obvious complications, with a total subdural drainage of 40 ml in 6 hours. Both his consciousness and the hemiparesis recovered completely. Eighty four hours after the operation the patient suddenly

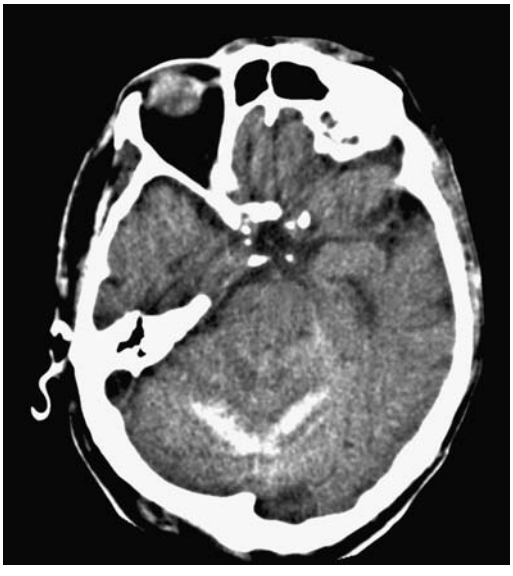

Fig. 4. Case 2: Postoperative CT-scan of the brain revealing the cerebellar haemorrhage

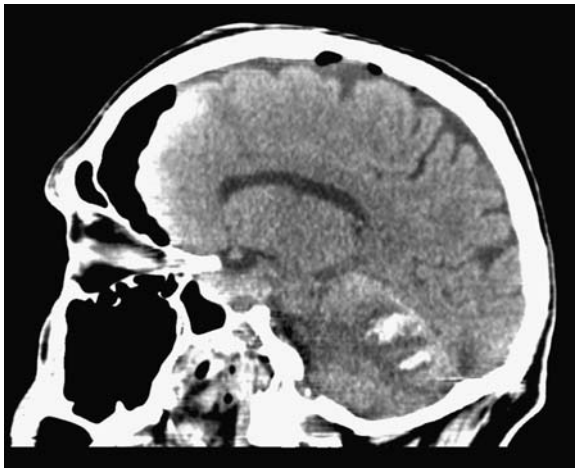

Fig. 5. Case 2: Sagittal CT-scan of the brain showing haemorrhage in the upper vermis within the folia of the cerebellum

deteriorated with a decreased Glasgow Coma Scale (E2M5V3), nausea and vomiting. A CT scan showed haemorrhage within the upper cerebellar vermis and on both sides within the cerebellar folia with compression of the fourth ventricle (Figs. 4 and 5). At that time the coagulation parameters in the blood were normal. The secondary obstructive hydrocephalus was treated with external ventricular drainage. Post-operatively the patient improved slowly and on discharge he had a normal level of consciousness but was still unable to walk unaided, which further improved over time.

## Discussion

These two cases describe a very rare complication of supratentorial surgery, with a reported incidence ranging between 0.08% [9] and 0.29% [6].

As seen in our two cases the neuroradiological appearances of this remote postoperative haemorrhage suggest a venous origin. Contrary to arterial hypertensive bleedings, these haemorrhages are located almost uniformly in the upper vermis within the folia of the cerebellum. They are vaguely circumscribed and transversely oriented. In our opinion this type of bleeding is not likely to be based on co-incidence during surgery.

Previous reports have suggested several causes for cerebellar haemorrhage, which is suspected to occur post-rather than per-operatively [2, 3]. 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 vermian veins increasing the venous pressure resulting in venous haemorrhage [1, 6, 8]. Postoperative repositioning of patients with intra- and extradural drains on the other hand could lead to negative intracranial pressure causing a suction effect on the brain and cerebellum. In this theory the transtentorial pressure gradient precipitates damage to the draining cerebellar venous system [3]. 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. Continuous suction drainage could even increase this gradient [9] leading to rupture of the small supracerebellar veins and capillary bed with venous bleeding as a consequence. Although pre-operative mechanical factors seem to play an important role in the pathophysiology of this type of cerebellar haematoma, postoperative mechanical factors also seem to equally contribute to the postoperative development of this haematoma. The relation between subdural haematoma evacuation through burr holes and a postoperative cerebellar haematoma has to our knowledge previously only been described in two patients [5]. The clinical course and neuroradiological findings in our two cases support the post- rather than per-operative mechanical pathogenetic hypothesis of this complication, but also highlight the increased risk even after minor surgery.

## Conclusion

Although a rare complication, it is essential to be aware of the development of cerebellar haematoma after supratentorial surgery, even after limited surgery such as drainage of a chronic subdural haematoma through burr holes. In our two cases, and other cases in the literature, there is no relation to high blood pressure, underlying vascular malformation or neoplasm. We suggest it may rather be a result of per- and postoperative mechanical factors due to displacement of the brain. Although both our cases needed temporary external ventricular drainage for acute hydrocephalus, prognosis is generally good. But also a less benign course with persistent morbidity and even death has been described.

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## Comment

An excellent case report(s) of this perplexing entity of remote cerebellar hemorrhage complicating supratentorial surgery. The exact etiology remains obscure and case reports of the complication occurring after burr hole drainage of chronic subdural hematoma are rare indeed. These two cases contribute to our understanding of the spectrum of the condition and will contribute as well to deciphering the obscure pathophysiology.

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