

Brainstem haemorrhage as a rare complication of burr hole craniostomy

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ABSTRACT

Aim Evacuation through burr hole craniostomy is the most common type of chronic subdural hematoma surgical treatment, with a morbidity rate of 0-9%.

Methods Here we present a case of 66-year-old Caucasian woman with bilateral hemispheric chronic subdural hematoma and left transtentorial uncal herniation. Bilateral burr hole craniostomy with gradual and simultaneous evacuation was performed and subdural drains were placed with daily strict monitoring of drained fluid.

Results Despite immediate prompt neurological improvement, on the second postoperative day bilateral ptosis and left medial rectus weakness occurred, with no signs of consciousness deterioration. Radiological exams revealed a 9 x 6 mm haemorrhage of the tegmentum mesencephali. In the next day progressive neurological improvement occurred and a follow-up at 1 month revealed persistence of bilateral ptosis with almost complete regression of the left medial rectus weakness.

Conclusion Although burr hole craniostomy is considered a minor procedure, rare but fatal complications like brainstem haemorrhage may occur. Bilateral simultaneous and gradual drainage, strict monitoring of drained fluid and blood pressure in the perioperative period and frequent neurological with prompt radiological assessment in case of clinical worsening, should be the mainstay of a correct management of chronic subdural hematoma (particularly if bilateral) in order to avoid potentially fatal complications.

Key words: bleeding, chronic subdural hematoma, clinical worsening, post-surgical issue, surgical procedure.

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INTRODUCTION

Chronic subdural hematoma (CSDH) generally occurs in the elderly, with a mortality rate ranging from 0.5 to 4% (1,2).

Evacuation through burr hole craniostomy is the most common type of surgical treatment, with a morbidity rate of 0-9% (1, 3-5). Others include twist-drill craniostomy (6-8) and craniotomy with membranectomy (2).

Subdural fluid and blood reaccumulation, cerebral edema, tension pneumocephalus, seizures, subdural empyema and intracerebral haemorrhage represent possible post-surgical complications (9-11). Among these, intracerebral haemorrhage is rare, occurring with a reported incidence of 0.7-4.0% (9, 12-14). According to the literature, even more uncommon is brainstem haemorrhage and its mechanism still remains unclear.

Here we present a rare case of a brainstem haemorrhage following the evacuation of bilateral CSDH. The possible physiopathogenetic mechanisms and strategies aimed at preventing this complication are discussed along.

PATIENT AND METHODS

Patient and study design

A 66-year-old Caucasian woman was admitted in the Department of Neurosurgery, Ospedale Santa Maria della Misericordia of Perugia with persistent and severe headache that started 4 days before and worsened in the last 24 hours.

Clinical history did not reveal significant comorbidities, except for mild traumatic brain injury 2 months before and intake of high doses of non-steroidal anti-inflammatory drugs (NSAID). Neurological examination on admission did not reveal

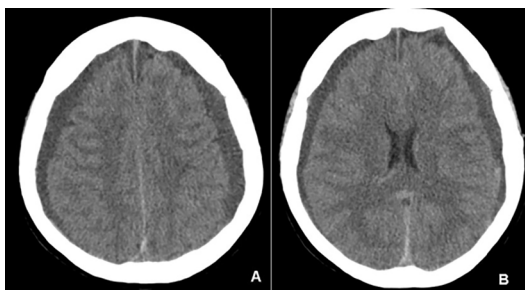


Figure 1. A, B) Pre-operative axial CT scan showing bilateral hemispheric subdural hematomas thicker on the left side (Department of Neuroradiology, Ospedale Santa Maria della Misericordia of Perugia, 2017)

any significant neurological impairment, except for persistent headache. However, the next day persistent and severe headache associated with progressive neurological deterioration occurred.

At the admission the laboratory exams showed a normal clotting profile, the CT scan of the brain showed bilateral hemispheric subdural hematomas thicker on the left side. Magnetic resonance imaging (MRI) scans, at the admission, showed increase of parenchymal compressive effect and inferomedial displacement of the left temporal lobe (transtentorial uncal herniation) (Figure 2 A-B).

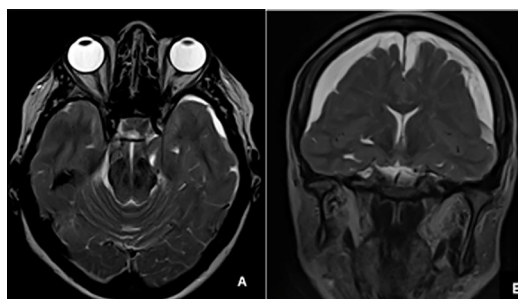


Figure 2. A) Pre-operative axial and B) coronal T2-weighted MRI scans showing bilateral hemispheric subdural hematomas thicker on the left side with fluid level. The left uncus is displaced infero-medially to the crural cistern, suggesting transtentorial herniation (Department of Neuroradiology, Ospedale Santa Maria della Misericordia of Perugia, 2017)

Methods

The patient underwent urgent surgical evacuation of the hematomas. Under the local anaesthesia, bilateral parietal burr holes were performed consecutively; dura mater and outer membrane were exposed and opened bilaterally at the same time. Despite the high pressure of the hematomas, evacuation occurred gradually in order to avoid too fast decompression. Bilateral subdural drains without vacuum bulb were placed and reservoirs gradually lowered with daily strict monitoring of drained fluid. The patient was left supine in bed at 0°.

RESULTS

The patient experienced prompt clinical and neurological improvement, with the resolution of the preoperative symptoms related to brain compression. Blood pressure (BP) monitoring did not reveal significant alterations. Nevertheless, on the second postoperative day, bilateral ptosis and left medial rectus weakness occurred, with no signs of consciousness deterioration.

Radiological evaluation with CT scans revealed a 9 x 6 mm haemorrhage located at tegmentum



Figure 3. Post-operative CT scan showing a 9x6 mm brainstem haemorrhage of new onset located at tegmentum mesencephali (Departement of Neuroradiology, Ospedale Santa Maria della Misericordia of Perugia, 2017)

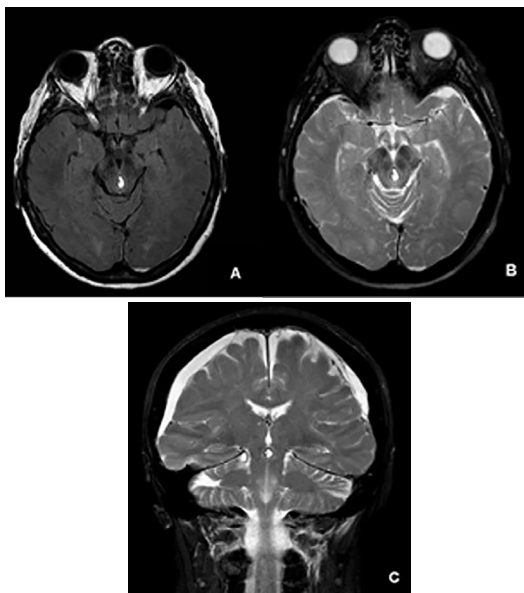


Figure 4. A) Post-operative axial fluid attenuated inversion recovery (FLAIR), B) axial and C) coronal T2-weighted MRI scans confirming the 9 x 6 mm brainstem haemorrhage located at tegmentum mesencephali (Department of Neuroradiology, Ospedale Santa Maria della Misericordia of Perugia, 2017)

mesencephali (Figure 3), subsequently confirmed by MRI performed 5 days after the burr hole craniostomy (Figure 4 A-C). In the next day progressive neurological improvement occurred and the patient was discharged home. A follow-up at 1 month showed further improvement and the last neurological examination performed at 1 year revealed complete regression of the previously described symptoms.

DISCUSSION

Intracerebral haemorrhage following CSDH drainage is rare and usually ipsilateral to CSDH itself. Only few cases of remote bleeding are described in the literature (15-20).

Among these, brainstem haemorrhage is an extremely rare complication of CSDH drainage and only three cases are described in the literature (Table 1) (15,16,18) two of which detected at autopsy (15,16). Despite several theories, pathogenesis still remains unclear.

Cohen et al. (19) assumes an association between postoperative cerebrospinal fluid (CSF) over drainage through a closed system drainage and remote intracranial haemorrhage, resulting in excessive tearing and stretching of bridging veins.

Mechanical compression, as in transtentorial herniation, may have an important role as well, as blood vessels near the brainstem might be stretched and distorted (18).

Park et al. (18) describe a case of brainstem haemorrhage following burr hole drainage of CSDH in which asymmetrical evacuation and rapid decompression occurred. As in the present case, preoperative CT and MRI scans showed transtentorial herniation. However, unlike Park et al., in the presented patient bilateral drainage was gradual and simultaneous. So further unknown factors may have a role in this type of complication.

According to Ogasawara et al. (21), rapid decompression of CSDH frequently results in a sudden

Table 1. Cases of brainstem haemorrhage as a complication of subdural hematoma's evacuation reported in the literature

Study (year) (reference number)	Patients data						
	Gender	Age (years)	Subdural hematoma	Surgical treatment	Time to complication (hours)	Treatment	Follow up (months)
McKissock and Bloom (1960) (15)	NA	NA	NA	NA	NA	Conservative	NA (autopsy finding)
Robinson RG (1984) (16)	NA	59	NA	NA	0	Conservative	NA (autopsy finding)
Park et al. (2009) (18)	M	76	Bilateral, subacute	Single bilateral burr hole	48	Conservative	0.5
Presented case	F	66	Bilateral, chronic	Single bilateral burr hole	48	Conservative	12

NA, not available; M, male; F, female;

transient hyperperfusion in the cerebral cortex beneath the hematoma due to impaired vascular autoregulation for long-term brain compression by CSDH itself, leading to possible complications as seizures, temporary acute agitated delirium and, in the most severe cases, intracerebral haemorrhage (22,23). The authors show how hyperperfusion observed 1 hour after CSDH drainage persisted, albeit diminished, until 24 hours postoperatively and disappeared on the third postoperative day. In this setting, mean BP seemed to promote hyperperfusion during CSDH drainage, pointing out the importance of BP monitoring, particularly in the first 24 postoperative hours.

Indeed, due to reduced vascular compliance, labile hypertension and increased small blood vessels fragility (in some cases related to amyloid angiopathy (21), elderly patients are more likely to develop postoperative intracranial haemorrhage.

In the presented patient all precautions described were carefully observed during surgical procedure and in the postoperative period. Nevertheless, perioperative BP peak occurred, making once

again impaired vascular autoregulation the pivotal factor and labile hypertension an important cofactor of this type of complication.

Although CSDH drainage through burr hole craniostomy is considered a minor procedure, rare but fatal complications like brainstem haemorrhage may occur. Rapid brain decompression and excessive amount of fluid drainage, hypertension, cerebral amyloid angiopathy and coagulopathies are the most likely factors related to this uncommon complication. Bilateral simultaneous and gradual drainage, strict monitoring of drained fluid and BP in the perioperative period and frequent neurological assessment with prompt radiological assessment in case of clinical worsening should be the mainstay of a correct management of CSDH (particularly if bilateral) in order to avoid potentially fatal complications.

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TRANSPARENCY DECLARATION

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