

## Case Report

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# Subarachnoid Hemorrhage Following Drainage of Chronic Subdural Hematoma: A Case Report

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## Abstract

**Background:** Acute subarachnoid hemorrhage (SAH) is a rare but severe complication after burr hole surgery for Subarachnoid hemorrhage (CSDH).

**Case presentation:** An 86-year-old male was found fainted. Computed tomography (CT) scans showed a right fronto-temporo-parietal CSDH with a shift in the midline structures. Under local anesthetic with medical sedation a closed-system drainage of the hematoma was performed via one burr hole. Two days after surgery the patient complained of headache and a subsequent CT scan revealed SAH. The presence of intracranial aneurysms was excluded by CT angiogram. The patient survived with medical management.

It is possible that SAH of unknown origin following surgery for CSDH occurred after that rapid drainage of the hematoma produced a rupture of a weak subarachnoid vessel following a movement of the hemisphere.

**Conclusion:** We believe, according to relevant literature, that in elderly patients probably due to cerebral atrophy a slow and gradual drainage of CSDH is needed to avoid a rare but severe complication such as SAH.

**Keywords:** Chronic subdural hematoma; Drainage; Subarachnoid hemorrhage; Post-operative hyperperfusion syndrome; Burr hole surgery; Complication.

**Abbreviations:** CSDH: Chronic subdural hematoma; ICH: Intracerebral hemorrhage; SAH: Subarachnoid hemorrhage; MRC: Medical research council; CT: Computed tomography.

## Background

Chronic subdural hematoma (CSDH) is a neurological disease resulting from brain compression, caused by an abnormal collection of liquefied blood degradation underneath the dura mater, with an overall annual incidence of 1.7-20.6 per 100,000 persons

per year, greater in the elderly population [1]. In fact, elderly individuals are more commonly affected by CSDH, with a mortality rate of 0.5% to 4% and known risk factors are advanced age, therapeutic anticoagulation and mild head injury [2]. The incidence is expected to double by the year 2030, owing to the continuous aging of the population [3].

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Chronic SDH may be considered as an angiogenic disease where inflammation plays an important role in hematoma formation.

Histological analysis demonstrates a modified layer of connective tissue cells named “dural border cells” in the dura mater, which have two essential roles: phagocytosis and the development of a fibro-cellular connective tissue, which may lead to new membranes as seen in CSDH [4]. A clinical classification, namely the Markwalder grading score, might help to decide which therapy modality might be more appropriate. However, no consensus exists about the best treatment for each grade and the treatment modality [5].

Conservative medical treatment includes corticosteroids, ACE-inhibitors, tranexamic acid, platelet activating factor receptor antagonist, and statins [3]. The most commonly practiced surgical management is the burr hole evacuation procedure with closed drainage system in the operating theater, however a recent meta-analysis found a statistical evidence of similar efficacy and safety compared to bedside twist-drill drainage of CSDH [6]. Some rare but severe complications such as intracerebral hemorrhage (ICH) and acute subdural hematoma (SDH); subarachnoid hemorrhage (SAH) has recently been reported in some case reports, however the pathophysiological process underneath its formations has to be established yet [2,7,8]. Here we present a case report of a patient with SAH following right fronto-temporo-parietal CSDH evacuation.

### Case presentation

An 86-year-old man was admitted to our emergency department after being found lying on the ground at his home. He had a minor head trauma two weeks prior that event. His medical history included an anxiety disorder and a hypokinetic disease. At neurological examination he was confused and presented hyposthenia of his left upper limb, quantifiable 3/5 of Medical Research Council (MRC) grading system. The routine laboratory tests and clotting profiles were normal, electrocardiography and chest-abdomen-pelvis computed tomography (CT) showed normal findings. A brain CT scan demonstrated a right fronto-temporo-parietal CSDH with a shift of the midline structures and lateral ventricle compression (Figure 1). The patient underwent a closed-system drainage of the hematoma via one burr hole located at the parietal bone protuberance area under local anesthesia in the operating room. After incision of the dura mater, the subdural space was irrigated with warm physiological saline and closed system drainage was carefully placed through the burr hole.

He was stable during the operation and the patient’s blood pressure was well-controlled. However, after two days from the procedure, the patient suddenly complained a diffuse strong headache. The patient underwent a new head CT scan, which revealed signs of SAH located at the basal cisterns and at the right sylvian fissure.

Compared to the preoperative image, a marked reduction of the right lateral ventricle compression and a return to the correct position by the midline structure occurred (Figure 2). Vascular malformations were then excluded with a CT angiography (Figure 3).

Conservative treatments, such as osmotic diuretics, hypertonic

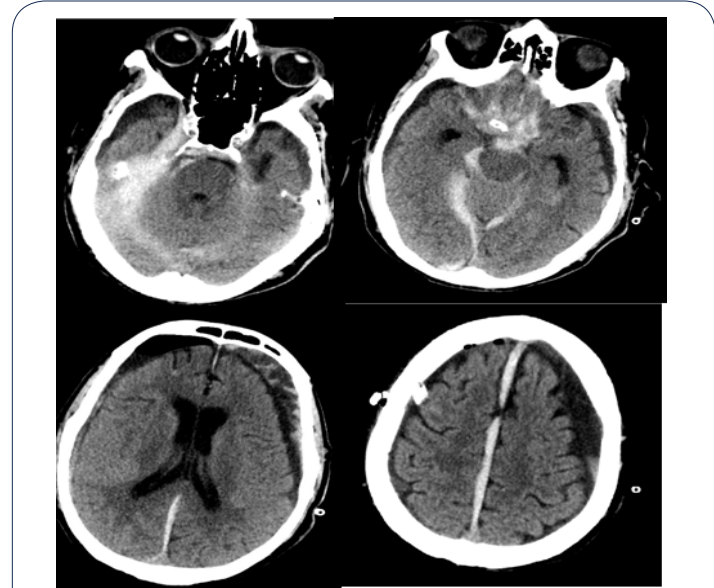
saline and hemostatic agents were adopted. Two days later, the CT scan showed the partial reabsorption of the SAH.

Afterwards, no further symptoms, vasospasm or rebleeding happened. The clinical course improved, and the patient was admitted to the neurology unit for close observation. After one month, the patient fully recovered and was discharged.

Right lateral ventricle compression was markedly reduced, and the midline structure returned to original position.



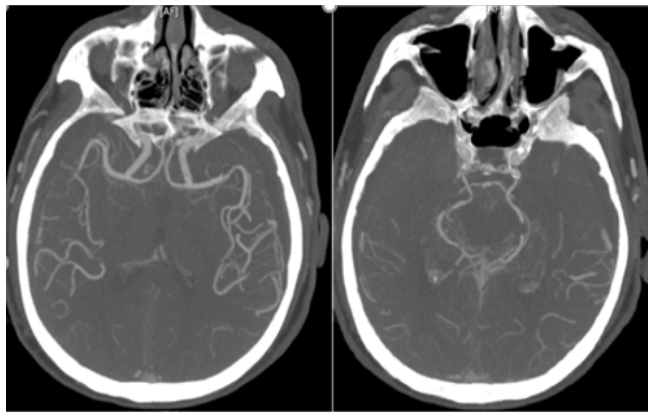
**Figure 1:** Preoperative images. CT scans showed a CSDH in the right hemisphere with shift of the midline structures and lateral ventricle compression. A B: brain CT images.



**Figure 2:** Postoperative CT images, A-D. CT scans revealed SAH focused on the basal cisterns and on the right sylvian fissure. The right lateral ventricle compression was markedly reduced, and the midline structure returned to original position.

### Conclusions

Elderly population, due to brain atrophy, suffers frequently from CSDH, which occurs with a minor head trauma: accumulation of blood clots between the dura mater and the brain surface results from tearing of fragile small blood vessels [7,9]. After burr hole surgery, which remains a safe and effective treatment [10]. Postoperative hemorrhagic complications, such as SAH, are rare but severe. Ogasawara et al. [11] showed that rupture of a weak subarachnoid vessels and hyperemia take place from rapid decompression of CSDH and rapid decrease of intracranial pressure, after the drainage of the hematoma. Impaired vascular auto



**Figure 3:** Postoperative CT angiography images: A CT angiogram excluded the presence of intracranial aneurysms and showed normal arteries.

regulation, due to long-term compression by CSDH, and hyperperfusion are possible causes of bleeding [2]. It is possible that SAH of unknown origin following surgery for CSDH is the result of sudden cerebral blood flow variation after cerebral decompression, rupture of weaker subarachnoid vessels and perforating arteries, brain shift (12) related to prompt expansion of brain [8]. Diffuse cerebral atrophy, advanced age and consequent cerebral vascular failure of autoregulation, therapeutic anticoagulation and other pathologic conditions or individual factors can contribute to development of SAH after CSDH operation [2,7,8]. In our 86-year-old patient, with brain atrophy, a CT scan after surgery showed SAH; the movement of the hemisphere could have resulted in hemorrhage after the drainage because of sudden decompression. Immediate CT scan is mandatory in the suspect of such complication. The patient with conservative treatment fully recovered. Speed of drainage mostly influence on the occurrence of this potentially devastating complication following evacuation of CSDH, so we recommend a slow and gradual decompression of this latter chronic extracerebral fluid collection. We believe, according to relevant literature, that in elderly patients, probably due to cerebral atrophy, a slow and gradual drainage of CSDH is needed to avoid a rare but severe complication such as SAH with a view to minimize change in blood volume and pressure and to prevent a too rapid or excessive postoperative drainage.

#### Declarations

**Ethics approval and consent to participate:** The patient accepted to participate in the following case report.

**Consent for publication:** Not applicable.

**Availability of data and material:** Data sharing is not applicable to this article as no datasets were generated or analysed during the current study.

**Competing interests:** The authors declare that they have no competing interests.

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**Authors' contributions:** VL selected the case for this report. DA supervised data collection. AI and OPP wrote the report. MD performed draft review. All authors read and approved the final manuscript.

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