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Case Report

A case report and technical tip of chronic subdural hematoma treated by the placement of a subdural peritoneal shunt

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ABSTRACT

Background: Chronic subdural hematomas (CSDH) tend to occur most commonly in the elderly population, usually resulting from minor or insignificant head trauma. The pathophysiology behind CSDH is often directly associated with cerebral atrophy, and other causes of cerebral atrophy such as alcoholism or dementia. Other predisposing factors include diabetes, coagulopathy, use of anticoagulants (including aspirin), seizure disorders, and CSF shunts. Considerable evidence supporting the use of external drainage after evacuation of primary CSDH is readily available in the literature.

Case report: We report the case of a 72 year-old male with a history of recurrent left subdural hematoma presenting to the neurosurgical clinic with a two-day history of personality changes, difficulty speaking, urinary incontinence, and headaches. Burr hole evacuation was performed with the placement of a subdural peritoneal shunt. At the one-month follow-up appointment, the patient had complete resolution of symptoms and CT scan showed no new recurrence of the subdural hematoma.

Conclusions: Although several treatment options are available for the management of CSDH, recurrence of hematoma is a major and very common complication that may result in re-injury due to mass effect caused by chronic hematoma. However, placement of subdural peritoneal shunt for the treatment of CSDH can reduce the recurrence rate of CSDH and therefore, reduce the risk of brain re-injury.

Introduction

Chronic subdural hematomas (CSDH) tend to occur most commonly in the elderly population, usually resulting from minor or insignificant head trauma. Often, the antecedent event is never recognized. It frequently presents as a headache, and can be a common treatable cause of dementia. In younger individuals, however, the CSDH may be the result of hypertension, vascular abnormalities, coagulopathies as well as substance abuse [1,2]. A minority of cases stem from acute subdural hematomas that have matured (i.e., liquefied) due to lack of treatment. One retrospective study reported that the highest incidence occurred between the fifth and sixth decades, with an average of 59.3 years of age [3].

Cortical bridging veins are thought to be under greater tension as the brain gradually atrophies from the skull with advancing age; even minor trauma may cause one of these veins to tear. Slow bleeding from the low-pressure venous system often enables large hematomas to form before clinical signs appear. Studies suggest that CSDH is a unique type of hematoma contained within a

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neomembrane capsule within the dura mater propria. However, new morphological studies utilizing scanning electron microscopy provide different evidence of dynamic changes that exist with CSDH [4]. As the CSDH develops, its vascularized structure, composed primarily of dural border cells and a capillary plexus, forms a neomembrane capsule [2]. This neomembrane capsule is made of granulation tissue composed of newly sprouted vasculature, inflammatory cell infiltrates, and proliferating fibroblasts. As the angiogenic and inflammatory reactions are suppressed, fibrotic scar tissue is formed. In CSDH, the overproduction and over secretion of tissue plasminogen activator (tPA) from the sinusoidal and capillary endothelium results in increased fibrinolysis, thereby impairing normal hemostasis, allowing for recurrent hemorrhage of capillaries and a resultant growth of the CSDH [5]. Also, the newly formed vasculature is more permeable and fragile, thus further promoting chronic hemorrhage [5–6].

In patients with CSDH, blood flow to the thalamus and basal ganglia regions appears to be particularly affected primarily due to mechanical distortion of central brain regions [7]. Tanaka et al. suggested that impaired thalamic function can lead to a spreading depression that impairs various cortical regions, due to transneural depression, thereby producing various clinical deficits [7]. They found that a 7% decrease of cerebral blood flow (CBF) was commonly associated with headache, whereas a 35% decrease of CBF was associated with neurological deficits such as hemiparesis.

Given that the pathophysiology of CSDH is often directly associated with cerebral atrophy, it is not surprising that subdural hematomas are associated with conditions that cause cerebral atrophy (e.g., alcoholism, dementia). Most CSDHs are probably caused by head injury; other causes and predisposing factors include coagulopathy, use of anticoagulants (including aspirin), seizure disorders, and CSF shunts. Commonly used medications, such as anticoagulants and/or antiplatelet therapy, and comorbidities may have an influence on the increasing incidence of CSDHs. In a retrospective study of 303 patients that underwent burr hole craniotomy, evaluation of existing comorbidities among the patients showed that diabetes increased the risk of recurrence ($p = 0.027$) [8].

Neurosurgeons routinely use diverse approaches for the treatment of CSDH, including single or double burr hole evacuation, twist drill craniostomy, and classical craniotomy [9]. Considerable evidence supporting the use of external drainage after evacuation of primary CSDH is readily available in the literature [1,10]. The most significant principles utilized in defining the control of a CSDH are monitoring of clinical neurological signs, symptoms, and evaluation with CT scan [11]. Subacute hematomas can be treated with a similar technique as chronic hematomas [12]. Treatment of recurrent CSDH is usually straightforward; and ultimate prognosis is related to the amount of associated direct brain damage and damage resulting from mass effect of the hematoma. Still, it can occasionally be refractory to traditional treatment [13–14].

Placing a permanent subdural peritoneal drain with burr hole evacuation is explained here as a strategic technique to be implemented as standard of practice to improve patient prognosis. The peritoneal shunt is a relatively simple device that comprises two parts including the proximal and distal tubing. This technique may lower the incidence of re-injury related to the amount of associated damage resulting from the mass effect created by chronic hematoma [1,15]. Subdural peritoneal shunt placement is a viable option to mitigate repeat surgical intervention risks and in high-risk patients can lessen perioperative time [1].

Case report

A 72 year-old male with a history of myocardial infarction and stroke (without any residual side effects) presented with a recurrent left-sided subdural hematoma within a seven-month period. The patient originally presented to the neurosurgical clinic complaining of a two-day history of personality changes, urinary incontinence, balance instability, and headaches. Physical examination was significant for a decreased level of consciousness, cognitive impairment, ataxic gait, speech difficulty, right-sided hemianopsia, mild third and sixth nerve palsy, as well as papilledema on fundoscopic examination. A computerized tomography (CT) image revealed a chronic recurrent left-sided subdural hematoma (Image Fig. 1A).

The patient was admitted from the emergency department and the subdural hematoma was drained with placement of a valveless subdural peritoneal shunt. The patient, in the supine position and under general endotracheal anesthesia, was prepped and draped with routine sterile methods, including the left frontal, parietal and occipital areas, in addition to the ipsilateral side of the chest, neck and abdomen. Endoscopy was used to pass the peritoneal shunt up to the parieto-occipital juncture. A burr hole was created and the dura opened in the left frontal area. After evacuation of the hematoma, a ventricular catheter was connected to the peritoneal tubing. Physical examination two days postoperatively revealed complete resolution of all neurological deficits.

The patient presented to a one-month follow-up appointment without the presence of any neurological symptoms. CT imaging (Image Fig. 1B) of the brain showed complete resolution of the hematoma with no new recurrences.

Discussion

Different treatment modalities can be implemented for the management of subdural hematomas. In most cases, patients are treated with simple single or double burr hole evacuation with or without the use of external subdural drainage. Other techniques include twist-drill craniostomies and classical craniotomies [9,16]. These procedures carry complications such as failure of brain re-expansion and/or re-accumulation of blood in the subdural space (0–30%), seizures (1–23%), intracerebral hemorrhage (0.7–5%), post-operative infection (2%), and tension pneumocephalus (0–10%) [9,17]. In a study of 500 patients treated by burr-hole craniostomy with closed-system drainage, postoperative complications occurred in 5.4% and recurrence of CSDH occurred in nearly 10% of patients [17].

While burr-hole craniostomy continues to be the most commonly used technique for the treatment of CSDH, successful treatment proves a challenging dilemma due to a 10–20% recurrence rate [18]. Therefore, alternative techniques such as subdural peritoneal shunt placement should be considered as a permanent treatment option in patients with chronic or recurrent subdural hematomas.

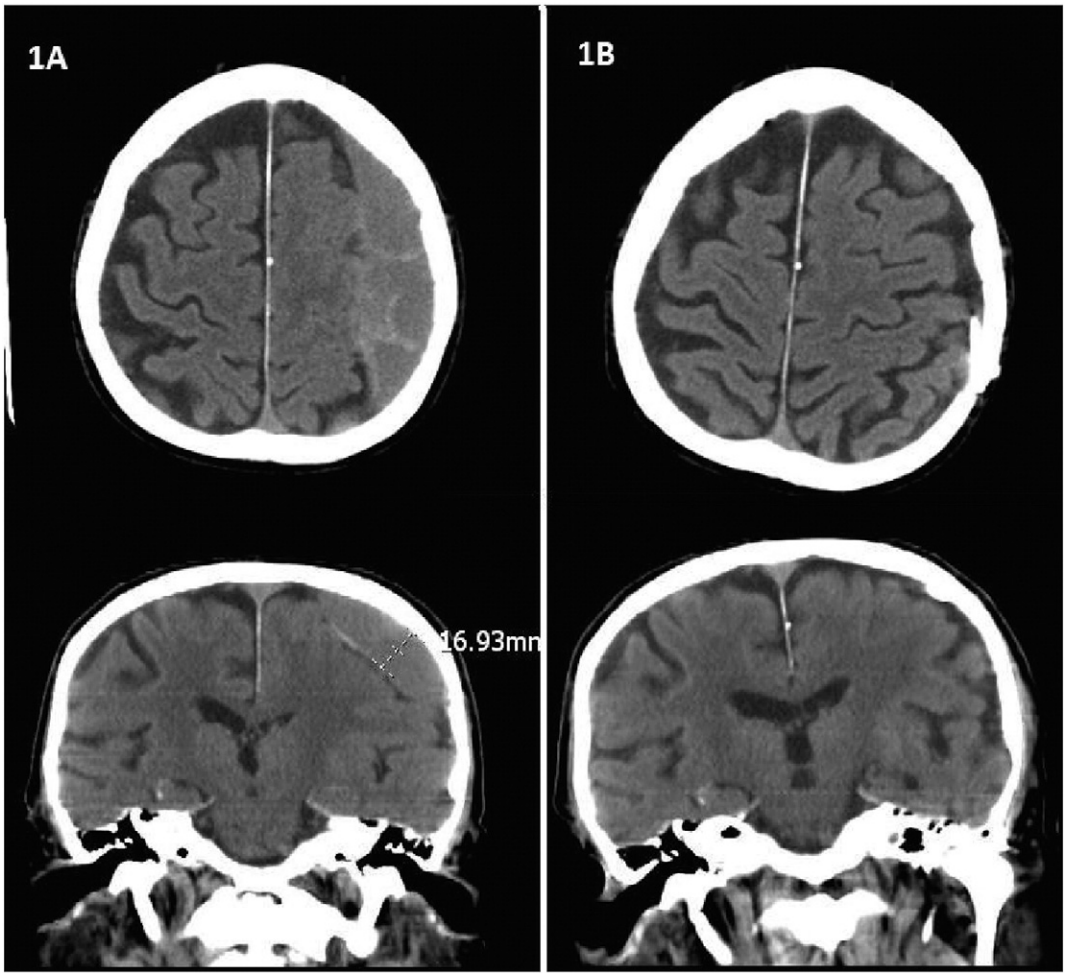

Fig. 1. A. Brain CT scan pre-op. Image showing a large right subacute subdural hematoma causing subfalcine herniation, impending uncal herniation, right to left shift of 1.0 cm mass effect and ipsilateral ventricles. B. One-month status-post neurosurgical evacuation of right subdural hematoma. Burr hole is present at the parietal convexity. Subdural drainage catheter is seen, stable in position. Previously present right subdural air has resolved. No extra-axial fluid collections identified from the level of the foramen of Monro, to the convexity. No acute intracranial hemorrhage.

Although the literature regarding its use is limited, this case of a 72 year-old male with a chronic recurrent subdural hematoma status-post subdural peritoneal shunt placement proved both successful in the treatment and in prevention of recurrence.

Peritoneal shunts have the potential to provide us with an effective tool for reducing the number of surgical procedures required by the patient to and may further be useful for patients with chronic or recurrent subdural hematoma [1]. Hence, it is in our opinion that patients with recurring chronic collections or those at high risk of mortality and/or recurrence should be considered for management with subdural peritoneal shunt placement.

Conclusion

The evacuation of chronic subdural hematoma with stable subdural peritoneal shunt placement is a safe, effective and an active management choice that successfully prevents the recurrence of blood collection [1].

Conflict of interest

The authors have no personal financial or institutional interest in any of the drugs, materials, or devices in this article. No grant is pertinent to this article.

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