

Demonstration of Brain Expansion in Cases of Chronic SDH during Admission Leads to Decreased Rates of Recurrence

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Abstract

While being considered a simple procedure among the wide spectrum of neurosurgical procedures, the surgical management of chronic subdural hematoma (SDH) still possesses a degree of variability. Present concepts of production versus absorption of chronic SDH fluid has led to practitioners differing in the use of drains, the treatment of inner membrane, the flushing of the subdural cavity, and the perioperative decision making for cases with comorbidities and a history of anticoagulant/antiplatelet usage. In this article, we present the management of chronic SDH over a period of 15 months using the principles followed at our center. In 60 patients of chronic SDH, with the use of drains, we waited for radiological demonstration of brain expansion before drain removal and discharge. In our experience, this has led to better prognostication and very low recurrence rates, particularly in patients with comorbidities and on anticoagulant/antiplatelet medication.

Keywords

- ▶ burr hole
- ▶ chronic SDH
- ▶ drains
- ▶ imaging
- ▶ treatment

Introduction

The treatment of chronic subdural hematoma (SDH) is considered one of the first surgeries learnt by a trainee neurosurgeon. But as we gain more experience, most surgeons would agree that this seemingly easy to treat disease can throw up harrowing surprises. Historically, the treatment of chronic SDH has many points of debate. This includes theories on the pathophysiology of the condition as well as treatment practices and steps. Added to this variability, is the increasing use of anticoagulants/antiplatelet drugs in the senior population in an era of increasing awareness and defensive practice in heart disease. The use of these drugs and the need to restart them after surgery for chronic SDH further increases the risk of recurrence. In this study, we elucidate the practice followed at our center, its basis in the pathophysiology of chronic SDH, and our results.

Materials and Methods

Patient Inclusion Criteria

Sixty patients of chronic SDH operated at our center were studied retrospectively. The study included patients from February 2018 to April 2019 with minimum 3-month follow-up. Patients were studied for characteristics of age, unilateral or bilateral collection, neurologic status, presenting complaints, and the presence of comorbidities. A special emphasis was placed on whether the patient was taking anticoagulants or antiplatelet medication. Patients were followed up for resolution of symptoms, neurologic status, and recurrence/reoperation.

Surgical Methodology

At our center, chronic SDH is treated by burr hole and evacuation. Surgery was performed by four surgeons independently but using the same protocols. Surgeons possessed 8 to 14 years of experience as individual practitioners.

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For majority of patients, surgery is done under sedation and local anesthesia. Indications for general anesthesia include poor neurologic status, uncooperative patients, and those in whom higher amounts of sedation are needed which may lead to unstable vitals. Location of burr holes is based on the area of maximum collection on the noncontrast computed tomography (NCCT) scan of the head. For most patients, a frontal and parietal burr hole is created and collection is evacuated. After the drainage, a wash is given till the content is clear.

A soft biocompatible silastic rubber-polymer drain is inserted (Surgiwear External Ventricular Drain) through the frontal burr hole carefully so as not to damage the underlying brain. The drain is inserted anteriorly from the frontal burr hole till 4 cm. Bilateral drains are inserted for bilateral collections through frontal burr holes into the SDH cavity, extruded through a tunneled cavity, and connected to collection bags postoperatively. The bags are placed in a dependent position and the patient is encouraged to maintain a flat position, lie without a pillow with the head turned to the side of the drain. For bilateral collections, the patient is asked to turn the head to either side hourly. In this position, the frontal burr hole forms the most dependent part of the head to assist drainage. If the drain stops draining, it is flushed with saline and if it still does not drain an NCCT of the head is done to look for brain expansion. If the CT shows resolution of collection and expansion of the brain, the drains are removed. If the CT shows persistent collection, the drains are repositioned (by retracting them 1–2 cm; drains are never pushed further inside blindly) and flushed. The process is repeated till expansion is demonstrated. If the drain shows clear high-volume drainage indicative of cerebrospinal fluid (CSF), drainage is stopped. If the NCCT head in this case shows persistent collection with high-volume clear drainage, it is likely that CSF is being drained. Drains are then removed and the patient watched closely. A repeat NCCT head is done after 48 to 72 hours to see for expansion of the brain.

The patient is discharged 3 to 5 days from the day of surgery depending on the postoperative course.

Results

Sixty cases of chronic SDH were studied from February 2018 to April 2019. Mean follow-up time was 8.43 months. Nine patients were females while 51 were males. Average age of patients was 64.33 years. Out of 60 patients, 18 had bilateral chronic SDH. Among unilateral collections, the left side (25 patients) was more common than the right (17 patients).

A history of trauma could be elicited in only 20 out of 60 patients. Headache was the most common presenting complaint followed closely by history of weakness most often unilateral. Other complaints included giddiness, speech complaints, and difficulty walking. Five patients were brought in poor neurologic status ranging from drowsiness to deep coma.

Forty-five patients out of 60 had comorbidities. The most common were hypertension and diabetes mellitus. Thirteen patients had previously undergone percutaneous transluminal coronary angioplasty (PTCA) or coronary artery bypass grafting. A staggering 21 patients were on some form of anti-coagulation or antiplatelets (most commonly aspirin, clopidogrel, and prasugrel). Patients with no history of PTCA had been on aspirin prescribed for history suggestive of angina, partial coronary thrombosis or previous stroke, or partial carotid stenosis. One patient had rheumatic heart disease with mitral stenosis and was on warfarin. Other than these, two patients had diabetic nephropathy, three had chronic kidney disease, and two patients had Alzheimer's dementia. One patient had decompensated chronic liver disease and one had central nervous system lymphoma and was on chemotherapy.

None of the patients in the study had a recurrence of chronic SDH needing repeat surgery in follow-up.

Four patients died. Among these, two patients died during admission—one was brought in M3 status with decompensated liver cirrhosis (Child–Pugh C). Another was brought to the emergency in pulseless status and was revived with cardiopulmonary resuscitation before surgery (old case of right middle cerebral artery infarct on aspirin). Two patients died in the follow-up period—one had been discharged in M6 status with improvement in symptoms and died suddenly 6 months postoperatively (cause unknown). Another patient was a known case of Alzheimer's. The patient did not improve symptomatically postoperatively, continued to deteriorate neurologically after 3 to 4 weeks of stability, and died 2 months postoperatively. One patient was reoperated for acute collection 12 hours after the initial surgery. This patient did well after the second surgery with no recurrence after discharge.

Four patients reported continued headache after the surgery, but there was no recurrence of chronic SDH. Fifty-two patients remained symptom free at follow-up.

Discussion

Historically, the treatment of chronic SDH has involved craniotomy and drainage of the collection. At the dawn of modern neurosurgery, the procedure of choice was to create a large craniotomy and evacuate the collection, but rates of reaccumulation were high. This led to the creation of more permanent craniotomies that encouraged fluid to drain continuously. More senior neurosurgeons may be familiar with the creation of a large temporal craniotomy (usually not less than 3cm in diameter) that led to the absorption of fluid through the overlying temporalis muscle. Eventually, the invasiveness of this approach was reduced with the creation of one or two burr holes to achieve the same effect.

The change has been a result of a better understanding of the pathophysiology of chronic SDH. Initially thought to be a static collection, it is now believed that chronic SDH forms as a continuous process of fluid creation and reabsorption.

Numerous studies of the chronic SDH membranes have found these to be inflammatory tissues infiltrated with cytokines.¹⁻⁵

Modern treatment therefore bases itself on not just decompressing the collection (often leading to a miraculous relief of symptoms) but also in preventing its future development by the creation of a fluid fistula. The purpose of the fistula is to tip the balance of secretion and reabsorption in the favor of reabsorption. Therefore, the reaccumulation of chronic SDH is prevented by reabsorption and not just drainage. The point of debate is how to go about the creation of such a fistula.

The size of the fistula opening is controversial to begin with. Patients have been cured by a single-twist drill hole, by a single burr hole, by multiple burr holes, and by a craniotomy. Studies comparing twist-drill craniotomies and burr hole craniotomies to treat chronic SDH have concluded equivalent long-term results. But almost all agree that twist-drill craniotomies show poorer resolution of midline shift in the short term, larger residual collections, and the need for repeat bedside twist-drill craniotomies in the same admission. Burr hole craniotomies allow better visualization and hemostasis of the bone and dura, a fact that we have found to be extremely important in patients on anticoagulants. The debate rages on regarding the number of burr holes necessary, but most studies have been conducted with at least two burr holes providing excellent results.⁶⁻¹⁰

The use of a closed drainage system after burr hole or twist-drill craniotomies has been studied in large trials. All publications studied by us have concluded that the use of a closed drainage system gives significantly reduced rates of reaccumulation as opposed to not using drains after surgery.¹¹⁻¹⁴

Our operative philosophy is therefor based on the following points drawn from a study of literature (► Fig. 1):

1. The chronic SDH cavity is an active space with a balance of secretion and absorption.
2. The modern treatment of chronic SDH necessitates tipping the balance of absorption and secretion toward absorption.
3. The use of burr holes allows better visualization and control of bleeding from the bone and dura that is essential when operating on patients taking anticoagulants/antiplatelets.
4. The best indicator that we have successfully shifted the balance toward increased absorption is the demonstration of the expansion of the brain and the collapse of the chronic SDH cavity.
5. Patients in whom the brain does not expand, or in whom CSF starts draining (leading to further shrinkage of the brain if the drain is not stopped), can be prognosticated toward a poorer outcome postoperatively.

To ensure that the balance between secretion and reabsorption has been altered, the demonstration of brain expansion has guided our results. Radiological surety of the collapse of the chronic SDH cavity helps ensure that the fistula

The philosophy behind our strategy

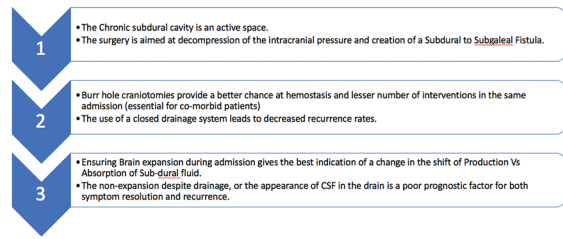


Fig. 1 Schema of strategy followed and scientific basis.

created by the burr holes has the best likelihood of succeeding in the future. This is particularly important in patients on anticoagulants who are highly prone to recurrence. We receive a high number of such patients, but the recurrence rate despite these comorbidities has been extremely low.

In those patients who continue to drain CSF after the procedure, we conclude that the chronic SDH has a component of hygroma. In such patients, prognosis for symptom relief is more guarded. Drainage of such a cavity leads to shrinkage of the brain instead of expansion, further promoting subdural collection at other locations. Once the drain is removed, if the brain expands, we can say with more confidence that resolution of symptoms is more likely.

In those patients in whom the brain does not expand despite drainage, prognosis remains guarded. The cause for symptoms in such patients may not be related to the chronic SDH and may be due to the patient’s comorbidities.

Conclusion

The use of drains postoperatively in patients of chronic SDH and the radiological demonstration of brain expansion during admission in our center has led to extremely low recurrence rates, better rates of symptom resolution, better prognostication guidance for symptoms, and a suitable technique with excellent outcomes even in high-risk patients with various comorbidities and on anticoagulation. We recommend a larger study involving more institutions and different surgeons following this protocol to further test the power and accuracy of the results.

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