An Institutional Experience with Surgical Evacuation for Chronic Subdural Hematomas with Burr-Hole Drainage

Arun Kumar [1], Lokendra Singh [2], Surya P Singh [3]

ABSTRACT

BACKGROUND:

Surgery for chronic SDH (CSDH), one of the most common clinical entities in neurosurgery with the best prognosis, is the gold standard of therapy for elderly patients with a history of moderate trauma.

RESEARCH GOALS:

This study aimed to evaluate the clinical presentation, radiologic findings, therapy, and consequences of individuals with CSDH following surgical burr-hole evacuation.

MATERIALS AND PROCEDURES:

This prospective study was conducted on 24 patients who underwent cranial burr hole surgery for chronic subdural hematomas.

RESULT:

Five (20.8%) of the 24 patients in this study were female, and 19 (79.19%) were male. The most common age range for CSDH detection was 51-70 years old. The most frequent presenting symptoms of the patients were headache (14 {58.33%}) and giddiness (17 {70.8%}), which were followed by hemiparesis, or one-sided weakness. Of the patients, 22 (91.6%) exhibited a midline displacement greater than 5 mm. Recurrence of CSDH was the most common result in our study, occurring in 3 instances (12.5%). Recurrence was 8.3% (1 case out of 12) after two burr holes and 16.6% (2 cases out of 12) after a single burr hole. Mild uncomplicated pneumocephalus was present in 66.66% of the cases. We discovered a wound infection in 1 case (4.1%), which was treated with antibiotics. We did not have complications such as severe bleeding, CSF (cerebrospinal fluid) leakage, or tension pneumocephalus (TP).

CONCLUSION:

Two burr holes at the highest point of the hematoma are sufficient to fully drain the unilateral CSDH. Significant midline movement, single or multiple burr holes, and the age of the patient with comorbidities all affect the recurrence rate. Surgery is not required to treat postoperative mild pneumocephalus that appears on follow-up radiological imaging. For hazardous conditions such infection, post-operative pneumocephalus CSF leak, and recurrence of CSDH, emergency care is required.

KEYWORDS: Chronic subdural hematoma (CSDH), burr hole, infection, headache, pneumocephalus

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INTRODUCTION

Chronic subdural hematoma (CSDH) is a condition in which fluid builds up within the dura layer. According to estimates, the annual incidence of CSDH ranges from 0.001 to 0.002%. [1]

Patients over 40 are involved in 80% of cases. Trauma is perhaps the biggest risk factor for the development of CSDH, as two-thirds of CSDH patients report having experienced some form of minor trauma. Additional risk factors include chronic alcoholism, primary coagulopathy in children, spinal anesthesia, lumbar puncture, cerebrospinal fluid (CSF) shunting, seizures, dehydration, brain atrophy, degenerative brain disease, and neurosurgical operations that include opening the subarachnoid space. Surgery is the "gold standard" of treatment for CSDH in people who exhibit symptoms.

The three primary surgical techniques used to treat CSDH are craniotomy, burr-hole craniostomy, and twist drill craniostomy (TDC). BHC and craniotomy are the most successful techniques with the lowest risks of recurrence. This increase in potential space in the subdural area facilitates post-operative air collection, and cerebral atrophy is commonly associated with CSDHs [2].[3]

The condition known as "pneumocephalus" is when there is air inside the skull. It usually happens after surgical removal of CSDH. Pneumocephalus comes in two forms: simple and tension. Simple pneumocephalus is typically asymptomatic and does not require treatment. Emergency care is required for tension pneumocephalus (TP), which is an accumulation of air under pressure.[4]

MATERIAL AND METHOD

This prospective study was conducted on 24 patients who underwent cranial burr hole surgery for chronic subdural hematomas.

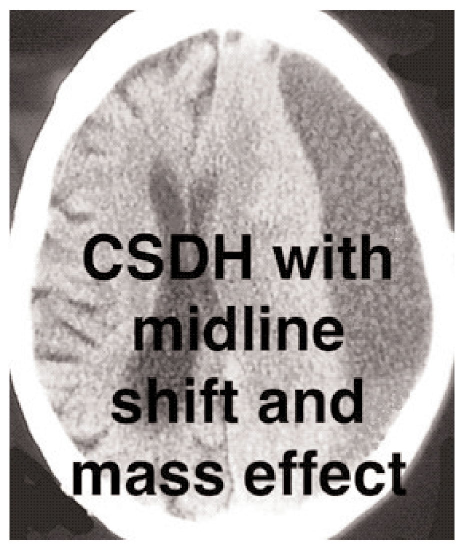

Fig. 1 *Plain CT scan Axial view: Preoperative CT brainis showing CSDH in left FTP region, also associated with significant midline shift and mass effect.*

A computed tomographic (CT) scan was conducted in each instance to assess the degree of midline shift and the site of CSDH, if any. [Figure. 1]

Burr hole craniotomy (single or double) was one of the surgical procedures performed under local or general anaesthesia. The thickest area of the hematoma was approached, and the subdural collection was evacuated by making incisions in the dural and hematoma membranes and then repeatedly irrigating with saline until clear fluid emerged in every instance. Consequently, the surgical process remained consistent.

In order to encourage brain enlargement, patients were kept in a flat head (0 degree) position for 24 to 48 hours after surgery and received enough intravenous (IV) fluids for two to three days. Every patient had a follow-up CT scan one month following surgery, and a postoperative CT scan 24 hours later (if any patients had deteriorated, the CT brain was updated as needed).

Follow-up was conducted 15 days following surgery, and patients who had no problems were released between the fourth and fifth postoperative days. After one month following surgery, a second follow-up was also done for a small number of patients.

The surgical outcomes were assessed at the time of admission, immediately following surgery, and 30 days later using the Glasgow Outcome Scale Extended (GOS-E) [5].

Good pre- and postoperative outcomes were categorized as either unfavourable (GOS1-3) or favourable (GOS4-5) for patients. The GOS-E and comparable measures, according to some, do not accurately capture the complexity of patient outcomes following CSDH. This is due to their emphasis on physical results, but dysfunction that is cognitive or emotional may have a bigger effect on long-term results.

RESULT

Out of the 24 patients in this study, 19 (79.19%) were men and 5 (20.83%) were women. The patients' ages ranged from 21 to 85 years ([Table 1]). Eleven patients (45.8%) with CSDH were in the most common age group, which was between 61 and 70 years old. Five patients (20.83%) were in the 51-60 year age range. Twenty-two (91.6%) of the patients had a history of head injuries. The majority of head injuries were caused by falls that occurred at home or at work and resulted in minor trauma without unconsciousness. Eleven patients (45.8%) had a preoperative midline shift of 11 to 15 mm, nine patients (37.5%) had a shift of 6 to 10 mm, two patients (8.33%) had a shift of more than 16 mm, and two patients had a shift of less than or equal to 5 mm. There was a midline movement of more than 5 mm in 22 (91.6%) of the individuals. Patients over 40 years of age and those who presented with a midline shift greater than 5 mm had a higher incidence of CSDH.

Headache (14 {58.33%}) and giddiness (17 {70.8%}) were the most common presenting symptoms, followed by weakness in 13 (54.16%) patients. Alternated sensorium was the next most frequent presenting symptom ([Table 2]). The patients also showed signs of bloody vomit, urine incontinence, abnormal behaviour, and seizures. Recurrence of CSDH was the most frequent complication, occurring in 3 instances (12.5%). Recurrence was 16.6% (2 instances out of 12) after a single burr hole {single burr hole done in 12 (50%)} and 8.3% (1 case out of 12) after two burr holes {two burr holes done in 12 (50%)}. Within 24 to 48 hours following surgery, two patients experienced postoperative seizures. Postoperative CT scans of 16 (66.66%) subjects showed some intracranial air, basic moderate pneumocephalus. We discovered a wound infection in 1 case (4.1%), which was treated with antibiotics. We did not have complications such as severe

Year	No. of patients (%)
21-30	1 (4.16)
31-40	1 (4.16)
41-50	2 (8.33)
51-60	5 (12.7)
61-75	11 (32.7)
75-80	3 (12.5)
> 80	1 (4.16)

***Table 1:** incidence of CSDH with Age Group*

Name	Count	Percentage
Headache	14	58.33
Weakness	13	54.16
Giddiness	17	70.8
Vomiting	12	50
Loss of consciousness	5	20.8
Wound Infection	1	4.16
Altered sensorium	5	20.8
Forgetfulness	3	12.5
Seizure	5	20.8
Fever	2	8.33

***Table 2:** Clinical presentationon admission*

bleeding, CSF (cerebrospinal fluid) leakage, or tension pneumocephalus (TP).

No neurologic deterioration was observed in any of the simple and moderate cases of pneumocephalus, and no special therapy was needed. A wound infection and fever occurred in one case, while postoperative fever occurred in another. Both cases were treated with antibiotic medication and recovered without any further problems.

According to the Glasgow Outcome Scale Extended (GOS-E) grading system ([Table 3]), the authors had 18 (75%) patients in grades 4-5 during the preoperative phase.

Six patients, or 25% of the total, were in grades 1-3. Three patients (12.5%) in grades 1-3 had poor postoperative outcomes, according to postoperative grading using the same approach. Three individuals did not recover from their neurologic disability, fever, and infection. Of the patients in grades 4-5, 21 (87.5%) had good surgical outcomes. According to the Glasgow Outcome Scale Extended (GOS-E) scale, one patient (4.16%) had a poor outcome, falling into grades 1 to 3, and 23 patients (95.8%) demonstrated good recovery, falling into grades 4 to 5, one month after the burr-hole evacuation.

Outcome	Before Surgery	After Surgery	Follow-up (1 month)
4-5 (good)	18 (75%)	21 (87.5%)	23 (95.8%)
1-3 (poor)	6 (25%)	3 (12.5%)	1 (4.16%)

Table 3: *The Glasgow Outcome Scale Extended (GOS-E)*

DISCUSSION

When properly treated, CSDH, one of the most common forms of cerebral hemorrhage, has a good prognosis.[6] Our understanding of the etiology of CSDH is incomplete. It is well acknowledged that traumatic subdural effusion is a precursor of CSDH.[7] [8] Arachnoid ripping brought on by head trauma or neurosurgery results in traumatic subdural effusion, and the fluid-with or without blood-in the subdural space promotes the development of the so-called outer membrane. One of the reasons for the effusion of CSDH is local hyperfibrinolysis, which is accompanied by recurrent bleeding from capillaries with deteriorating endothelium.[9]

After modest head injuries, CSDH frequently develops in older adults due to brain atrophy that causes the subarachnoid space to grow and the bridging veins to stretch. This allows the arachnoid membrane to rip and bloody CSF to flow.[5]

Twenty-two (91.6%) of the cases had a clear history of head injuries.

91% of patients in this study were over 40, while the age group of 61 to 70 years old had the highest incidence of CSDH, at 45.8%. Additionally, most studies have indicated that patients' prognoses worsen with age, and age is generally considered to be a major predictor of prognosis.[10] There were 19 (79.19%) male in the current study.

Men are more likely than women to have a head injury, women are less likely to seek medical attention, and estrogen and its derivatives may have a protective effect on capillaries, which could explain the male preponderance.[11]

The advantages of burr hole craniotomy over twist drill craniotomy are similar among the three popular surgical techniques. Compared to craniotomy, BHC has a higher cure rate, is safer, has a lower recurrence rate, and produces superior results. Under local anaesthesia, it is possible to accomplish it.[2] It is less intrusive and requires less time to operate than the other two, although it is frequently less effective at removing the hematoma, particularly when thick hematomas or separated forms of CSDH are involved.[12]

Recurrence rates in this study were 12.5% overall, 16.6% following a single burr hole, and 8.3% following two burr holes. To ascertain whether a single burr hole is important or not, a sizable comparison group is necessary. In our investigation, the sample size was insufficient for a single burr hole, but the literature showed a recurrence rate of 7-18% following a single BHC.The rate of recurrence in this series was 12.5%, which is slightly higher than rates reported by other authors, and drain was not used in this trial in any case.[13]

According to earlier research, there is disagreement in the literature about drain's superiority. According to Markwalder and Seiler [14], there are no extra advantages to using a subdural drain. There was no discernible difference in the recurrence rate between BHC with closed system drainage and basic BHC with irrigation, according to Erol et al. [15] and Hamilton et al. [16].

For nearly a century, the pathophysiology and recurrence of CSDH have been contentious and are still unknown. The most commonly accepted explanation is that it is caused by recurrent bleeding from the hematoma's outer membranes. There are numerous explanations for the recurring bleeding.Eosinophil infiltration was noted in the vascularized and hynalized granulation tissue of the subdural membrane [17] [18] [19] [20]. Yamashima[17] hypothesized that recurrent subdural bleedings and local hyperfibrinolysis could be facilitated by the eosinophils in the outer membrane.Even though the outer membrane is left intact, CSDH removal alone is nearly always successful. By removing hemorrhagic fluid, which most likely contains anticlotting factors, Weir[21] suggested that the removal of CSDH causes hemostasis and fibrosis by halting the self-perpetuating cycles in the subdural neo-capillaries.

Following trauma and intracranial surgery, pneumocephalus is frequently observed. It frequently occurs following CSDH surgical evacuation. While simple pneumocephalus usually has no symptoms, TP is an uncommon neurosurgery emergency that can be lethal if not identified and treated promptly. TP can occur with as little as 25 mL of air.[22]

In 66.66% of the cases in this study who had immediate postoperative CT scans, there was some air present; these instances were clinically asymptomatic. All follow-up CT scans after a month showed that this air was resolved. Nine patients (18%) in ZidanIhab's study experienced a recurrence of CSDH, and seven out of nine patients had pneumocephalus, a typical finding in recurring cases.[1] In a similar vein, the recurrence rate in the Zakaraia et al. study [23] was 4.9% in patients without pneumocephalus and 7.3% in individuals with it. According to their research, patients with pneumocephalus had a somewhat higher recurrence rate. The two groups' results did not differ in a way that was statistically significant.

The prevalence of simple pneumocephalus does not significantly increase recurrence, as seen by the study's recurrence rate of 12.5%, which is equivalent to that of other studies without pneumocephalus. Fortunately, tension pneumocephalus (TP) did not develop after surgery in our series. According to earlier research, the incidence range described in the literature is 0-16.[24] [25] [26] In this instance, TP manifested clinically as headache, hemiparesis, and diminished consciousness, with increasing neurologic decline during the postoperative phase. The Mount Fuji sign used to appear on the CT scan. The subdural air separates and compresses the frontal lobes, resulting in an enlarged interhemispheric space between the tips of the frontal lobes that resembles the silhouette of Mount Fuji and produces the Mount Fuji sign visible on the CT scan.

Fig 2 :The Mount Fuji sign

The distinctive separation of the frontal lobe tips suggests that the air tension is greater than the CSF surface tension between the frontal lobes.[27] [28] [29] The Mount Fuji indication by itself is not regarded as a TP diagnosis. The "peaking sign" was suggested by Pop et al. [30] as an additional indicator of TP. The "air bubble sign"-the existence of several tiny air bubbles dispersed throughout multiple cisterns-was recognized by Ishiwata et al. [31] as an indication of TP.

CONCLUSION

It is adequate to completely evacuate the unilateral CSDH using two burr holes at the highest position of the hematoma. Recurrence rate is influenced by single burr hole, extensive midline movement, and age. A common radiologic abnormality that is clinically asymptomatic and untreatable is postoperative simple pneumocephalus. TP is a severe side effect that needs to be treated right away.

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