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Original Article

Surgery Section

Outcome of Endoscopic Management of Chronic Subdural Haematoma: A Retrospective Study

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ABSTRACT

Introduction: Chronic Subdural Haematoma (CSDH) is a condition with a collection of liquefied blood in the subdural space, which usually develops at least three weeks after an injury. Endoscopic evacuation of CSDH is a minimally invasive technique that has been shown to be effective in reducing the need for surgical dissection.

Aim: To evaluate the outcome of endoscopic evacuation for CSDH.

Materials and Methods: This retrospective study was conducted at the Department of Neurosurgery, Gajra Raja Medical College, Gwalior, Madhya Pradesh, India and its affiliated hospitals from January 2021 to December 2022. All patients with CSDH on non contrast CT were included, except those with incomplete records, organised CSDH, secondary CSDH within six months of neurosurgery or meningitis, and those with an injury-to-procedure interval of less than 15 days. At admission, socio-demographic data (age, gender), clinical variables (headache, forgetfulness, hemiparesis, giddiness, speech difficulties), and co-morbidities were recorded. Pre and post-assessment were done by Glasgow Coma Scale (GCS). Descriptive statistics was used and results were expressed in terms of frequency and percentages.

Results: A total of 20 patients with unilateral CSDH (predominantly on the left-side) were included, among which 16 were males and 4 females with a mean age of 64.45 years. The most common presenting complaints were headaches, forgetfulness, and unilateral weakness. Most patients had a GCS score of 14-15, and four had co-morbidities such as diabetes and hypertension. No brain tissue injury was observed during the endoscopic evacuation, and all patients achieved complete recovery (GCS score: 15) without any recurrence, infection, fresh bleeding, or brain or membrane injury. Rapid brain expansion occurred in 16 patients; Subdural Drains (SDD) was kept for five days in four patients.

Conclusion: Endoscopic evacuation of CSDH is a safe and effective technique for improving clot removal and reducing the recurrence rate.

Keywords: Endoscopic evacuation, Glassgow coma score, Subdural drain

INTRODUCTION

The CSDH is a common neurosurgical condition with the collection of liquefied blood in the subdural space, which usually develops 3 weeks post injury. The annual incidence of CSDH is about 1-5.3 cases per 100,000 population [1], and the incidence of CSDH is increasing with the aging population and associated medical diseases such as haemodialysis, anticoagulant, and/or antiplatelet therapy [2]. The older patients had more co-morbidities and surgical risk factors than patients aged <65 [2]. Men are more commonly affected than women, representing at least two-thirds of patients [3]. The haematoma contains liquefied older blood and is also defined as a liquefied haematoma in the subdural space with a characteristic outer membrane that occurs at least three weeks after injury [4]. Patients of CSDH typically present with confusion, headache, and reduced state of consciousness.

Although various treatment options are available, including burr hole drainage and craniotomy, there is growing interest in the endoscopic management of CSDH [5]. Endoscopic surgery offers advantages such as minimal invasiveness, less blood loss, and faster recovery time. However, there is limited research on the outcomes of endoscopic management of CSDH [6]. Hence, this retrospective study aimed to evaluate the outcomes of endoscopic management of CSDH. The primary outcome measured was the rate of recurrence of CSDH after endoscopic surgery. Secondary outcome included length of hospital stay and functional outcomes (assessed using the GCS score).

MATERIALS AND METHODS

This retrospective analysis of all the patients who underwent endoscopic management of CSDH was conducted at the Department of Neurosurgery, Gajra Raja Medical College, and a group of hospitals (GRMC) over a period of 2 years, from January 2021 to December 2022.

Inclusion criteria: All patients with a CSDH on Non Contrast Computed Tomography (NCCT) were included.

Exclusion criteria: Those with incomplete clinical records, patients with secondary CSDH that occurred within six months of other neurosurgical operations or were accompanied by specific causes such as meningitis were excluded.

At admission, socio-demographic data (age, sex), clinical variables (headache, forgetfulness, hemiparesis, giddiness, speech difficulties), and co-morbidities were recorded. Initial NCCT Head was looked for findings of the haematomas and the midline brain shift. Pre and postassessment were done by GCS. Endoscopic evacuation of haematoma was performed in all cases.

Surgical Procedure

All surgeries were performed in general anaesthesia as these surgeries require complete immobility of the head. The patient's head was slightly raised and turned towards the contralateral side of the lesion, to facilitate better angulation of the telescope in the CSDH cavity. The incision was marked at the initial part of CSDH, usually 3-4 cm in length. One burr hole was made, usually 1.5-3cm in size. Dura was open after complete haematosis and part of the haematoma came out spontaneously. Angled suction tubes were introduced into the cavity, and the suction of the remaining CSDH was done. The CSDH cavity was irrigated with normal saline. A biocompatible silastic tube (Surgiwear External ventricular drain) was inserted through the frontal burr hole into the CSDH cavity and postoperatively connected with

a drainage bag. The daily output of the drainage bag was noted. Repeat NCCT Head was done after 24 hours of surgery to ensure the amount of haematoma removal, resolution of midline shift, and expansion of brain tissue. The SDD was removed if the brain gets expanded; if the brain was not expanded, then the SDD was kept for five days to ensure the complete removal of the remaining CSDH. The patients were discharged 3 to 5 days from the days of surgery, depending on the postoperative course.

STATISTICAL ANALYSIS

Data was entered and analysed by STATA statistical software version 15.0. Descriptive statistics was used and results were expressed in terms of frequency and percentages.

RESULTS

The study included 20 patients with CSDH among which 16 were males and 4 females. Total 16 haematomas of left sided and 4 of right sided were treated endoscopically. The mean age of patients was 64.46±7.63 years [Table/Fig-1].

Parameters	Number of patients (%)
Age distribution (in years)	
50-60	3 (15%)
61-70	11 (55%)
71-80	6 (30%)
Gender	
Male	16 (80%)
Female	4 (20%)
Side involved	
Left	16 (80%)
Right	04 (20%)
Presenting complaints	
Headache	16 (80%)
Forgetfulness	10 (50%)
Hemiparesis	10 (50%)
Giddiness	06 (30%)
Speech complaints	03 (15%)
Co-morbid conditions	
Hypertension	3 (15%)
Diabetes	1 (5%)
None	16 (80%)

[Table/Fig-1]: Socio-demographic characteristics of the study subjects.

CT head findings indicated that the maximum depth of haematoma was 11.75 mm with more than 10 mm in 50% of cases, and a midline shift of more than 10 mm was present in 70% of patients [Table/Fig-2].

Parameters	Number of cases (%)
Presentation of Subdural Haematoma	
With septation	05 (25%)
Without septation	15 (75%)
Max. depth of haematoma	
5-10 mm	10 (50%)
>10 mm	10 (50%)
Midline shift	
>5-10 mm	6 (30%)
>10 mm	14 (70%)

[Table/Fig-2]: Computed tomographic findings.

The preoperative average GCS score was 14 (9-15). Complete recovery (GCS score: 15) was achieved in all patients, and there were no deaths, recurrences, infections, fresh bleeds, or brain or membrane injuries [Table/Fig-3].

Glasgow Coma Scale	Number of patients (%)
Preoperative	
3-7	0
8-13	9 (45%)
14-15	11 (55%)
Postoperative	
3-7	0
8-13	0
>13-15	20 (100%)

[Table/Fig-3]: Glasgow coma scale score.

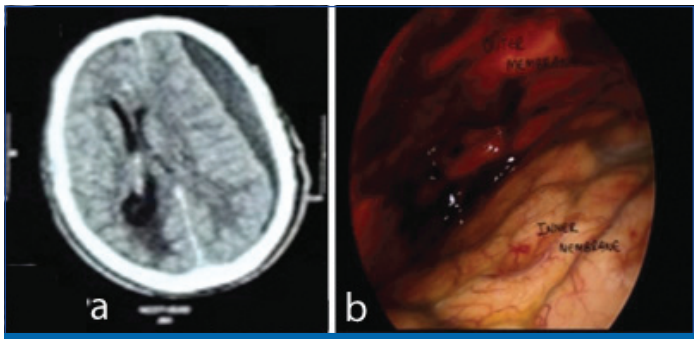
The average hospital stay in the study was 4.95±1.05 days [Table/Fig-4].

Days of hospital stay	Number of patients (%)
3-5	15 (75%)
>5-10	5 (25%)
>10	0

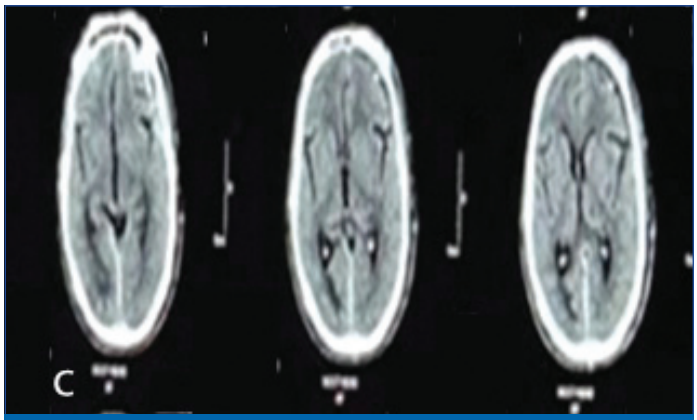
[Table/Fig-4]: Duration of hospital stay.

A SDD was placed in all cases (N=20) at the required site for irrigation or aspiration under good endoscopic control, and the duration of subdural drainage was 3 to 5 days. Complete recovery was achieved in all patients, and there were no deaths, recurrences. Although no injuries to the membrane or the brain were observed, it was possibly due to using the endoscope or the suction catheter, Proper selection of the burr hole site and a curved suction can overcome this problem. The study included 20 cases, among which 4 cases are discussed with their results as follows.

A 65-year-old male presented with a complaint of headache and right-sided weakness. NCCT head revealed hypodense haematoma over the left subdural space with mass effect and midline shift. Endoscopic evacuation of CSDH was done with a 1 cm burr hole with the simple evacuation of haematoma [Table/Fig-5].



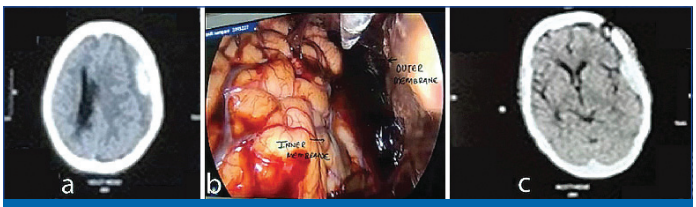
[Table/Fig-5a,b]: a) NCCT head: hypodense subdural haematoma over left frontoparietal convexity with midline shift; b) Intraoperative endoscopic view showing the status of the outer and inner membrane with liquefied clots.



[Table/Fig-5c]: Postoperative NCCT head showing complete evacuation of CSDH with a resolution of midline shift.

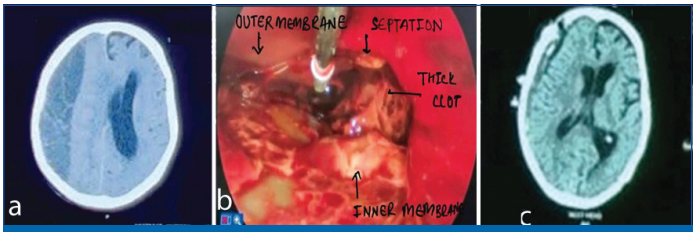
A 60-year-old male presented with a complaint of headache and right-sided weakness. NCCT head revealed mixed-density

haematoma over left F'T'P" subdural space with mass effect and midline shift. Intraoperatively there was a mixture of thick and liquid clots. Endoscopy helps better visualise the haematoma cavity and remove thick clots [Table/Fig-6].



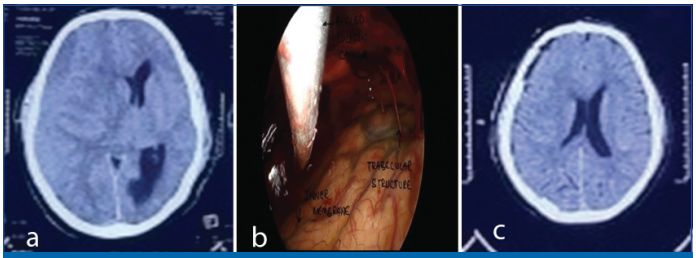
[Table/Fig-6]: a) NCCT head: hypodense subdural haematoma with some hyperdensity over left frontoparietal convexity with midline shift; b) Intraoperative endoscopic view showing the status of the outer and inner membrane with thick clot; c) Postoperative NCCT head showing complete evacuation of CSDH with a resolution of midline shift.

A 62-year-old male presented with a complaint of headache and left-sided weakness. NCCT head revealed mixed-density haematoma over the right hemispheric subdural space with mass effect and midline shift. Intraoperatively there was a mixture of thick and liquid clots with multiple septations and bridging vessels. Endoscopy helps better visualise the haematoma cavity and remove thick clots, coagulation of bridging vessels and debris [Table/Fig-7].



[Table/Fig-7]: a) NCCT head: hypodense subdural haematoma in right frontoparietal convexity with multiple septations with midline shift; b) Intraoperative endoscopic view showing the status of the outer and inner membrane with thick clot and multiple septations and bridging vessels; c) Postoperative NCCT head showing evacuation of CSDH with a resolution of midline shift with a SDD in situ.

A 62-year-old male presented with a complaint of headache and left-sided weakness. NCCT head revealed iso to hypodense haematoma over the right subdural space with mass effect and midline shift. Intraoperatively there was a liquid clot which was easily sucked with suction. Postoperatively there was the resumption of midline shift [Table/Fig-8].



[Table/Fig-8]: a) NCCT head: Iso to hypodense subdural haematoma in right frontoparietal convexity; b) Intraoperative endoscopic view showing the status of the outer and inner membrane and liquefied clot and trabecular structures; c) Postoperative NCCT head showing complete evacuation of CSDH with a resolution of midline shift.

DISCUSSION

Endoscopic procedures are increasingly used in brain surgeries. In the present study, there were 16 male and 4 female patients, with a male predominance of 80%. The average age of the patients was 64.46±7.63 years, ranging from 52 to 79 years. Bartek J et al., noticed a median age group of 75.4 years in 1200 patients with a male predominance of 69.6% [7]. Toi H et al., also observed that more than 50% of patients were in the age group of over 70 years [8].

In the present study, the headache was the most common presenting complaint in 80% of patients, followed by forgetfulness and hemiparesis. In a study by Yamada SM et al., the headache was recognised in 22.6% of patients, while nausea or vomiting suggesting increased intracranial pressure was detected in only 3.0% [9]. Wakuta N et al., noticed headache and motor disturbance is the most common initial symptom, present in >50% of patients in every age group [2].

In the present study, three patients presented with hypertension and one with diabetes mellitus, as cardiovascular diseases, diabetes mellitus was detected more frequently in patients with CSDH, which Tabuchi S and Kadowaki M also observed as the most common concomitant disease was hypertension (45%), followed by dementia (35%) and cerebral infarction (30%) [10]. Wakuta N et al., observed hypertension in 49.4% of patients, followed by diabetes mellitus in 20% and dyslipidemia in 17.2 % of patients [11].

In 5 patients (25%), CSDH was present with septation. Gelabert-González M et al, observed septated CSDH in 19.6% of patients [12]. Hellwig D et al., found 14 patients with septated CSDH in their study [13]. All patients were operated on using the endoscopic technique. After the endoscopic intervention, 12 patients had a sufficient or complete haematoma evacuation [14]. The average depth of the haematoma in current study was 11.75 mm whereas in Kim HY et al., noticed a depth of 10 mm in less than 80% of patients and >10mm in 18.1% of cases [14].

In the present study, the burr hole was made in the most anterior part of CSDH, to ensure complete evacuation of the clot. It provides a straighter trajectory for endoscopic instruments to manipulate. However, the amount of CSDH behind the parietal cortex is challenging to remove due to curvature. Authors used a curved suction tube for the removal of this part. As a standard practice at our department, we routinely use two burr holes, one at the frontal and one at the parietal bone. At the same time, in endoscopic evacuation, the study obviates the need for two burr holes. It suggests that only a single burr hole of different sizes is adequate for removing such haematoma. Yadav YR et al., used an enlarged burr hole of 2.5 to 3cm at the appropriate place, the most curved part of the skull [15]. This bony opening was planned to offer a straight trajectory to the full length of the haematoma cavity [16]. The inner and outer table of the burr hole margin was also drilled to provide a straight trajectory to the haematoma cavity.

In the present study, SDD was used in 20 patients and did not notice any haematoma, cortical injury, or recurrences. SDD was inserted from the frontal burr hole under the vision, between the dura and the cortex (underneath the calvarium). SDD is near the cortical surface, bridging veins, and haematoma membranes may lead to iatrogenic injury of these structures and postoperative morbidity [17,18]. Some authors have advocated inserting Subperiosteal Drains (SPD), which are positioned between the periosteum and the calvarium, whereby intracranial bleeds and drains placed accidentally within the cortex or seizures can be averted [19]. Although the mortality and the complications of the SPD were lower than the SDD, the recurrence rate was higher in the SPD than the SDD in the Bellut D et al., report [18]. Soleman J et al., compared SDD and SPD after the burr hole evacuation of CSDH. They concluded that SPD insertion led to lower recurrence rates, fewer surgical infections, and lower drain misplacement rates. These findings suggest that SPD may be warranted in routine clinical practice [19].

Average hospital stay in this study was 4.95±1.05 days. Deng J et al., noticed that the patients in the neuroendoscopic treatment group had a shorter total hospital stay of 5.26±1.89 days [20]. Our study had no complications or additional risks of infection. Kale A et al., observed that increasing the duration of the drainage provided better results without increasing the risk of complication [21]. You W et al., observed that the longer duration of postoperative drainage was associated with a lower risk of recurrence [22].

Further research is to optimise patient selection and surgical technique, and a learning curve associated with the procedure.

Nonetheless, the study provides valuable insights into the outcomes of endoscopic management of CSDH and highlights the potential for its clinical utilisation.

Limitation(s)

Selection bias: The study only included patients who underwent endoscopic management of CSDH at a single centre. The sample size may not represent the general population of patients with this condition, and the results may not be generalisable to other centers.

Retrospective design: The study design may have limited the ability to control for confounding variables, and data may not have been collected in a standardised manner. Retrospective studies also rely on existing medical records, which may contain incomplete or inaccurate information.

Lack of control group: This study did not have a control group, which may limit the ability to draw conclusions about the effectiveness of endoscopic management compared to other treatments or no treatment.

Short follow-up period: The study had a relatively short follow-up period of six months, which may not capture long-term outcomes or complications associated with endoscopic management.

Small sample size: The sample size of this study may have limited the statistical power to detect significant differences in outcomes between subgroups of patients or between different treatment approaches.

CONCLUSION(S)

Headache was the most common presenting complaint, followed by forgetfulness and hemiparesis. Co-morbid conditions, such as hypertension and diabetes mellitus, were also observed in some patients. Using a burr hole at the most anterior part of the CSDH and inserting a SDD were effective techniques for evacuating the haematoma.

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