

Original Research

Outcome of Chronic Subdural Hematoma Evacuation in Association with Its Etiology

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ABSTRACT

Objective: To evaluate outcomes of the chronic subdural hematoma (cSDH) evacuation in association with its etiology at a tertiary care Hospital.

Materials & Methods: A prospective clinical cohort study was done at the Neurosurgery department of Pakistan Institute of Medical Sciences (PIMS) Islamabad. Diagnosed cases with cSDH, aged more than 18 years, both genders were scheduled for surgical evacuation by standard neurosurgical techniques as per indications, and Hospital protocols were incorporated. Postoperative CT scans of all patients were examined. Patients were followed for a minimum of 3 months post-surgery. Favorable outcomes were categorized as good recovery and moderate disability, while unfavorable outcomes included severe disability, persistent vegetative state, and death.

Results: There were 51 patients with cSDH, with a mean age of 69 years. Males were in majority 74.5% and females were 25.5%. The common causative factor was old age, in 33.3% of cases followed by Trauma 17.6%, old age combined with hypertension (11.8%), hypertension and anticoagulant (7.8%), followed by post-VP shunt (3.9%), and various combinations of old age, trauma, hypertension, anticoagulant use, and alcohol consumption. The good outcome was 92.2% improvement with a moderate disability 3.9%, and 3.9% died. Among patients, those with trauma and hypertension, and hypertension, anticoagulant, and alcohol consumption had worse outcomes, including one death in each group.

Conclusion: Overall, outcomes of chronic subdural hematoma evacuation were observed to be favorable. Only two patients died, both of whom had etiological factors such as trauma and hypertension, or hypertension, anticoagulant use, and alcohol consumption.

Keywords: Chronic subdural hematoma, Surgical Evacuation, Survival, Mortality.

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INTRODUCTION

Chronic subdural hematoma (cSDH) is an accumulation of blood, fluid, and blood breakdown products situated between the dura mater and the arachnoid membrane on the surface of the brain.^{1,2} Such a condition exerts compressive pressure on the brain, resulting in neurological deficits that vary based on the hematoma's size and location.¹ Its incidence is anticipated to rise substantially and is expected to be the most prevalent cranial disease amongst adults by 2030,^{3,4} largely due to the aging population. Treating patients with cSDH is generally challenging, with elevated incidences of readmission, considerable inpatient expenses, and rates of mortality ranging from 1.5% to 32%, according to patient demographics and comorbidities.^{3,5} Chronic subdural hematoma is among the most frequent neurosurgical conditions, with more than 160,000 cases reported annually in Europe and the United States.¹ The use of anticoagulants or antithrombotic drugs is considered an important iatrogenic factor.⁶ This condition can develop gradually over several weeks or days and could remain untreated for months or even up to a year. Clinical symptoms can range from being asymptomatic to a state of unconsciousness. The majority of the patients exhibit a GCS score of 12 or higher and do not experience loss of consciousness.^{6,7}

The etiology of chronic subdural hematoma (cSDH) involves various factors and mechanisms contributing to its formation and progression.^{8,9} While cSDH is generally thought Trauma is thought to be the etiology of almost half of cases that do not report a history of head injury. Besides trauma, the commonest causative factors contributing to the development of risks for, poor absorption, or cSDH recurrences include prolonged usage of the antiplatelet or the anticoagulant medications, repetitive or sudden increases in chest and the pressure of the abdomen, prior craniotomy, and hematological disorders.⁸ Although the exact mechanisms behind

the development and absorption of cSDH remain unclear. Numerous studies have investigated its pathogenesis, exploring factors for instance, hemorrhage from an avulsion of the pontine vein, raised osmotic pressure, hemorrhage within the capsule of hematoma, and local hyperfibrinolysis, while all these studies have been linked to the formation and progression of cSDH, the exact pathogenesis remains uncertain.⁸⁻¹¹

Managing cSDH includes either closed observations or surgical interventions.¹² Although the surgical procedure is relatively straightforward by neurosurgical standards, the postoperative progression may be complicated by various reasons such as the advanced age of individuals, multiple comorbidities, and the common use of antithrombotic medications, which increase the risk of recurrent bleeding.¹² Despite the rising incidence of cSDH, currently there is not sufficient evidence to guide patient management following surgical evacuation.¹³

The gold standard is the surgical evacuation for treating cSDH when typically performed, by craniotomy either twist drill or burr-hole trephination and drainage, with the application of irrigation or without it.¹⁴ This approach often leads to significant improvements in neurological conditions. Although cSDH is typically associated with a good prognosis, unfavorable results have been observed, particularly in older patients or those with a decreased preoperative Glasgow Coma Scale.^{14,15} With the aging population, the incidence of poor outcomes has been increasing. Thus, it is important to reassess the factors contributing to poor outcomes to determine the best management strategies for these high-risk patients.¹⁴ Therefore this study was aimed to evaluate the outcomes of chronic subdural hematoma evacuation concerning its etiology.

MATERIAL AND METHODS

Study Type, Setting, and Duration

A prospective clinical cohort study was carried out at the Department of Neurosurgery of PIMS,

Islamabad. A Non-Probability Purposive Sampling technique was used. The study was conducted over six months from June 2023 to December 2023. The study was done with CPSP approval Ref. No. (CPSP/REU/NSG-042-893).

Inclusion Criteria

Patients presented with the diagnosed cSDH based on computed tomography (CT) or magnetic resonance imaging (MRI), aged more than 18 years, both genders, and were scheduled for surgical evacuation by standard neurosurgical techniques as per indications, and hospital protocols were included.

Exclusion Criteria

All the cases presented those who were not fit for anesthesia and surgical intervention, patients with acute subdural hematoma or other intracranial pathologies were excluded.

Data Collection

The sample size of the 51 cases was determined based on the expected effect size, power, and level of significance, aimed to achieve satisfactory statistical power to detect clinically meaningful differences in consequences. Everyone who participated informed consent was obtained after providing detailed explanations and counseling regarding the purpose of the study and the confidentiality of their data, which was only to be used for research purposes.

Surgical Management

The preferred surgical approach to address chronic subdural hematomas (cSDH) was burr holes for slow evacuation and irrigation, associated with the continuous closed system drainage.

Post-surgical Management

Following surgery, Participants remained supine for 48 hours to promote the gravitational drainage of the leftover subdural fluid. Patients received

intravenous fluids for 2 to 4 days to promote brain expansion and were mobilized immediately as per feasibility. The control CT scan was performed before removing the drainage, or earlier if deemed clinically necessary. Post-surgery CT scans of all patients were examined, focusing on factors such as the maximum residual thickness of the hematoma, midline displacement, and the presence of residual air in the subdural cavity.

Follow up

All the cases underwent periodic assessments, with CT scans repeatedly done at the 6th week and 12th week post-discharge if residual collections were observed in the initial scan, or earlier if symptoms recurred. All patients in this cohort were followed for a minimum of 3 months post-surgery. Favorable results were defined as satisfactory recovery and moderate disabilities, while adverse consequences comprised severe disabilities, permanent vegetative state, and mortality. All of the data had been collected using a self-created Proforma.

Data Analysis

The data was submitted and evaluated using SPSS version 26. Statistical test One-way ANOVA was applied in context to determine the statistically significant differences in the mean Glasgow Coma Scale (GCS) scores among three outcome groups as good, improving with moderate disability and death, taking and p-value ≤ 0.05 as significant.

RESULTS

Age

The study included 51 patients with cSDH, with a mean age of 69.45 ± 16.45 years. The average duration of hematoma was 2.50 ± 1.27 months, and the mean GCS score at presentation was 12.94 ± 1.72 . The average lesion size was 94.50 ± 13.53 ml (Table 1).

Gender

Of the patients, 74.5% were males (n=38) and 25.5% were females (n=13). The right side was involved in 68.6% of cases (n=35), while the left side was involved in 31.4% (n=16) (**Table 1**).

Clinical Presentation

Regarding clinical presentation, 21.4% of patients presented with headaches alone, headache combined with extremity weakness was noted in 41.2%, and 9.8% had headache, extremity weakness, and sphincter dysfunction. Other combinations of symptoms were less common, with isolated presentations including headache with fits (2.0%, n=1), and extremity weakness alone (2.0%, n=1) (Table 1).

Etiology

According to the etiology, the most common cause was old age, in 33.3% (n=17) of cases. Trauma was responsible for 17.6% of cases, followed by old age combined with hypertension (11.8%), hypertension and anticoagulant use (7.8%), and combinations involving trauma, anticoagulants, and hypertension. Less common causes included post-VP shunt (3.9%), and various

combinations of old age, trauma, hypertension, anticoagulant use, and alcohol consumption, each contributing to smaller percentages as shown in Figure 1.

Operative Time

The overall mean operative time was 49.11 ± 22.53 minutes, the average volume of hematoma extracted was 94.50 ± 13.53 ml, and the estimated mean intraoperative blood loss was 18.11 ± 10.81 ml. In terms of overall outcomes, 92.2% (n=47) of patients had a good outcome, 3.9% (n=2) showed improvement with moderate disability, and 3.9% (n=2) unfortunately died (**Table 2**).

Outcome Association with Etiology

Among patients, those with trauma and hypertension, and hypertension, anticoagulant, and alcohol consumption had worse outcomes, including one death in each group. Additionally, patients with hypertension and alcohol consumption showed improvement with moderate disability (2 cases) (**Table 3**).

The mean GCS scores at presentation also correlated with outcomes as it was significantly lower among patients with adverse outcomes (mortality) (p=0.001) (**Table 4**).

Table 1: Patient's demographic and clinical characteristics (n=51).

Variables		Statistics	
The mean age of the patient		69.45±16.45 years	
The mean duration of hematoma		2.50±1.27 months	
Mean GCS score at presentation		12.94±1.72	
Mean lesion size		94.50±13.53 ml	
		Frequency	Percentage
Gender	Males	38	74.5
	Females	13	25.5
	Total	51	100.0
Side involved	Left	16	31.4
	Right	35	68.6
	Total	51	100.0
Clinical presentation	Headache	11	21.4
	Headache, fits, and vomiting	1	2.0
	Headache extremity weakness	21	41.2

Headache, weakness of the extremity, Sphincter dysfunction	5	9.8
Headache, weakness of the extremity, dysfunction of the Sphincter, changes in mentation, Memory loss, Fits	1	2.0
Headache, Extremity weakness, Sphincter dysfunction, Change in mentation, Fits, vomiting	1	2.0
Headache, weakness of the extremity, dysfunction of the Sphincter, Change in mentation, and vomiting	2	3.9
Headache, weakness of the extremity, dysfunction of the Sphincter	4	7.9
Headache, Extremity weakness, Change in mentation	1	2.0
Headache, Extremity weakness, FITs	3	5.9
Extremity weakness	1	2.0
Total	51	100.0

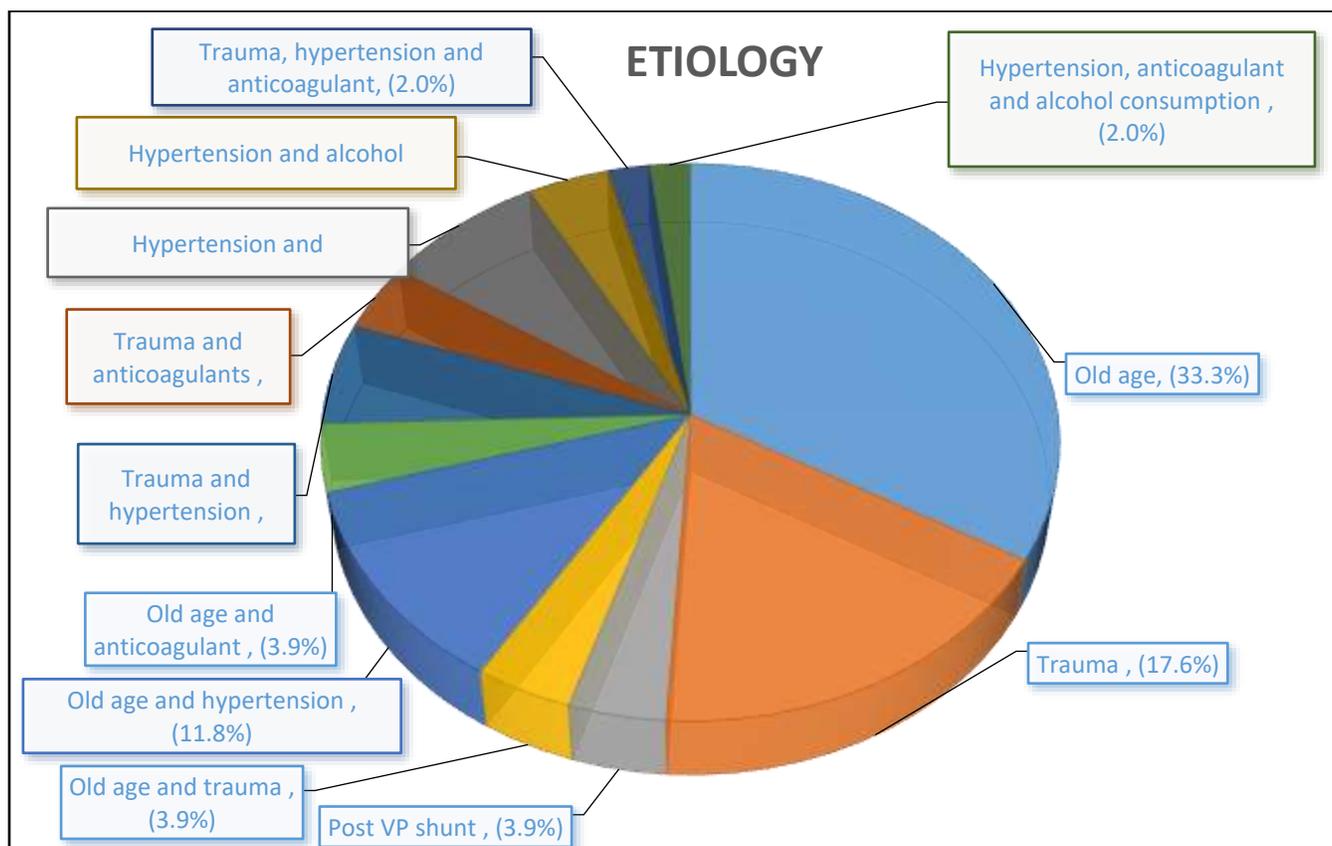


Figure 1: Etiology of chronic subdural hematoma (n=51).

Table 2: Operative and postoperative outcomes of the patients (n=51).		
Outcomes	Statistics	
Mean operative time	49.11±22.53 minutes	
Mean extract volume of hematoma	94.50±13.53 ml	
Estimated mean of intraoperative blood loss	18.11±10.81 ml	
Overall Outcomes	Good	47 92.2%
	Improving with moderate disability	2 3.9%
	Death	2 3.9%
	Total	51 100.0%

Table 3: Outcomes in association with etiology (n=51).

Variables	OUTCOMES		
	Good	Improving with Moderate Disability	Death
Old age	17	0	0
Trauma	9	0	0
Post VP shunt	2	0	0
Old age and trauma	2	0	0
Old age and hypertension	6	0	0
Old age and anticoagulant	2	0	0
Trauma and hypertension	2	0	1
Trauma and anticoagulants	2	0	0
Hypertension and anticoagulant	4	0	0
Hypertension and alcohol consumption	0	2	0
Trauma, hypertension, and anticoagulant	1	0	0
Hypertension, anticoagulant, and alcohol	0	0	1

Table 4: Mean GCS score according to outcomes (n=51).

Variables	OUTCOMES				
	Good	Improving with Moderate Disability	Death		
Mean GCS score	13.23±1.44	9.0±1.00	10.9±1.72		
One-way ANOVA					
	Sum of Squares	df	Mean Square	F	p-value
Between Groups	52.398	2	26.199	13.042	0.0001
Within Groups	96.426	48	2.009		
Total	148.824	50			

Between Groups: 2 (This corresponds to the number of groups minus one: 3 - 1 = 2)

Within Groups: 48 (The total number of observations minus the number of groups: 51 - 3 = 48)

Total: 50 (Total number of observations minus one: 51 - 1 = 50)

DISCUSSION

Chronic subdural hematoma is a type of intracerebral hemorrhage disease and a common neurosurgical condition that has a gradual onset and slow progression, leading to significant clinical consequences. However, due to the old age and underlying medical issues of patients, surgical treatment is often accompanied by numerous complications. This has been done on 51 cases of chronic subdural hematoma to evaluate outcomes of its evacuation in association with its etiology with an overall mean age of 69.45 ± 16.45 years and male predominance of 74.5% with a male-to-female ratio of approximately 2.92:1. Consistently, Filza F et al,¹⁹ reported that the age range of the of

their study population was between 18 to 80 years, with an average age of 54 years and among the 86 patients, 73 were males and 13 were females. In alignment with this study, Khan HU et al,¹² demonstrated that the patients' average age was 62 ± 13.694 years, and out of all their study participants males were in the majority 40(66.7%) and females were 20(33.3%). Males are predominance across the studies may be because males are more likely to engage in activities that increase the risk of head trauma, such as contact sports and physically demanding occupations and males also have a higher prevalence of certain health conditions and lifestyle factors, like consumption of alcohol and anticoagulant use,

which can contribute to the development of cSDH.

In this study, 21.4% of patients presented with headaches alone, 41.2% had headaches combined with extremity weakness, and 9.8% had headaches combined with weakness of the extremity and sphincter dysfunction. The commonest causative factor was old age (33.3%), followed by trauma (17.6%), old age combined with hypertension (11.8%), and hypertension with anticoagulant use (7.8%). Less common causes included post-VP shunt (3.9%) and various combinations of old age, trauma, hypertension, anticoagulant use, and alcohol consumption. In the comparison of this study, Khan HU et al,¹² reported that the predominant presenting symptom was headache 85%, drowsy state 15%, vomiting 80%, giddiness (73%), weakness of the limb, including right or left hemiparesis/ hemiplegia 51% and (34%). Furthermore, in alignment with this study, Sim YW et al,²⁰ observed that anticoagulants and antiplatelets have become increasingly significant as risk factors for chronic subdural hematoma (CSDH) in recent times compared to previous years. Conversely, factors such as head trauma, epilepsy, consumption of alcohol, and prior neurosurgical procedures were considered less significant. Therefore, they recommended that it is crucial for physicians to carefully prescribe these medications, weighing the potential risks against the benefits.²⁰

In this study, the mean operative time was approximately 49.11 minutes, with an average volume of extracted hematoma of 94.50 ml and an estimated mean intraoperative blood loss of 18.11 ml. Overall, 92.2% of patients showed a favorable outcome, while 3.9% showed improvement with moderate disability, and 3.9% of patients died. Additionally, combined trauma with hypertension and the combination of hypertension with anticoagulant therapy and alcohol consumption were significantly associated with mortality ($p < 0.001$). In the comparison to this study, Atefi N et al,²¹ found that peri-procedural mortality and morbidity rates were 11.8% and 19.6%

respectively. Additionally, they observed an overall recurrence rate of 22.55% and a mean total hospital stay of 10.6 days.²¹ In line with this research, Abdullah HM et al,²² found that the overall outcome of their study was favorable, while our patients experienced mild symptoms such as gait impairment or minor disturbances of consciousness, they maintained a good quality of life and only one patient has died caused by to cardiovascular failure. In this study, patients with poor outcomes had lower GCS scores. The finding seems consistent with the findings of another study by Amir S et al,²³ who observed that lower entrance GCS scores and advanced age are related to a lower frequency of positive outcomes and an increased risk of adverse outcomes. Several risk factors have been found as significant in the elderly, including a history of anticoagulant or antiplatelet medication and a higher incidence of falls.²⁴⁻²⁶ This group is more prone to recurrence and usually takes a longer duration to achieve radiological recovery.²⁴ Literature offers limited information regarding the outcomes of chronic subdural hematoma evacuation concerning its etiology. However, this study also faces several limitations, including a very small sample size and the retrospective addition of some data. Additionally, it is a single-center study. Consequently, while the study provides useful insights, its findings cannot be categorically endorsed for immediate implementation into clinical practice. Therefore, more validation through large-scale and longitudinal investigations is recommended. Such efforts would help to validate the study's findings and improve their application to clinical decision-making procedures.

CONCLUSION

As per the study conclusion, the overall outcomes of chronic subdural hematoma evacuation were observed to be favorable. Only two patients died, both of whom had complex etiological factors

such as trauma combined with hypertension or a combination of hypertension, anticoagulant use, and alcohol consumption. While these results are promising, they cannot be considered definitive due to the limited sample size. Further large-scale and longitudinal studies are recommended to validate these findings and provide more conclusive evidence on the outcomes of chronic subdural hematoma evacuation and its association with various etiological factors.

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Additional Information

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AUTHORS CONTRIBUTION

Sr. #	Author's Full name	Intellectual Contribution to Paper in Term of:
1.	Hamza Ejaz and Aisha Adalat	Conceptualization, data collection, first draft writing.
2.	Lal Rehman	Overall supervision and guidelines.
3.	Aisha Adalat, and M. Mujahid Sharif	Research administration, resources and materials for the study.
4.	Shafiq-Ur-Rehman Jamil	Literature review and manuscript writing.
5.	Kashif Ramooz	Data analysis.