



CLINICAL PROFILE AND SURGICAL OUTCOMES OF PATIENTS WITH CHRONIC SUBDURAL HEMATOMA

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ABSTRACT

Background: Chronic subdural hematoma (CSDH) is a common neurosurgical condition affecting elderly individuals. This study aimed to evaluate the clinical profile, surgical management and postoperative outcomes of patients with CSDH.

Materials and Methods: This observational study included 120 surgically treated patients with CSDH. Demographic characteristics, clinical presentation, radiological findings, surgical procedures, neurological recovery, complications and recurrence were evaluated.

Results: Most patients were older than 60 years (63.3%), and 71.7% were male. Headache (65.0%) and hemiparesis (51.7%) were the most common symptoms. Bilateral hematomas were present in 16.7%, and 46.7% had midline shift exceeding 5 mm. Single burr-hole evacuation was performed in 60.0%, while postoperative drainage was used in 90.0%. Neurological improvement occurred in 86.7% of patients. Hematoma recurrence was observed in 10.0%, repeat surgery was required in 8.3%, and mortality was 3.3%. No evaluated clinical or radiological parameter showed a statistically significant association with recurrence.

Conclusion: Surgical evacuation of CSDH was associated with favorable neurological recovery and low mortality. Appropriate surgical management and postoperative monitoring are essential for improving outcomes.

Keywords: Chronic subdural hematoma, burr-hole evacuation, neurological recovery, recurrence, surgical outcomes.

INTRODUCTION

Chronic subdural hematoma (CSDH) is a common neurosurgical condition characterized by the gradual accumulation of blood and its degradation products within the subdural space, usually following minor or unrecognized head trauma[1]. It predominantly affects elderly individuals,

particularly those aged above 70 years, owing to age-related cerebral atrophy and increased vulnerability of bridging veins to injury. The incidence of CSDH increases with advancing age and is further influenced by predisposing factors such as alcohol consumption, coagulation abnormalities and the use of antiplatelet or anticoagulant medications. Despite being a potentially treatable condition, CSDH remains an important cause of neurological morbidity, particularly among older patients with multiple comorbidities [2]. The pathophysiology of CSDH involves a combination of vascular injury, inflammation and recurrent microhemorrhage. Initial bleeding into the subdural space leads to the formation of hematoma membranes containing fragile neovascular structures. Repeated bleeding from these vessels, increased vascular permeability and enhanced fibrinolytic activity contribute to progressive hematoma enlargement. The resulting compression of underlying cerebral structures may produce neurological dysfunction of varying severity. These pathological mechanisms also contribute to the persistence and recurrence of hematoma following surgical evacuation [3,4]. The clinical presentation of CSDH is highly variable and often develops gradually over several weeks. Common manifestations include headache, hemiparesis, gait disturbances, altered sensorium, cognitive impairment, behavioral changes and seizures. Elderly patients may present with nonspecific symptoms such as confusion, memory disturbances or progressive functional decline, which can delay diagnosis. The severity of neurological impairment depends on hematoma size, location, associated mass effect and the patient's underlying neurological condition. Computed tomography (CT) of the brain remains the primary diagnostic modality, allowing assessment of hematoma density, thickness, laterality, midline shift and cerebral compression. Clinical and radiological evaluation plays an important role in determining the need for surgical intervention [5,6]. Surgical evacuation remains the preferred treatment for symptomatic CSDH, particularly in patients presenting with neurological deficits, progressive deterioration or significant mass effect. Various surgical techniques, including twist-drill craniostomy, burr-hole trephination and craniotomy, have been employed for hematoma evacuation. Among these, burr-hole trephination with closed-system drainage is widely practiced because of its technical simplicity, effectiveness and relatively low morbidity [7,8]. Although most patients demonstrate substantial neurological improvement following surgery, postoperative recurrence remains an important concern, with reported rates varying considerably across studies. Recurrence may necessitate repeat surgical intervention, prolong hospitalization and adversely affect functional recovery [9,10]. Surgical outcomes in patients with CSDH are influenced by several clinical, radiological and operative factors, including age, preoperative neurological status, associated comorbidities, hematoma characteristics and surgical technique. Postoperative neurological improvement, complications, recurrence, duration of hospitalization and mortality are important indicators of treatment effectiveness. Previous studies have demonstrated the beneficial role of postoperative drainage in reducing hematoma recurrence; however, considerable variation persists in clinical presentation and surgical outcomes across different patient populations [11,12]. A comprehensive evaluation of these parameters is therefore essential for improving patient management and identifying factors associated with unfavorable outcomes. The present study was undertaken to evaluate the clinical profile and surgical outcomes of patients with chronic subdural hematoma, with particular emphasis on presenting manifestations, radiological characteristics, postoperative neurological recovery, complications and recurrence.

MATERIALS AND METHODS

This was a hospital-based observational study conducted in the Department of surgery at Era's Lucknow Medical College and Hospital Lucknow. The study evaluated the clinical profile, radiological characteristics, surgical management and postoperative outcomes of patients diagnosed with chronic subdural hematoma (CSDH). A total of 120 patients diagnosed with chronic subdural hematoma who underwent surgical intervention were included in the study. Eligible patients were enrolled according to the predefined inclusion and exclusion criteria.

Study Duration: 18 months

Inclusion Criteria

Patients aged 18 years and above with a radiologically confirmed diagnosis of chronic subdural

hematoma who underwent surgical evacuation and had available clinical and postoperative outcome records were included in the study.

Exclusion Criteria

Patients with acute subdural hematoma, epidural hematoma, intracerebral hemorrhage, subdural empyema or other intracranial lesions requiring separate surgical management were excluded. Patients managed conservatively and those with incomplete essential clinical or surgical outcome data were also excluded.

Data Collection and Clinical Assessment

Demographic and clinical information, including age, sex, history of head trauma, presenting symptoms, duration of symptoms, associated comorbidities and history of antiplatelet or anticoagulant medication use, was recorded using a structured data collection proforma. Presenting manifestations such as headache, hemiparesis, altered sensorium, gait disturbances, seizures and cognitive impairment were documented. Neurological status at admission was assessed using the Glasgow Coma Scale (GCS), and the presence of focal neurological deficits was recorded.

Radiological Evaluation

All patients underwent preoperative computed tomography (CT) of the brain to confirm the diagnosis and assess hematoma characteristics. Radiological parameters included hematoma laterality, density, thickness, midline shift and associated mass effect. Hematomas were categorized as unilateral or bilateral and classified according to their CT density characteristics. Postoperative imaging findings were recorded when available to assess hematoma evacuation, residual collection and recurrence.

Surgical Management

Patients underwent surgical evacuation according to their clinical presentation, radiological findings and the treating neurosurgeon's assessment. The operative technique, including burr-hole evacuation, twist-drill craniostomy or craniotomy, was documented. In patients undergoing burr-hole evacuation, the use of irrigation and postoperative closed-system drainage was recorded. Intraoperative findings and procedure-related complications were also documented.

Postoperative Assessment and Outcome Measures

Patients were monitored postoperatively for neurological improvement, complications and hematoma recurrence. Neurological recovery was assessed through changes in GCS score, improvement in presenting symptoms and resolution of focal neurological deficits. Surgical outcomes included postoperative complications, requirement for repeat surgical intervention, duration of hospital stay and in-hospital mortality. Recurrence was defined as symptomatic reaccumulation of subdural hematoma confirmed by neuroimaging after initial surgical evacuation. Functional outcome at discharge was assessed using the Glasgow Outcome Scale (GOS), where documented.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS 16 statistical software. Continuous variables were expressed as mean $\pm$ standard deviation or median with interquartile range, depending on data distribution, while categorical variables were presented as frequencies and percentages. The Shapiro–Wilk test was used to assess normality. Comparisons between groups were performed using the independent samples t-test or Mann–Whitney U test for continuous variables and the Chi-square test or Fisher's exact test for categorical variables, as appropriate. Potential associations between clinical or radiological characteristics and surgical outcomes were evaluated using suitable statistical tests. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 120 patients with chronic subdural hematoma (CSDH) were included in the study. Most patients were aged >70 years (35.0%), followed by 61–70 years (28.3%), with male predominance (71.7%). A history of head trauma was reported in 68.3% of patients. Hypertension (40.0%) and diabetes mellitus (26.7%) were the most common comorbidities, while antiplatelet use, anticoagulant use and chronic alcohol consumption were reported in 21.7%, 11.7% and 20.0%, respectively (Table 1 and Figure 1). Headache was the most common presenting symptom (65.0%), followed by hemiparesis (51.7%), altered sensorium (36.7%) and gait disturbance (31.7%). Most patients had a

preoperative GCS score of 13–15 (63.3%), followed by 9–12 (26.7%) and 3–8 (10.0%). Symptom duration was predominantly 8–14 days (35.0%), followed by 15–30 days (28.3%) (Table 2 and Figure 2). Preoperative CT revealed left-sided hematoma in 45.0%, right-sided in 38.3% and bilateral involvement in 16.7%. Hypodense hematoma was most common (43.3%), followed by mixed-density (33.3%) and isodense hematoma (23.3%). Hematoma thickness >20 mm was observed in 31.7%, midline shift >5 mm in 46.7% and significant mass effect in 68.3% of patients (Table 3 and Figure 3). Single burr-hole evacuation was the most common surgical procedure (60.0%), followed by double burr-hole evacuation (30.0%) and craniotomy (10.0%). Postoperative drains were placed in 90.0% of patients, with drainage maintained for 25–48 hours in 63.0% of those receiving drains. Hospital stay was predominantly 6–10 days (48.3%), followed by ≤5 days (35.0%) (Table 4). Postoperative neurological improvement was observed in 86.7% of patients, while 8.3% remained unchanged and 5.0% deteriorated. Good recovery (GOS 5) was achieved in 68.3%, followed by moderate disability (18.3%) and severe disability (8.3%). Hematoma recurrence occurred in 10.0%, and repeat surgery was required in 8.3%. Common complications included pneumocephalus (8.3%), seizures (5.0%) and surgical site infection (3.3%). In-hospital mortality was 3.3% (Table 5). Among patients with recurrence, 83.3% were aged >60 years, 83.3% were male and 41.7% had a history of antiplatelet use. Bilateral hematoma (33.3% vs 14.8%; $p=0.114$), mixed-density hematoma (58.3% vs 30.6%; $p=0.182$), thickness >20 mm (50.0% vs 29.6%; $p=0.192$) and midline shift >5 mm (66.7% vs 44.4%; $p=0.222$) were more frequent in recurrent than non-recurrent cases. However, no clinical, radiological or surgical parameter showed a statistically significant association with recurrence (all $p>0.05$) (Table 6).

Table 1. Demographic Characteristics and Associated Risk Factors of Patients With Chronic Subdural Hematoma (N=120)

Parameter	Category	n (%)
Age (years)	≤40	8 (6.7)
	41–50	14 (11.7)
	51–60	22 (18.3)
	61–70	34 (28.3)
	>70	42 (35.0)
Sex	Male	86 (71.7)
	Female	34 (28.3)
History of head trauma	Present	82 (68.3)
	Absent	38 (31.7)
Hypertension	Present	48 (40.0)
Diabetes mellitus	Present	32 (26.7)
Antiplatelet use	Present	26 (21.7)
Anticoagulant use	Present	14 (11.7)
Chronic alcohol consumption	Present	24 (20.0)

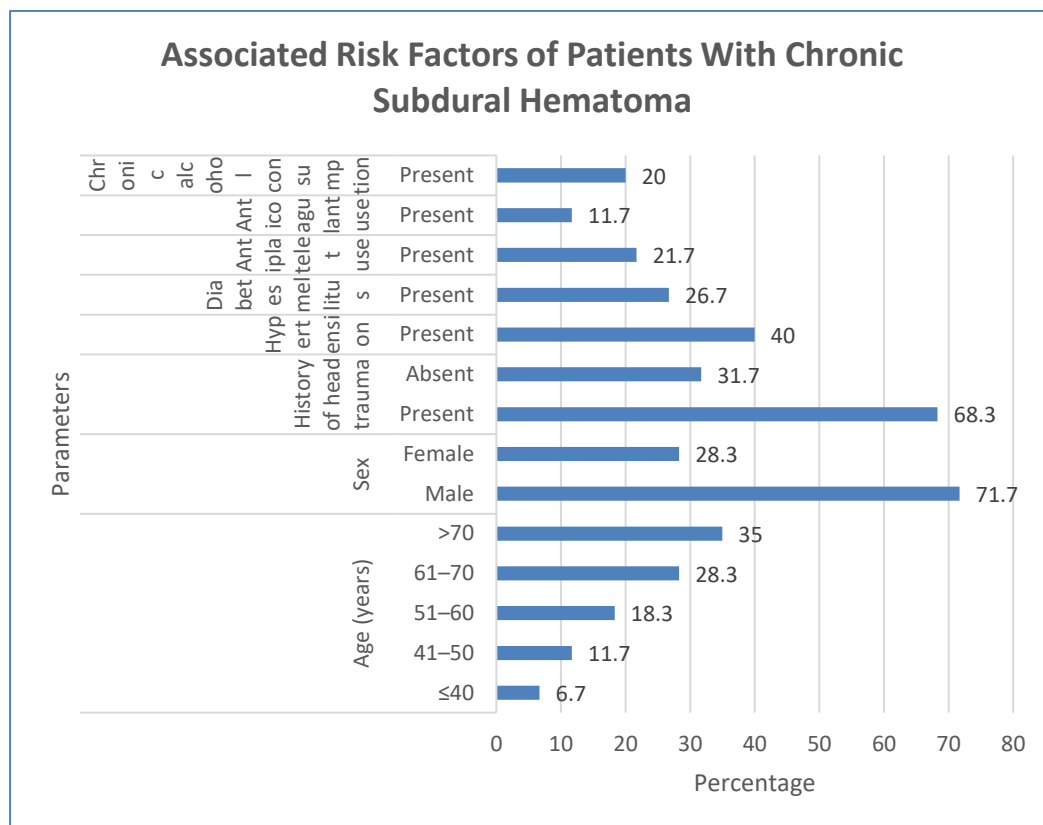


Figure 1. Demographic Characteristics and Associated Risk Factors of Patients With Chronic Subdural Hematoma (N=120)

Table 2. Clinical Presentation and Preoperative Neurological Status of Patients With Chronic Subdural Hematoma (N=120)

Parameter	Category	n (%)
Headache	Present	78 (65.0)
Hemiparesis	Present	62 (51.7)
Altered sensorium	Present	44 (36.7)
Gait disturbance	Present	38 (31.7)
Cognitive impairment	Present	32 (26.7)
Vomiting	Present	24 (20.0)
Seizures	Present	12 (10.0)
Preoperative GCS	13–15	76 (63.3)
	9–12	32 (26.7)
	3–8	12 (10.0)
Duration of symptoms	≤7 days	28 (23.3)
	8–14 days	42 (35.0)
	15–30 days	34 (28.3)
	>30 days	16 (13.3)

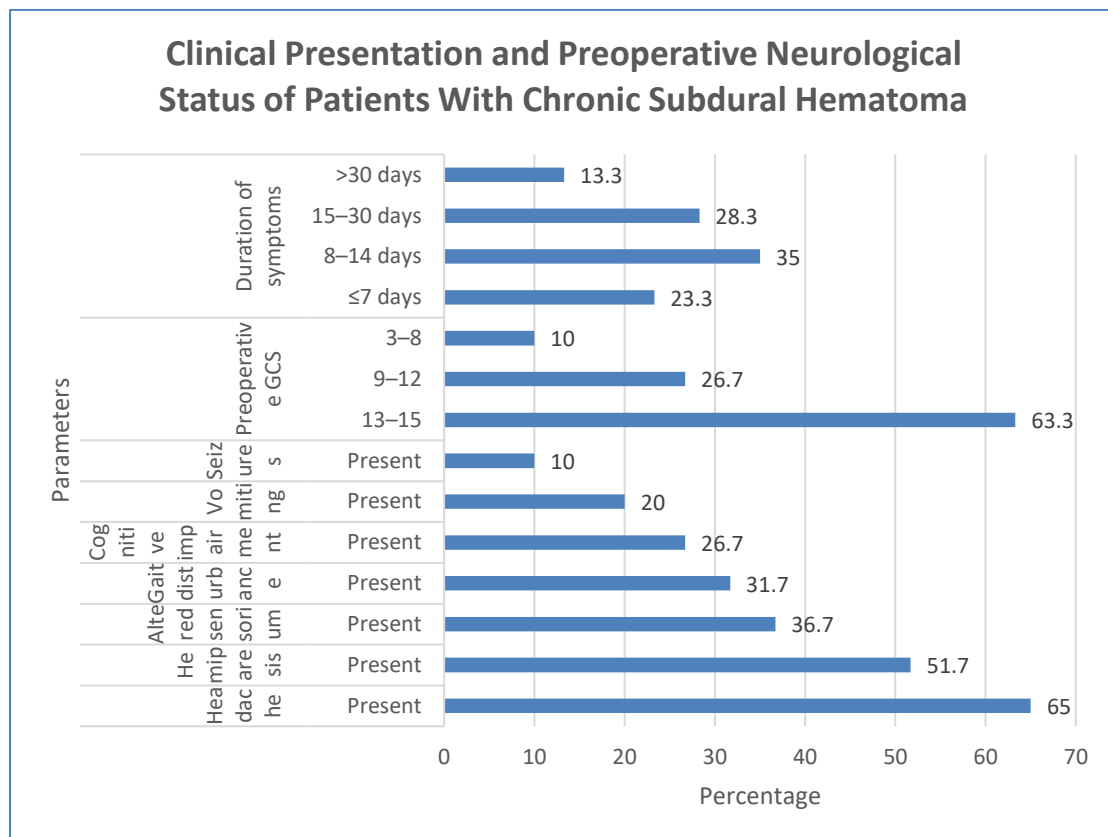


Figure 2. Clinical Presentation and Preoperative Neurological Status of Patients With Chronic Subdural Hematoma (N=120)

Table 3. Radiological Characteristics of Chronic Subdural Hematoma on Preoperative CT Brain (N=120)

Parameter	Category	n (%)
Hematoma laterality	Right-sided	46 (38.3)
	Left-sided	54 (45.0)
	Bilateral	20 (16.7)
Hematoma density	Hypodense	52 (43.3)
	Isodense	28 (23.3)
	Mixed density	40 (33.3)
Hematoma thickness	20 mm	38 (31.7)
Midline shift	No shift	22 (18.3)
	1–5 mm	42 (35.0)
	6–10 mm	38 (31.7)
	>10 mm	18 (15.0)
Significant mass effect	Present	82 (68.3)
	Absent	38 (31.7)

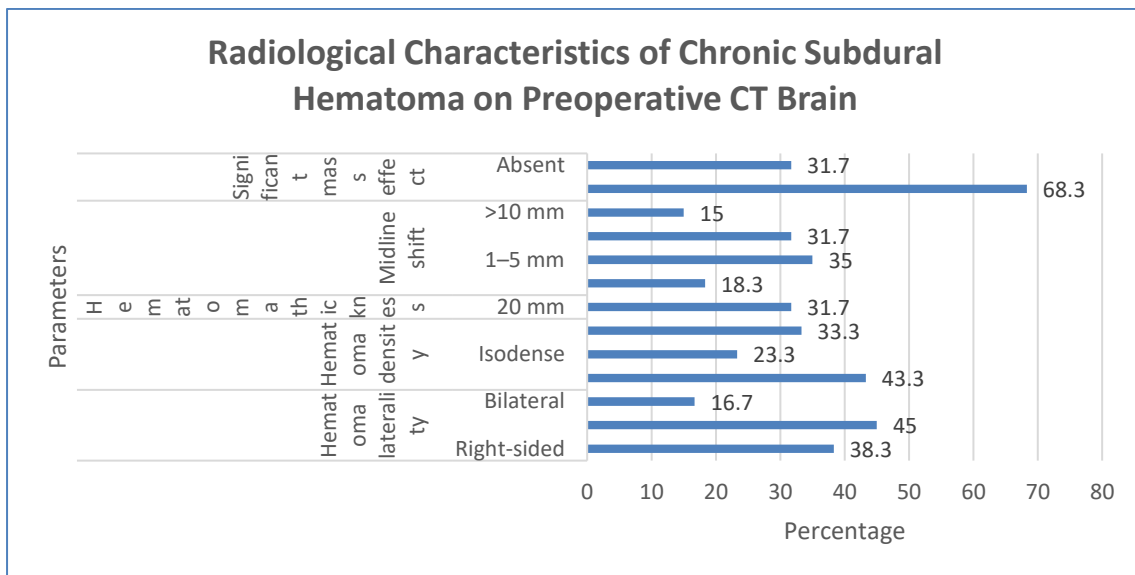


Figure 3. Radiological Characteristics of Chronic Subdural Hematoma on Preoperative CT Brain (N=120)

Table 4. Surgical Management and Perioperative Characteristics of Patients With Chronic Subdural Hematoma (N=120)

Parameter	Category	n (%)
Surgical procedure	Single burr-hole evacuation	72 (60.0)
	Double burr-hole evacuation	36 (30.0)
	Craniotomy	12 (10.0)
Postoperative drain placement	Yes	108 (90.0)
	No	12 (10.0)
Duration of drainage (n=108)	≤24 hours	22 (20.4)
	25–48 hours	68 (63.0)
	>48 hours	18 (16.7)
Duration of surgery	60 minutes	28 (23.3)
Hospital stay	≤5 days	42 (35.0)
	6–10 days	58 (48.3)
	>10 days	20 (16.7)

Table 5. Postoperative Neurological Recovery, Complications and Surgical Outcomes (N=120)

Parameter	Category	n (%)
Neurological status	Improved	104 (86.7)
	Unchanged	10 (8.3)
	Deteriorated	6 (5.0)
Glasgow Outcome Scale	Good recovery (GOS 5)	82 (68.3)
	Moderate disability (GOS 4)	22 (18.3)
	Severe disability (GOS 3)	10 (8.3)
	Vegetative state (GOS 2)	2 (1.7)
	Death (GOS 1)	4 (3.3)
Hematoma recurrence	Present	12 (10.0)
	Absent	108 (90.0)
Repeat surgical intervention	Required	10 (8.3)
	Not required	110 (91.7)
Pneumocephalus	Present	10 (8.3)

Postoperative seizures	Present	6 (5.0)
Surgical site infection	Present	4 (3.3)
Intracranial hemorrhage	Present	2 (1.7)
In-hospital mortality	Present	4 (3.3)

Table 6. Association of Clinical and Radiological Parameters With Postoperative Hematoma Recurrence (N=120)

Parameter	Category	Recurrence (n=12), n (%)	No recurrence (n=108), n (%)	p- value	Statistical test
Age	≤60 years	2 (16.7%)	42 (38.9%)	0.207	Fisher's exact
	>60 years	10 (83.3%)	66 (61.1%)		
Sex	Male	10 (83.3%)	76 (70.4%)	0.506	Fisher's exact
	Female	2 (16.7%)	32 (29.6%)		
History of head trauma	Present	8 (66.7%)	74 (68.5%)	1.000	Fisher's exact
	Absent	4 (33.3%)	34 (31.5%)		
Antiplatelet use	Present	5 (41.7%)	21 (19.4%)	0.131	Fisher's exact
	Absent	7 (58.3%)	87 (80.6%)		
Hematoma laterality	Unilateral	8 (66.7%)	92 (85.2%)	0.114	Fisher's exact
	Bilateral	4 (33.3%)	16 (14.8%)		
Hematoma density	Hypodense	3 (25.0%)	49 (45.4%)	0.182	Fisher– Freeman– Halton exact
	Isodense	2 (16.7%)	26 (24.1%)		
	Mixed density	7 (58.3%)	33 (30.6%)		
Hematoma thickness	≤20 mm	6 (50.0%)	76 (70.4%)	0.192	Fisher's exact
	>20 mm	6 (50.0%)	32 (29.6%)		
Midline shift	≤5 mm or absent	4 (33.3%)	60 (55.6%)	0.222	Fisher's exact
	>5 mm	8 (66.7%)	48 (44.4%)		
Surgical procedure	Single burr-hole	6 (50.0%)	66 (61.1%)	0.486	Fisher– Freeman– Halton exact
	Double burr-hole	4 (33.3%)	32 (29.6%)		
	Craniotomy	2 (16.7%)	10 (9.3%)		

DISCUSSION

In the present study, 63.3% of patients were older than 60 years, with the highest proportion aged above 70 years (35.0%). Male patients predominated (71.7%), and 68.3% had a history of head trauma. Hypertension (40.0%) and diabetes mellitus (26.7%) were the most common comorbidities. Torihashi et al. [13], in their study of 343 surgically treated patients, examined demographic and clinical predictors of recurrence and identified bilateral hematoma as an independent risk factor. Similarly, Yamamoto et al. [14] evaluated 105 patients and emphasized the importance of clinical and radiological characteristics in predicting postoperative recurrence. Headache was the most common presenting symptom (65.0%), followed by hemiparesis (51.7%), altered sensorium (36.7%) and gait disturbances (31.7%). Most patients (63.3%) had a preoperative Glasgow Coma Scale (GCS)

score of 13–15, while 10.0% presented with severe neurological impairment. Voelker [15] highlighted the importance of neurological status, symptom severity and hematoma characteristics in determining appropriate management. The predominance of patients with relatively preserved consciousness in the present study indicates that a substantial proportion presented before severe neurological deterioration. Left-sided hematoma was observed in 45.0% of patients, followed by right-sided (38.3%) and bilateral hematoma (16.7%). Hypodense collections were most common (43.3%), while 31.7% had hematoma thickness greater than 20 mm and 46.7% had midline shift exceeding 5 mm. Torihashi et al. [13] reported a recurrence rate of 17.8% among 343 patients and identified bilateral hematoma as an independent predictor. In the present study, recurrence occurred in 20.0% of patients with bilateral hematomas compared with 8.0% with unilateral hematomas ($p=0.114$). Yamamoto et al. [14] identified hematoma width as an independent predictor of recurrence, supporting the clinical importance of hematoma dimensions. Single burr-hole evacuation was performed in 60.0% of patients, double burr-hole evacuation in 30.0% and craniotomy in 10.0%. Postoperative drainage was employed in 90.0%, most commonly for 25–48 hours (63.0% of drained patients). Yu et al. [16], in a study involving 97 patients and 121 hematomas, reported an overall recurrence rate of 6.6%. Recurrence was significantly higher with drainage lasting less than three days (16.3%) than with drainage for three days or longer (1.3%). These findings suggest that drainage duration may influence postoperative recurrence, although this association was not separately evaluated in the present study. Postoperative neurological improvement was observed in 86.7% of patients, while 8.3% remained unchanged and 5.0% deteriorated. Good recovery (GOS 5) was achieved in 68.3%, and moderate disability (GOS 4) was observed in 18.3%, resulting in favorable functional outcomes in 86.7%. Weigel et al. [17] evaluated 438 surgically treated patients, with 310 included in their final analysis, and assessed neurological outcomes using the Markwalder grading system. Their study emphasized the importance of neurological assessment and postoperative recurrence in evaluating surgical management. The favorable outcomes in the present study indicate substantial neurological improvement following hematoma evacuation. Postoperative recurrence occurred in 12 patients (10.0%), and 10 patients (8.3%) required repeat surgical intervention. Torihashi et al. [13] reported recurrence in 61 of 343 patients (17.8%), whereas Yamamoto et al. [14] reported recurrence in 11 of 105 patients (10.5%). Yu et al. [16] documented a lower recurrence rate of 6.6%. Weigel et al. [17] observed significantly lower recurrence among patients receiving angiotensin-converting enzyme inhibitors (4.9%) than among those not receiving these medications (18.3%; $p=0.00345$). Recurrence was more frequent among patients aged above 60 years (13.2%), those receiving antiplatelet medications (19.2%), patients with bilateral hematomas (20.0%) and those with mixed-density collections (17.5%). Recurrence was also higher among patients with hematoma thickness greater than 20 mm (15.8%) and midline shift greater than 5 mm (14.3%). However, none of these associations was statistically significant in the provisional analysis ($p>0.05$). Torihashi et al. [13] identified bilateral hematoma as an independent predictor of recurrence, while Yamamoto et al. [14] identified hematoma width, seizure history and other clinical characteristics as significant predictors. These findings suggest that recurrence may be influenced by multiple interacting factors. The most common postoperative complication was recurrent hematoma (10.0%), followed by pneumocephalus (8.3%), seizures (5.0%), surgical site infection (3.3%) and intracranial hemorrhage (1.7%). In-hospital mortality was 3.3%. Yu et al. [16] investigated the influence of postoperative intracapsular air and drainage duration on recurrence, reporting that prolonged drainage was associated with reduced recurrence without an observed increase in infection frequency. These findings highlight the importance of postoperative monitoring and appropriate drainage management.

CONCLUSION

The present study demonstrated that chronic subdural hematoma predominantly affected elderly males, with headache and hemiparesis being the most common presenting symptoms. Surgical evacuation resulted in favorable neurological outcomes in 86.7% of patients, with a postoperative recurrence rate of 10.0% and mortality of 3.3%. Although recurrence was proportionally higher among patients with advanced age, bilateral hematomas, mixed-density collections and greater

midline shift, none of these factors showed a statistically significant association with recurrence.

LIMITATIONS

The study was limited by its relatively small sample size, particularly the low number of recurrence events, which restricted the statistical power to identify significant predictors of recurrence. The absence of long-term follow-up and detailed multivariable analysis limited the assessment of delayed recurrence and independent prognostic factors.

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