Original Article

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Factors Causing for Recurrence of Chronic Sub Dural Hematoma after Burr Hole Craniotomy and Evacuation

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Author`s Contribution

[1]Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work, [2]Supervision, [3]Drafting the work or revising it critically for important intellectual content

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ABSTRACT

Objective: To determine the incidence of recurrence of Chronic Sub Dural Hematoma (CSDH) and its associated factors at a tertiary care Hospital.

Methodology: This cross-sectional observational study was conducted at Neurosurgery department at Pakistan Institute of Medical Sciences (PIMS), Islamabad, from February 2024 to October 2024. Patients aged 18 years and above, both genders, underwent diagnosed with CSDH confirmed by imaging (CT or MRI) and drained with burr hole craniotomy and evacuation were included. All patients undergoing burr hole craniotomy and evacuation for the drainage of chronic subdural hematoma (CSDH), (a neurosurgical technique involves creating two or more burr holes in the cranium, through which the dura mater is carefully elevated to access the subdural space. Following this, all the patients were followed during the post-operative period till discharge for recurrent CSDH. All the demographic information, including recurrences and risk factors was entered and analyzed using SPSS version 26.

Results: The study included 145 patients, with an overall mean age of 62.59 years, the majority being male (83.4%). The primary underlying cause was trauma, affecting 69.7% of the patients. The overall recurrence rate of hematoma was 12.4%, with approximately half of the cases occurring within two weeks postoperatively. Male gender was a significant risk factor, with 12 of 18 recurrent cases occurring in males compared to 6 in females (p = 0.041). Bilateral hematomas were also significantly associated with recurrence, as 6 of 7 patients with bilateral involvement experienced recurrence (p = 0.001). Hematoma thickness and midline shift were statistically significant predictors, as all 18 recurrent cases had a thickness >15 mm and a midline shift >10 mm (p = 0.001). Regarding drain tube management, 13 of 18 patients whose drains were removed within 24 hours experienced recurrence.

Conclusion: Recurrences of chronic subdural hematoma observed to be the 12.40%. Male gender, bilateral hematoma, mixed density hematoma, thickness and midline shift were found to be the causative factors for recurrences.

Keywords: CSDH, incidence, recurrence.

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Introduction

Intracranial Hemorrhage is one of the life-threatening injuries. There are different types of Intracranial Hemorrhage such as Epidural hematoma, Sub-Dural hemorrhage, Sub-Arachnoid hemorrhage and Intra-parenchymal hemorrhage.[1,2] Sub-Dural Hematoma is collection of blood in the sub dural space and it affects people of different age group. It can present immediately after major trauma or in case of minor trauma after a period of days to weeks. This late presentation is particularly common among elderly patients who suffer trivial un noticed trauma. Depending upon the time frame of presentation; Sub-Dural Hematoma can be classified as acute, sub-acute or chronic. Chronic Subdural Hematoma (CSDH) frequently impacts the elderly population (those over 65 years old).[3] Its overall incidence, which ranges from 1.72 to 20.6 per 100,000 people annually, is on the rise due to the growing number of older adults and the extensive use of antiplatelet and

anticoagulant medications.[3,4] A chronic subdural hematoma is characterized by an accumulation of old blood and degraded blood products in the subdural space.

This collection can enlarge significantly, driven by inflammatory and angiogenetic factors, leading to brain compression and subsequent symptoms.[5,6] Typical symptoms of CSDH include focal neurological deficits, changes in mental state, and signs of increased intracranial pressure, such as headache, reduced consciousness, and in and in severe instances, death as well.[5] Management of Sub-Dural Hematoma involves resuscitation of the patient presenting to the hospital, managing and coagulation abnormalities and neurosurgical intervention. Studies investigates the best therapeutic approaches for CSDH, focusing on complications, neurological outcomes and the rates of recurrences.[7] Conversely the effective management of CSDH is becoming increasingly crucial. Currently, CSDH is mainly treated through surgical evacuation via burr hole craniotomy,[8] which is commonly performed in which burr holes are created in cranial cavity followed by evacuation of hematoma. However, recurrence after this procedure is common, often necessitating repeated surgical interventions.[8,9] Different studies found different recurrences rate. According to a recent study it was found that 32% of the patients suffered from recurrence with large size hematoma, decreasing internal organization and sedimented hematomas had greater recurrence rates.[10] In another study recurrence rate was found to be 16.7% with internal architecture and heterogenous density, hypertension, diabetes mellitus and bilateral hematomas were found to be predictors of recurrence.[11]

In another study recurrence rate of 10% was observed.[12] On the other hand various studies have identified different risk factors associated with the recurrence of chronic subdural hematoma (CSDH). For instance, Kim SU identified diabetes mellitus, anticoagulation, headache, and preoperative midline shifting as independent predictors of recurrence.[13] Another study highlighted the presence of acute blood on top of chronic fluid (mixed density) as a risk factor for recurrence within the first month postoperatively.[14] Additionally, a previous national study noted a direct correlation between age and brain re-expansion after surgery.[15] Given the conflicting findings and the lack of sufficient local data, this study has been done to evaluate the recurrence rate of chronic subdural hematoma and its associated factors.

Methodology

This cross-sectional observational study was conducted at Neurosurgery department at Pakistan Institute of Medical Sciences (PIMS), Islamabad, from February 2024 to October 2024. After study protocol reviewed and approved by the institutional review board committee of PIMS Ref no. F-5-2/2024(ERRB)/PIMS. A total 145 sample size was calculated by WHO formula, using proportion (CSDH recurrence after burr hole evacuation 10.77%) with 95% confidential level and 5% margin of error. All patients aged 18 years and above of both genders, diagnosed with chronic subdural hematoma (CSDH) confirmed by imaging (CT or MRI), and treated with burr hole craniotomy and evacuation were included in the study. Patients with acute subdural hematoma, intraoperative complications, CSDH resulting directly from high-impact trauma or severe head injury, concurrent neurosurgical conditions affecting outcomes, cardiac patients requiring postoperative antiplatelet therapy, or any other pathology mandating postoperative antiplatelet or anticoagulant therapy were excluded. Patients who declined to participate were also excluded.

A simple consecutive convenient sampling technique was used. Prior to participation, all patients were provided with a detailed explanation of the study's aims and objectives, and written informed consent was obtained, ensuring confidentiality of their information.

All patients underwent burr hole craniotomy and evacuation for drainage of CSDH, a neurosurgical procedure involving the creation of two or more burr holes in the cranium, through which the dura mater is carefully elevated to access the subdural space. During the procedure, accumulated blood in the subdural space was irrigated and removed to alleviate intracranial pressure and associated symptoms. Patients were followed throughout the postoperative period until discharge to monitor for recurrence of CSDH.

All demographic data, recurrence outcomes, and potential risk factors were recorded and analyzed using SPSS version 26.

Results

This study involved 145 patients, with an overall mean age of 62.59 years with the majority being male (83.4%) and (16.6%) were females. The primary underlying cause of their condition was trauma, affecting 69.7% of the patients. Most of the patients had unilateral hematomas (95.2%), with only 4.8% having bilateral hematomas. Out

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of all 62.1% patients were hypertensive, diabetes was (22.8%), liver disease was in (13.1%), and (5.5%) cases had renal impairment. Regarding the types of hematomas, 31.0% had mixed density hematomas, 64.1% had iso dense hematomas, and 2.8% had hyperdense hematomas. In 13.8% patients having no drain placement, 23.4% having the drain removed before 24 hours, and in 62.8% patients drain removal time was > 24 hours. Most patients (97.9%) had hematomas thicker than 15mm, and nearly all (99.3%) had a midline shift greater than 10mm. Table I

Table I: Demographic and clinical characteristics of the patients. (n=145)

Study variables		N	%
Gender	Male	121	83.4%
	Female	24	16.6%
Underlying cause	Trauma	101	69.7%
	Spontaneous	44	30.3%
Hematoma	Unilateral	138	95.2%
	Bilateral	07	4.8%
Comorbidities	Hypertension	90	62.1%
	Diabetes	33	22.8%
	Liver disease	19	13.1%
	Renal disease	8	5.5%
Types of hematoma	Mixed density hematoma	45	31.0%
	Iso dense hematoma	93	64.1%
	Hyperdense hematoma	4	2.8%
Drain tube removal	No drain placement	20	13.8%
	<24 hours	34	23.4%
	>24hours	91	62.8%
Thickness	<15mm	3	2.1%
	>15mm	142	97.9%
Midline shift	<10mm	1	0.7%
	>10mm	144	99.3%
Age		62.59±12.03 years	
Duration of surgery		48.34±16.44 minutes	

Overall recurrence rate of hematoma was 12.40%. Regarding the postoperative duration in which the recurrence occurred, half of the patients developed a hematoma during 2 weeks postoperatively. Additionally, 27.8% experienced recurrence after 1 month, 11.1% after 1 week, with one case occurring at 2 months and another at 6 months. (Figure 1 and 2)

In terms to the analysis of risk factors for recurrent hematoma among 145 patients, gender was a significant factor, with males showing a higher recurrence (12 cases) compared to females (6 cases) out of 18 (p=0.041). Bilateral hematomas were significantly associated with recurrence, as 6 out of 7 patients with bilateral hematomas experienced recurrence, (p=0.001). Thickness and midline shift were statistically significant, as all 18 recurrent cases had thickness >15mm and midline shift >10mm (p=0.001). Drain tube removal timing was also significant; 13 out of 18 patients with drains removed in less than 24 hours had recurrence, while only 1 out of 81 with drains removed after 24 hours had recurrence (p=0.001). Although patients age and comorbidities did not show significant association with recurrences (p= >0.05). (Table II**)**

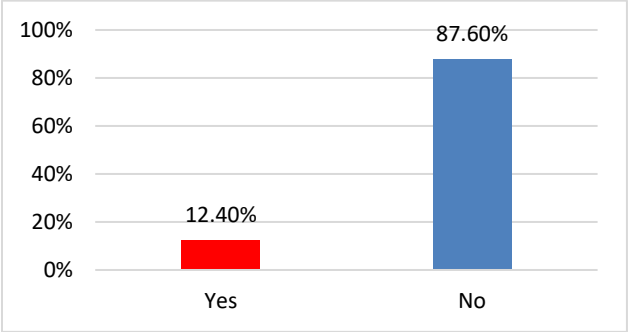

Figure 1. Frequency of recurrences of hematoma. (n=145)

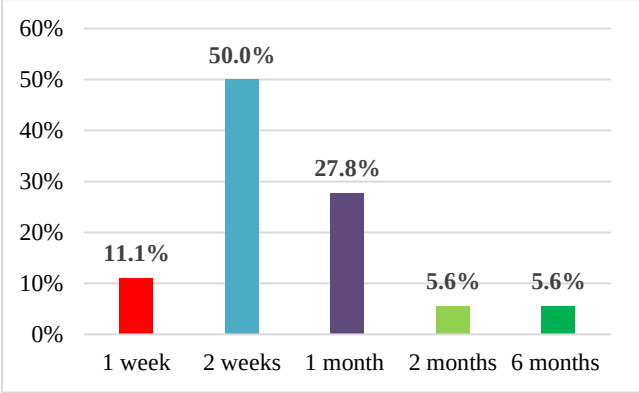

Figure 2. Post-operative duration on which recurrence of hematoma occurred. (n=18)

Table II: Risk factors of recurrent hematoma. (n=145)

Factors		RECURRENT HEMATOMA		Total	P-value
		Yes	No		
Age	40-60 years	9	76	85	0.427
	61-80 0r >80 years	9	51	60	
Gender	Male	12	109	121	0.041
	Female	6	18	24	
Hematoma	Bilateral	6	1	7	0.001
	Unilateral	12	126	138	
Hypertension	Yes	4	86	90	0.001
	No	14	41	55	
Diabetes	Yes	4	29	33	0.954
	No	14	98	112	
Liver disease	Yes	2	17	19	0.798
	No	16	110	126	
Renal disease	yes	1	7	8	0.994
	No	17	120	137	
Mixed density hematoma	Yes	9	36	45	0.063
	No	9	91	100	
Thickness	<15mm	0	3	3	0.001
	>15mm	18	124	142	
	<10mm	0	1	1	0.001

Midline shift	>10mm	18	126	144	
Drain tube removal	<24 hours	13	21	34	0.001
	>24hours	1	90	91	
	No drain placement	4	16	20	

Discussion

Chronic subdural hematoma (CSDH) is a common form of intracranial hemorrhage, although its underlying pathogenic mechanisms are not yet fully understood.[16] This study included 145 patients to evaluate the incidence of CSDH recurrence and its associated factors, with a mean age of 62.59 years and a predominance of male patients (83.4%). These findings are consistent with Chen FM et al.[16] who reported a mean patient age of 69 years, with the majority being male (79 of 102 patients). Similarly, the results align with Sioutas GS et al.[17] who reported an average patient age of 70.1 years, with 64.6% male and 29.7% female patients.

In another study by Zolfaghari S et al[18] also found males in majority 68.2% and females were 31.8%, with an overall mean age of 75 years. Male predominance may because of they are generally more likely to engage in outdoor activities and occupations that put them at higher risk for head injuries, such as contact sports, physical labor, and high-risk behaviors, which can lead to the development of CSDH, as in this study the primary underlying cause of their condition was trauma, affecting 69.7% of the patients and most of the patients had unilateral hematomas (95.2%). In aligns to this study Nouri A et al[19] reported that head trauma, the use of antithrombotic medications, and craniocerebral disproportion all elevate the risk of developing chronic subdural hematoma. On the other hand, Kim YI et al[20] also reported that the leading cause of CSDH was head trauma, affecting 187 (76.0%) individuals.

In this study, the overall recurrence rate of chronic subdural hematoma (CSDH) was 12.4%, which is comparable to the findings of Oh HJ et al[21] who reported recurrence in 8 of their cases (12%). In contrast, Qian Z et al.[22] observed a slightly higher recurrence rate of 16.1% (39 patients), while Cofano F et al.[12] reported a recurrence rate of 10%. Our results also align with Song DH et al[11] who reported a recurrence rate of 16.7%, with internal architecture, heterogeneous hematoma density, hypertension, diabetes mellitus, and bilateral hematomas identified as predictors of recurrence.

In the present study, analysis of risk factors among the 145 patients indicated that male gender was significantly associated with recurrence, with 12 of 18 recurrent cases occurring in males compared to 6 in females (p = 0.041). Bilateral hematomas were also significantly linked to recurrence, as 6 of 7 patients with bilateral involvement experienced recurrence (p = 0.001). Thickness and midline shift were statistically significant, as all 18 recurrent cases had thickness >15mm and midline shift >10mm (p=0.001). Drain tube removal timing was also significant; 13 out of 18 patients with drains removed in less than 24 hours had recurrence, while only 1 out of 81 with drains removed after 24 hours had recurrence (p=0.001). Although patients age and comorbidities did not show significant association with recurrences (p= >0.05). In aligns to this study Qian Z et [22] reported that the mixed density hematomas, advanced age and midline shift, were the independent causative factors for recurrence of the unilateral CSDH. In the comparison of this study Oh HJ et al[21] reported that the thick hematomas were the significant factor for recurrences. Additionally, according to a study by EFNS M et al[14] highlighted that the presence of acute blood on top of chronic fluid (mixed density) was a significant risk factor for recurrence within the first month postoperatively. However inconsistently Kim SU et al[13] identified diabetes mellitus, anticoagulation, headache, and preoperative midline shift as independent predictors of recurrence. Our findings were almost similar to other studies in terms of recurrence rate of CSDH, while the findings noted with some difference with other studies in terms of causative factors of CSHD. These discrepancies may be attributed to the fact that most studies, including ours, analyzed the risk factors for recurrence in a relatively small number of cases. Typically, after determining the prevalence of recurrent CSDH, only a limited number of cases were further analyzed to identify causative factors. Consequently, the results from such small sample sizes are likely to vary across different studies. Given this significant limitation, we believe that the findings remain controversial. Therefore, we recommend that further comprehensive, large-scale, and multicenter studies be conducted with larger sample sizes specifically focusing on cases with recurrences. This approach would provide more valuable insights into the causative factors for CSDH recurrence.

Conclusion

The recurrence rate of chronic subdural hematoma (CSDH) in this study was 12.4%. Analysis suggested that factors such as male gender, bilateral hematoma, mixed-density hematoma, increased hematoma thickness, and

significant midline shift may contribute to recurrence. However, these findings should be interpreted with caution due to the limited number of recurrent cases, which may affect the reliability of the identified risk factors. Therefore, further large-scale, longitudinal studies focusing specifically on patients with recurrent CSDH are warranted to validate these observations.

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