Original Article

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

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Author`s Contribution

[1,2]Substantial contributions to the conception or design of the work; or the acquisition, [4,6]Active participation in active methodology, [2,3]analysis, or interpretation of data for the work, [5]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: Study involved 145 patients, with an overall mean age of 62.59 years with the majority being male (83.4%). Primary underlying cause was trauma, affecting 69.7% of the patients. Overall recurrence rate of hematoma was 12.40% and half of the patients it developed approximately during 2 weeks postoperatively. Male gender was a significant factor, with 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 (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). In terms to drain tube removal timing 13 out of 18 patients with drains removed in < 24 hours had 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, recurrences, factors,

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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, after study protocol reviewed and approved by the institutional review board committee of PIMS. Duration of study was six months from February 2024 to October 2024. 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 the 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. Patients with acute Sub-Dural Hematoma or intraoperative complications, CSDH resulting directly from high-impact trauma or severe head injury, concurrent neurosurgical conditions affecting outcomes, cardiac patients requiring antiplatelet therapy in the post-operative period or any other pathology mandating anti-platelet or anti-coagulant therapy in the post-operative period and patients who were denying to participate in the study were excluded. Simple convenient consecutive sampling technique was used. Prior to their participation in the study, patients were provided with a comprehensive explanation of the study's aims and objectives. Written informed consent was obtained from each patient, ensuring that their information would be kept confidential. 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 (the accumulated blood in the subdural space is irrigated and removed to alleviate pressure and symptoms). All the demographic information, including recurrences and risk factors was entered 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 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 1**

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

Study variables		Frequency	%
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)

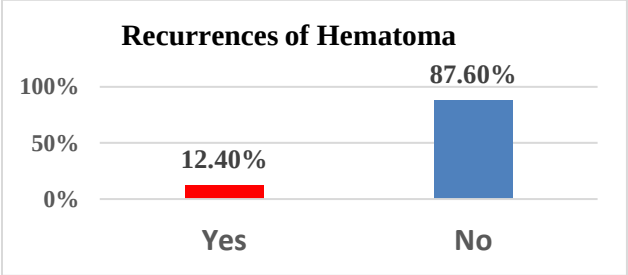

Figure 1: Frequency of recurrences of hematoma n=145

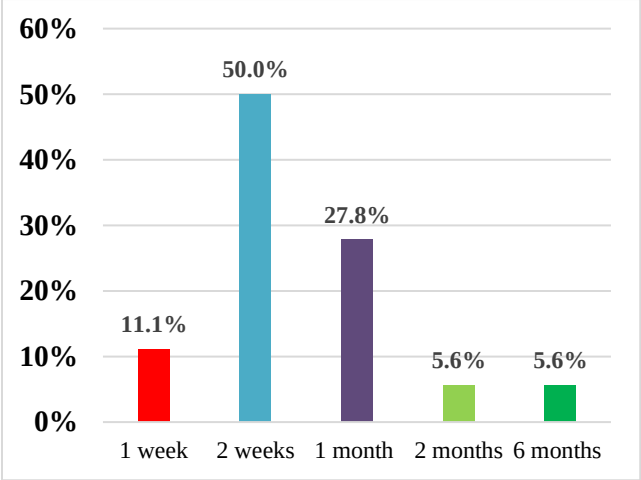

Figure 2: Post-operative duration on which recurrence of hematoma occurred. (n=18)

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**)**

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	
Midline shift	<10mm	0	1	1	0.001
	>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 prevalent form of intracranial hemorrhage, though its underlying pathogenic mechanism is still not well understood.[16] This study has been done on 145 patients to observe the incidence of recurrence of Chronic Sub Dural Hematoma (CSDH) and its associated factors, with an average age of 62.59 years and male predominance 83.4%. Consistently Chen FM et al[16] reported that the mean age pf the patients with CSDH was 69 years and majority of males (79 out of 102). Our findings reading age and gender were also supported by the Sioutas GS et al[17] where patient's average age was 70.1 years, males were 64.6 % and females were 29.7%.

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 overall recurrence rate of hematoma was 12.40% and these findings were almost similar to the study by Oh HJ et al[21] where they found recurrences of CSDH in 8(12%) of the cases. However, Qian Z et [22] found slightly higher rate of recurrences among 39(16.1%) patients. Study by Cofano F et al observed a recurrence rate of 10%.[12] Our findings align with those of Song DH et al[11], who reported a recurrence rate of 16.7% associated with internal architecture and heterogeneous density, as well as with hypertension, diabetes mellitus, and bilateral hematomas being identified as predictors of recurrence. Furthermore, in this study 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). 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

Recurrences of chronic subdural hematoma (CSDH) were found to be 12.40% in this study. The analysis identified several factors contributing to these recurrences, including male gender, bilateral hematoma, mixed density hematoma, increased hematoma thickness, and significant midline shift. The findings cannot be considered conclusive due to the limited number of recurrence cases, which may influence the identified causative factors. Therefore, further comprehensive longitudinal studies focusing specifically on patients with recurrent CSDH are recommended to prove these findings.

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