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Original Article

Comparison of One vs. Two Burr Hole Craniostomy in Chronic Subdural Hematoma Recurrence

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ABSTRACT

Introduction/Objective: Chronic subdural hematoma (CSDH) is most frequent neurosurgical conditions. To find the recurrence rate of chronic subdural hematoma in patients who underwent one vs. two burr craniostomy.

Material And Methods: A randomized controlled trial was conducted at the Neurosurgery department, Ayub Teaching Hospital, Abbottabad. In the current study, a total of 76 (38 in each group) patients were observed. ASA-I, ASA-II, ASA III patients, symptomatic radiologically proven Chronic subdural hematoma. Patients were randomly allocated into two groups of 38 patients each. randomization with blocks. Group A was treated with intraoperative epidural methylprednisolone while Group B was treated with normal saline only. Clinical information was recorded on a pre-designed proforma.

Results: Mean age was 54 years in group A, and 56 years in group B. In group A, 74% were male and 26% of patients were female. In Group B, 76% were male and 24% were female. The group A, 5% of patients had recurrence while in Group B, 13% of patients had a recurrence. There existed a significant difference between effectiveness and not-effectiveness of one/two burr hole craniostomy among patients who were less than 40 years.

Conclusion: The recurrence rate of chronic subdural hematoma is higher in patients undergoing two burr hole craniostomy as compared to one burr craniostomy.

Keywords: Recurrence Rate, One/Two Burr Hole Craniostomy, Chronic Subdural Hematoma.

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INTRODUCTION

Persistent subdural hematoma (CSDH) is defined by chronic clot accumulation in the subdural space and has a generally positive prognosis. It is one of the most common neurological conditions.[1-2] The condition has a varied

frequency of 5.3 to 13.5 individuals per 100,000 persons each year, with the elderly having a greater prevalence.[3-4] It is more frequent in the elderly population, where age-related reductions in brain volume with corresponding increases in the extent of the subdural space enhance vulnerability to this condition.[5] The major risk factor linked with around two-thirds of individuals with CSDHs is a history of head trauma, which is usually a minor trauma.[5-6] Some of the cases might be the result of a problematic coagulation system or those using antiplatelet medicines. The most prevalent CSDHs are seen on the most curved frontal or occipital convexity of brain tissue.[7] The symptoms of CSDH might range from no symptoms to severe headaches, seizures, poor memory, and disorientation. Some people may have trouble speaking, swallowing, and walking. Arms, legs, and the face may experience weakness or numbness. [6]

Bilateral CSDH affects 9.7 – 34.8 percent of individuals.[8] These individuals exhibit signs of elevated intracranial pressure (ICP), such as headache, vomiting, and fast loss of consciousness. According to Agawa et al, the bilateral hematoma is a risk factor for poor results.[9] Leroy et al, on the other hand, found no significant difference in results between bilateral and unilateral instances.[10] A CT scan is generally used to diagnose CSDH. Hematomas are often hypodense, however isodense or mixed density lesions can occur. An MRI scan is more sensitive in diagnosing bilateral isodense CSDH, numerous locations, intra-hematoma membranes, new bleeding, hemolysis, and capsule size.[6] For many years, the final therapy of CSDH has been debated, with contradicting recommendations leading to a significant difference in real clinical prospects. Even though the conservative approach has been the standard option in older patients with minor symptoms or asymptomatic individuals, there are no evidence-based guidelines for treatment, or frequency of serial CT imaging.[11] In Japan, however, the majority of symptomatic individuals had surgical therapy, with conservative treatment being uncommon.[12] Surgery is a well-established therapy that can result in quick clinical improvement and a good outcome in more than 80% of patients.[11] However, the most successful surgical procedure remains unknown. Twist-drill craniostomy, burr hole craniostomy, and craniotomy are the three most regularly employed methods. Several investigations, including a recent large prospective multi-center audit of CSDH therapy in the UK, revealed that burr hole craniostomy was the most commonly employed type of surgical draining.[13]

Despite advances in surgical procedures, the recurrence rate of CSDH has remained stable in recent decades, ranging from 0.36 to 33.3 percent.[14] Most studies have found a recurrence incidence of roughly 10 – 15%.[15] The most widely accepted definition of recurrence is that postoperative symptomatic recollection of hematoma requiring any type of reoperation The number of burr holes utilized is determined by the surgeon. However, there is no definitive indicator of the number of burr holes. The most typical manifestation in the elderly (50 – 70%) is an altered mental state.[16] It can cause disorientation, sleepiness, or coma in variable degrees. Acute delirium is often difficult to distinguish from behavioral or psychotic signs. Some individuals are even diagnosed with serious psychiatric diseases due to depression and paranoid symptoms. Also, in individuals with mental or neurological diseases, any change in behavior or functional condition is frequently attributed to their pre-existing sickness, making the diagnosis exceedingly difficult. A postmortem examination of 200 psychiatric patients in the days before computed tomography found 14 subdural hematomas, only one of which had been detected in life. In one study, 58 percent of the patients had hemiparesis.[17]

The prevalence of headaches varies in research, ranging from 14 to 80 percent.[18] It is

less prevalent in the elderly than in younger patients. It is partly owing to the vast amount of intracranial space available for the hematoma to occupy before putting pressure on the nearby brain. Another cause is the elderly's early onset of disorientation, which draws medical attention before the development of headaches. In recent prospective research including 43 older individuals, falls were observed to be a highly prevalent presenting symptom (74%).[19] Recurrent falls are widely established to be a substantial risk factor for CSDH. Because of a changed mental state, neurological impairments, and postural problems, the development of CSDH may result in repeated falls or increase the frequency of falls. Epilepsy has generally been regarded to be an uncommon presentation, even though it has been described as an early symptom in up to 6% of patients.[20] The development of CSDH has been associated with an increase in the frequency of seizures in individuals with established epilepsy. A simple partial seizure has been recorded as the only sign of CSDH, and it is readily confused with a transient ischemic attack. Seizures are most commonly accompanied by a big hematoma and a localized neurological impairment. According to a recent study, 23 percent of patients did not require surgery since the hematoma was tiny.[21] Conservatively treated patients should be closely watched, and the scan should be repeated if there is clinical deterioration. Concurrent use of high dosage steroids has been proven in several trials to hasten the clearance of subdural collection.[22] The present study aimed to find the recurrence rate of chronic subdural hematoma in patients who underwent one vs two burr craniostomy.

MATERIAL & METHODS

Study Design & Setting

A randomized controlled trial (RCT) at the Neurosurgery Unit of Ayub Teaching Hospital, Abbottabad from 12 months from 14th July 2020 to 14th July 2021.

Inclusion Criteria

Patients with ASA-I, ASA-II, and ASA-III were included. Patients included those who were symptomatic and radiologically proven for a chronic subdural hematoma.

Exclusion Criteria

Patients with ASA-IV and ASA-V grades, who were slightly symptomatic, asymptomatic radiologically established CSDH, and symptomatic due to other brain illnesses, were eliminated.

Patients Groups and Data Collection

The study was started after taking approval from the hospital ethics committee. Informed written consent was taken from each patient from all the willing patients who are filling the inclusion criteria by consecutive non-probability sampling. Patients were grouped randomly with the blocked randomization method. Each group included 38 patients. Group A was treated with intraoperative epidural methylprednisolone while Group B was treated with normal saline only. Clinical information was collected through a pre-designed proforma. Patients were followed for over 1 month postoperatively in the Outpatient department. Data was collected for symptomatic recurrence from each patient on designed protocols individually.

Data Analysis Procedure

The data was entered in SPSS version 26. Gender and treatment efficacy frequencies were determined as percentages. The Chi-square test was performed to compare treatment effectiveness in both groups. The stratification strategy was used to regulate effect modifiers such as age and gender. The chi-square test was used for stratification. T-test was applied to compare mean values, where required.

RESULTS

Age Distribution

Table 1 shows age ranges for both groups' patients in different ranges. The majority of patients were found with an age greater than 60 years; 37% were in group A, whereas 40% were in group B. Also, 37% of group B patients were of age between 51-60 years. The mean age was 54 years in group A, and 56 years in group B.

Gender Distribution

In group A, 28 (74%) were male and 10 (26%) were female. In Group B, 29 (76%) were male and 9 (24%) were female (Table 2).

Table 1: Age Distribution (n = 76).

Age	Group A One Burr Hole Craniostomy	Group B Two Burr Hole Craniostomy
≤ 40 years	3 (8%)	2 (5%)
41 – 50 years	8 (21%)	7 (18%)
51 – 60 years	13 (34%)	14 (37%)
> 60 years	14(37%)	15 (40%)
Total	38 (100%)	38 (100%)
Mean and SD years	54 ± 12.71	56 ± 11.09
P value:0.4672 (from T-test)		

Table 2: Gender Distribution (n = 76).

Gender	Group A	Group B
Male	28 (74%)	29 (76%)
Female	10 (26%)	9 (24%)
P value: 0.7910 (from Chi-Square)		

Recurrence

The group A, 2 (5%) patients had recurrence while in Group B, 5 (13%) patients had recurrence (Table 3).

Table 3: Recurrence (n = 76).

Recurrence	Group A	Group B
Yes	2 (5%)	5 (13%)
No	36(95%)	33 (87%)
P value: 0.2340 (from Chi-Square)		

Stratification Concerning Age & Gender for Efficacy of One/Two Burr Hole Craniostomy

There existed a significant difference between effectiveness and not-effectiveness of one/two burr hole craniostomy among patients who were less than 40 years (p-value: 0.000). An insignificant difference was observed in effectiveness in male patients as well as in female patients (Tables 4-5).

Table 4: Recurrence W.R.T Age

Age	Effectiveness	One Burr Hole Craniostomy Group	Two Burr Hole Craniostomy Group	P-value
≤ 40 years	Effective	0	0	significant 0.0000*
	Not effective	3	2	
Total		3	2	
41 – 50 years	Effective	0	1	0.2684
	Not effective	8	6	
Total		8	7	
51 – 60 years	Effective	1	2	0.5859
	Not effective	12	12	
Total		13	14	
> 60 years	Effective	1	2	0.5843
	Not effective	13	13	
Total		14	15	

Table 5: Recurrence W.R.T Gender.

Gender	Effectiveness	One Burr Hole Craniostomy Group	Two Burr Hole Craniostomy Group	P-value
Male	Effective	1	4	
	Not effective	27	25	0.1726
Total		28	29	
Female	Effective	1	1	
	Not effective	9	8	0.9371
Total		10	9	

DISCUSSION

In the present study, group A patients received intraoperative epidural methylprednisolone, whereas Group B patients received just normal saline. Those in Group A had a 5% recurrence rate, whereas patients in Group B had a 13% recurrence rate. There existed a significant difference between effectiveness and not-effectiveness of one/two burr hole craniostomy among patients who were less than 40 years. Similar findings were obtained in another study done by Hong-Joon et al.[23] One of 51 patients who had one burr hole operated on had it returned, but 9 of 129 patients who had two burr holes evacuated had it recurred. Most institutes use one or two burr-hole craniostomies with closed-system drainage as the primary treatment for CSDH. One burr hole craniostomy is less intrusive and takes less time than two burr hole craniostomies. Evacuating the hematoma, on the other hand, is typically less successful, especially in cases of split CSDH and/or thick hematoma. Yamamoto et al.[24] showed that irrigation through a single burr hole is often sufficient to clear hematomas from many cavities. A frontal catheter tip-enhanced surgical results in one burr craniostomy with closed-system drainage and irrigation, as per Nagakuchi et al.[25] Recurrence rates were 5% in the frontal region, 38% in the parietal region, 36% in the occipital region, and 33% in the temporal base. The catheter tip in the frontal region did not recur in any of the participants in our study.

With repeated irrigations, a two-burr-hole craniostomy is ideal for eliminating hematomas. Kuroki et al.[26] found five recurrences in the former and one in the latter when comparing CSDH managements of 'closed-system drainage with irrigation' and 'strict closed-system drainage.' However, there is little consensus on the specific function of postoperative subdural air in CSDH recurrence. Patients who had one burr hole operated on had a lower postoperative recurrence rate than those who had two burr holes, albeit this difference was not statistically significant. There is a possibility of a greater postoperative recurrence rate following two burr craniostomies. According to Amirjamshidi et al,[27] the persistence of the postoperative subdural cavity is a risk factor for re-accumulation of the hematoma, and the existence of postoperative residual air precludes cavity reduction. Irrigation should be avoided. According to Taussky et al,[28] patients who had one burr hole operated on had a statistically significantly greater incidence of recurrence, wound infection, and a longer hospital stay. The full evacuation of hematoma appears to be closely related to the surgical procedure's effectiveness. They also investigated[27] the influence of GCS scores on CSDH recurrence. GCS scores were found to have a high relationship with CSDH recurrence. According to Lee et al,[29] the length of postoperative brain re-expansion was connected not only to immediate brain re-expansion or pulsation during surgery but also to preoperative GCS score.

Yamamoto et al,[24] and Kang et al,[30] indicated that bigger hematomas tended to recur more

frequently because the postoperative subdural space was larger than that discovered following excision of a small hematoma. The recurring group with a width larger than 2 cm was considerably higher than the one with a width less than 2 cm. However, as previously reported, hematoma thickness on preoperative imaging scans was shown to have no significant effect on the postoperative recurrence rate in our investigation.[27,31] Three patients (12%) with bilateral CSDH and seven patients (0.5%) with unilateral CSDH recurred. As previously stated, bilateral CSDH had a greater recurrence rate, however, this was not statistically significant. It is yet unknown if a hematoma site is linked to CSDH recurrence. It was observed that bilateral CSDH should be treated by bilateral hematoma pressure decompression as soon as feasible, even if the patients had no or minimal neurological impairments.[32] Suzuki and Takaku[33] discovered that osmotherapy with 20% mannitol was beneficial in avoiding CSDH recurrent bleeding.

Residual fluid can be observed on computed tomography in up to 80% of individuals, the vast majority of whom are asymptomatic and clinically inconsequential. Symptomatic recurrence has been observed in 8% to 37% of postoperative individuals.[3] It normally happens between four days and four weeks, with a 12-day average gap. This illness is brought to light due to clinical worsening and radiological evidence. It is more frequent in the elderly, and limited brain growth following hematoma evacuation is likely to have a role.[34] After surgery, around 11% of patients experience seizures. Patients having a history of epilepsy are at a higher risk of developing postoperative seizures.[35] Tension pneumocephalus following CSDH burr hole evacuation is an uncommon postoperative complication. In a large series of 157 individuals, the total in-hospital death rate during index hospitalization was reported to be 15.6 percent for patients with CSDH. 96, 97 However, in patients who have a neurosurgical intervention, the morbidity and death rates following surgery are roughly 16% and 6.5 percent, respectively.[36-37]

CONCLUSION

According to our findings, individuals receiving two burr hole craniostomy had a greater recurrence incidence of chronic subdural hematoma than patients undergoing one burr hole craniostomy.

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Additional Information

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Conflicts of Interest:
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Financial Relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.
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AUTHOR CONTRIBUTIONS

Sr. No.	Author's Full Name	Intellectual Contribution to Paper in Terms of
1.	Mahboob Khan	Study Design, Methodology, and Paper Writing.
2.	Abdul Aziz Khan	Data Calculation and Data Analysis.
3.	Sohail Ahmad, Amir Zaman	Interpretation of Results.
4.	Shah Khalid, Khalid Zardan	Statistical Analysis.
6.	Muhammad Irfanudin Khan	Literature Review.