

## Comparison of One Versus Two Burr Hole Procedures in Evacuation of Chronic Subdural Hematoma

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### ABSTRACT

**Objective:** To compare the two techniques of chronic subdural hematoma evacuation, i.e. one burr hole versus two burr holes, in terms of recurrence and duration of hospital admission.

**Study Design:** Quasi-experimental study

**Place and Duration of Study:** Department of Neurosurgery, Combined Military Hospital Rawalpindi Pakistan, from Aug to Dec 2019.

**Methodology:** Two hundred twenty-eight patients with chronic subdural hematoma were recruited for this study and equally distributed into two groups. In the One-Burr Hole Group, all patients were operated by a single burr hole drilled via a pneumatic burr in the parietal bone on the affected side. In contrast, in the Two-Burr Hole Group, all patients were subjected to two burr holes, with one burr hole made in the parietal bone and the second burr hole in the frontal bone on the affected side.

**Results:** Patients 14(12.28%) with two burr hole procedures significantly ( $p=0.001$ ) recurred less than patients 27(23.68%) who were subjected to One Burr Hole treatment. The mean hospital stay (days) for Two-Hole Burr Group (Mean=9.00± 2.00) was significantly less than One-Hole Burr Group (Mean=14.00±3.00). However, operation time (minutes) on average for patients that were subject to Two-Hole Burr (Mean=110.00±7.00) procedure was significantly ( $p<0.001$ ) longer than One-Hole Burr (Mean= 96.00 ±6.00) patients.

**Conclusion:** It is better to evacuate the chronic subdural hematoma using a two burr holes procedure as the rate of recurrence, and the hospital stay are less as compared to the single burr hole technique.

**Keywords:** Burr holes procedure, Chronic subdural hematoma, Hematoma, Length of stay.

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### INTRODUCTION

Studies have reported a steady increase in the incidence of chronic subdural hematoma from 1.72 to 17.6 cases per 100,000 in the general population in the past two decades with the incidence higher in older age groups.<sup>1,2</sup> Surgical treatment with burr hole evacuation is the treatment of choice in symptomatic patients having low scores on the Glasgow Coma Scale (GCS).<sup>3</sup>

The treatment of chronic subdural hematoma depends upon the patient's clinical condition. Those with only mild headaches or no symptoms can be treated conservatively by corticosteroids alone.<sup>4</sup> However, the majority of people require operative intervention by burr holes. There is considerable debate about the efficacy of the technique using one burr or two burr holes.<sup>5,6</sup> CT scans of the brain are the diagnostic modality of choice for patients with chronic subdural hematoma. At the same time, the treatment

options include conservative management for small hematomas and surgical management in the form of burr-hole craniotomy or craniectomy for larger symptomatic hematomas.<sup>7</sup> Post-operative complications of burr hole craniotomy include recurrence, seizures, surgical site infection, damage to the brain parenchyma, swelling of the brain, brain damage leading to sensory and perceptual impairments, memory problems, coordination difficulties, speech impairments and coma.<sup>8</sup> There is no consensus regarding the ideal technique for the management of cases of chronic subdural hematoma. Double burr hole craniotomy, or the use of drains in the post-operative period, has been employed by neurosurgeons across the globe to prevent a recurrence, reduce hospital stays and prevent wound infections.<sup>9</sup>

There is a wide disparity in the existing literature regarding the exact frequency of recurrence of chronic subdural hematoma. The available literature has also reported conflicting results, with some studies depicting no effect on outcome irrespective of the

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number of burr holes while others reporting no difference between the two techniques.<sup>10</sup> CMH Rawalpindi Pakistan is a tertiary care referral centre for neurosurgical cases, and a study aimed at finding a better technique regarding several burr holes in the management of chronic subdural hematoma will help in improving the management of these patients. The objective of this study was to compare one-burr hole versus two-burr hole techniques to evacuate chronically accumulated subdural hematoma by measuring the frequency of recurrence and calculating the mean duration of hospitalization.

## METHODOLOGY

The quasi-experimental study was conducted at the Neurosurgery Department, Combined Military Hospital Rawalpindi, Pakistan from August to December 2019 after Hospital Ethical Committee permission (IERB Number 21/10/19). Sample size was calculated using WHO sample size calculator, keeping anticipated population proportion (P) = 30%.<sup>11</sup> Patients were selected by non-probability consecutive sampling technique.

**Inclusion Criteria:** Chronic subdural hematoma patients of either gender, aged 20 to 80 years, diagnosed by CT brain scan were included. Patients with crescent-shaped subdural collections were included.

**Exclusion Criteria:** Patients with polytrauma, bilateral subdural hematomas, concomitant extradural hematoma, depressed skull fractures, requiring ventilator support, ASA Class IV and V, patients of chronic liver disease, ischemic heart disease and on oral anticoagulants were excluded.

Written informed consents were taken from every patient and randomly assigned (lottery technique) to either a one-burr hole or two-burr hole group (Figure-1)

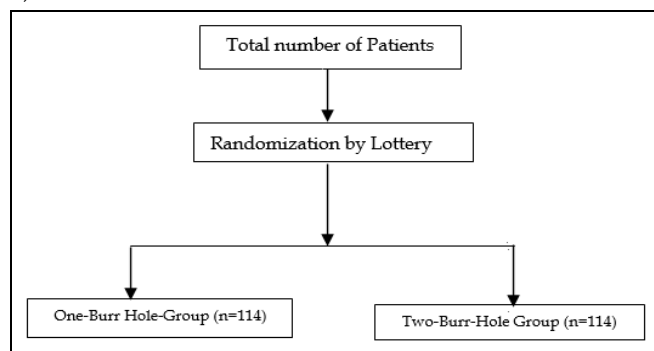


Figure: Patient Flow Diagram (n=228)

Other demographic information was taken, which included Hospital admission and discharge (A&D) number, name, age, sex, home address and contact numbers (optional). However, this information was kept confidential and under lock and key with the principal investigator. Glasgow Coma Scale (GCS) was used to assess the neurological status of the patient.<sup>12</sup> The same anaesthetist handled all the cases and gave general anaesthesia. Induction of anaesthesia was carried out with Fentanyl, Propofol and Atracurium, and the dose was adjusted based on the weight of the patient. A mixture comprising air, oxygen and Sevoflurane was used to maintain anaesthesia. In the One-Burr Hole Group, all patients were operated by a single burr hole drilled via a pneumatic burr in the parietal bone on the affected side.

In contrast, in the Two-Burr Hole Group, all patients were subjected to two burr holes, with one burr hole made in the parietal bone and the second burr hole in the frontal bone on the affected side. Radivac drains were kept in all patients. The operative time (minutes) and duration of stay (days) at the hospital for all patients were recorded by a doctor who was blind to the type of surgery being performed. Operative time was started with the scalp incision to the final stitch in the scalp. The same neurosurgical team performed all procedures. IV analgesia for pain relief was given with Ketorolac (30mg) 8 hourly for only 48 hours. For post-op infection, intravenous Ceftriaxone (1g) was given 12 hourly for five days in both groups. All patients were contacted for follow-up to assess the recurrence of symptoms associated with hematoma.

Recurrence was measured in both groups with the help of both clinical and radiological findings. Patients presenting with headache, nausea, vomiting, seizures, focal neurological deficit and decreased GCS in the post-operative period underwent a CT scan to confirm the reappearance of a hematoma at the same location after a month of initial surgery. Patients developing hematoma were labelled as recurrence positive.

Statistical Package for Social Sciences (SPSS) version 22.0 was used for the data analysis. Quantitative variables were expressed as Mean±SD and qualitative variables were expressed as frequency and percentages. Chi-square test was applied to explore the inferential statistics. The *p*-value lower than or up to 0.05 was considered as significant.

## RESULTS

Two hundred twenty-eight patients with chronic subdural hematoma were recruited for this study and equally distributed into two groups. In the One-Burr Hole Group, subdural hematomas were evacuated from 46(40%) male and 68(60%) female patients by single burr hole procedure. In contrast, in the Two-Burr Hole Group, hematomas were evacuated from 74(65%) male and 40(35%) female patients by using two burr holes procedure (Table-I).

**Table-I: Demographic Variables of Subdural Hematoma Patients (n=228)**

	One-burr Hole Group		Two-burr Hole Group	
	Male Patients	Female Patients	Male Patients	Female Patients
Age Range (Years)	n(%)	n(%)	n(%)	n(%)
20-30	01(0.87%)	02(1.75%)	02(1.75%)	00(0.00)
31-40	03(2.63%)	03(2.63%)	06(5.26%)	02(1.75%)
41-50	10(8.77%)	04(3.50%)	04(3.50%)	02(1.75%)
51-60	15(13.15%)	35(30.70%)	34(29.82%)	21(18.42%)
61-70	10(8.77%)	15(13.15%)	15(13.15%)	08(7.01%)
71-80	07(6.14%)	14(12.28%)	13(11.40%)	07(6.14%)

The mean age (years) of the one-burr hole Group (57.73±1.84) was similar to the two-burr hole Group (58.15±1.78). The efficacy of the two-burr hole procedure was determined by comparing the recurrence of symptoms or resurgence of hematoma; the two-burr hole procedure resulted in significantly fewer 14(12.28%) recurring cases than patients 27(23.68%) with one-burr hole. Mean hospital stay for the Two-Hole Burr Group was (9.00±2.00) statistically significant (*p*-value 0.001) as compared to the One-Hole Burr Group (14.00±3.00). Naturally, the total operating time (minutes) for the Two-Hole Burr Group (110.00±7.00) patients was significantly more (*p*-value 0.001) than One-Hole Burr Group (96.00±6.00) patients because drilling two holes versus one added more time to operative procedure, which averaged about 14 minutes extra (Table-II).

**Table-II: Efficacy of the Burr Hole procedures in the Study Groups (n=228).**

Variables	One Burr Hole-Group (n=114)	Two Burr Hole-Group (n=114)	<i>p</i> -value
Recurrence	27	14	0.001
Hospital Stay (Days)	14	09	0.001
Operating Time(Min)	96	110	0.001

## DISCUSSION

The collection of blood beneath the dura is called a subdural hematoma. If it happens immediately after a head injury, then it is called acute subdural hematoma, whereas if it occurs 2-3 weeks after the initial insult, it is called chronic subdural hematoma.<sup>12,13</sup> The latter occurs mostly in older people because of relative brain atrophy; the cortical dural bridging veins are stretched, and minor trauma can result in their rupture, leading to a steady blood collection. The resulting hematoma takes about days or weeks to expand by osmosis and ultimately produces the symptoms of raised ICP or focal neurological deficit.<sup>14</sup> The patients who are taking anticoagulants or antiplatelet drugs can manifest the same by a trivial trauma as well.

The treatment of chronic subdural hematoma depends upon the clinical condition of the patient. Those with only mild headaches or no symptoms can be treated conservatively by corticosteroids alone. However, the majority of people require operative intervention by burr holes. There is considerable debate about the efficacy of the technique using a single burr hole or two burr holes. We designed our study to compare the two methods regarding operating time, hospital stay days, and recurrence rate.<sup>15,16</sup>

A previous study stated that the frequency of recurrence in the single burr hole group was 20% as opposed to 16% in the double burr hole group. The difference between the two groups was statistically insignificant (*p*=0.131).<sup>17</sup> Similarly, another study reported that the frequency of recurrence in the single burr hole group was 36.36% as opposed to 25% in the double burr hole group. However, the difference between the two groups was again statistically insignificant (*p*=0.542). The difference in hospital stay between the groups was also not statistically significant (*p*=0.884).<sup>18</sup>

Contrary to the above, a study reported that the frequency of recurrence in the single burr hole group was 29% as opposed to only 5% in the double burr hole group, which was statistically significant (*p*=0.001). The mean duration of hospital stay was 12±6 days in the single burr hole group versus 9±4 days in the two burr hole group, the difference again being statistically significant (*p*=0.002).<sup>19</sup>

The results of our study have revealed that the rate of recurrence was significantly (0.001) less in the

patients treated with two burr holes than one burr hole procedure. Similarly, the length of hospital stay was significantly shorter for patients treated with two burr holes than one. On the other hand, the operating time for evacuation of hematoma using one burr hole was shorter than the two burr holes procedure. Therefore, the technique of using two burr holes is superior to a single burr hole for hematoma recurrence and time spent at the hospital. In contrast, the latter is superior in terms of operating time.

### CONCLUSION

It is better to evacuate the chronic subdural hematoma using the two burr holes procedure as the rate of recurrence, and the hospital stay is less as compared to the single burr hole technique. This should decrease the burden of disease and its management for the patient, family and health organizations.

**Conflict of Interest:** None.

### Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

BS & ATA: Conception, study design, drafting the manuscript, approval of the final version to be published.

MJM & KLB: Data acquisition, data analysis, critical review, approval of the final version to be published.

AAK & ME: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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