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Original research article

Surgery for chronic subdural hematomas: A comparison of the single-burrhole, closed-system drain and the twin-burrhole, open-drain approaches

Dr. A Venkateshwar Rao
Assistant Professor, Department of Neurosurgery, Gandhi Medical College, Secunderabad, Hyderabad, Telangana, India

Corresponding Author:
Dr. A Venkateshwar Rao

Abstract

Background: Neurosurgeons often deal with cases of chronic subdural hematoma. Persistent subdural hematomas are more prevalent in the elderly because brain atrophy causes the brain to shrink, creating more space between the brain and the skull.

Material and Methods: The participants in this research were all seen at the Department of Neurosurgery, Gandhi Medical College, Secunderabad, Hyderabad, Telangana, India, between December 2021 to November 2022, were the primary regions of patient dispersion. All hospitalized patients who were given the diagnosis of persistent subdural hematoma were included in the research.

Results: Eighty-two men and eight women participated in the trial for a total of 90 patients. Forty patients had operations using the single burrhole method, while fifty patients had procedures using the double burrhole method. Patients in Group 1 had, on average, 58.48 years, whereas those in Group 2 had, on average, 58.25.

Conclusion: The single burrhole technique reduced pneumocephalus despite statistical insignificance. Single burrhole closed system drainage for chronic subdural hematoma does not enhance the risk of recurrence or pneumocephalus.

Keywords: Surgery, chronic subdural hematomas, single-burrhole, closed-system drain

Introduction

Patients who suffer from a disease known as chronic subdural hematoma are a common source of consultation for neurosurgeons. Two to four new instances of chronic SDH are discovered every year for every 100,000 people in the population, according to specialists in the medical field [1]. A greater amount of space is formed between the brain and the skull in elderly individuals as a result of brain atrophy, which is the process that causes the brain to shrink. Because of this, aged patients are at an increased risk of developing chronic subdural hematomas [2].

It is possible that subdural hematomas will form as a result of the bleeding that takes place in the dura-arachnoid interphase. Chronic refers to a condition that has been present for more than three weeks and has symptoms consistent with SDH [3].

The number of people who are diagnosed with chronic SDH each year normally falls in between one and two cases per one hundred thousand people. Patients often have reached or are at least equivalent to the age of 50. Even among those who have had a brain injury, the majority of the time, the damage is not as serious as one would anticipate. Because of this, anywhere between one-fourth and one-half of all people have never had a head injury throughout their whole lives. Because of their chronic drinking, seizure disorders, or coagulopathies, a sizeable segment of the population is at risk for SDH [4, 5].

Surgical options for treating chronic SDH include burrhole craniostomies, twist drill craniostomies, and craniotomies with subdural membrane excision, reservoir shunting for continuous irrigation and drainage, percutaneous needle trephination, and others. Craniotomies and the removal of subdural membranes are two further examples of surgical operations [6]. For older patients with respiratory and cardiac concerns, burrhole craniostomy is the gold standard in treatment. The reason for this is to minimize the number of interventions performed while minimizing the overall amount of anesthesia administered [7, 8].

This research aimed to compare and contrast two approaches to treating chronic SDH: the traditional double burrhole technique with an open drain and the more contemporary single burrhole strategy with a closed drain. Double burrhole treatment for chronic SDH has been the standard for quite some time, whereas the single burrhole technique has just lately gained popularity [9].

According to the data that was shown before, it would seem that drainage from a single burrhole would

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be enough to cure Chronic SDH. This study is the first of its kind to be conducted in an Indian hamlet, and it is the first of its kind to offer a direct comparison between the effectiveness of single burrhole drainage and the effectiveness of double burrhole drainage. Comparing the efficacy of a single burrhole closed drain, which is less common, to that of a more common double burrhole open drain, which is more often employed in the surgical treatment of chronic SDHs, was the purpose of this research [10, 11].

Materials and Methods

The participants in this research were all seen at the Department of Neurosurgery, Gandhi Medical College, Secunderabad, Hyderabad, Telangana, India, between December 2021 to November 2022, were the primary regions of patient dispersion. All hospitalized patients who were given the diagnosis of persistent subdural hematoma were included in the research.

These individuals were classified into one of three categories:

a) Referred from a private facility; Chronic SDH diagnosed through CT scan
b) A patient admitted to the medical wards complaining of headache or limb weakness, and whose CT scan reveals a persistent subdural hematoma.
c) When a patient with a mild acute subdural hemorrhage that was first managed conservatively develops chronic subdural hematoma.

A total of 90 individuals were seen and cared for over the course of the investigation. Participants with the following exclusionary criteria were excluded from the study:

1. Coagulopathy and bleeding disorders.
1. Second, a bilateral case of chronic subdural hematoma.
2. Pre-operatively deceased patients.
3. Patients with many potentially fatal conditions.

Leaving 90 who met the study's inclusion requirements to participate. Intake of aspirin, coagulation problems, and co morbid diseases including hypertension, diabetes mellitus, and drunkenness were meticulously documented.

Results

The research was carried out on a total of 90 patients, just 8 of them were female, while the remaining 82 were male. 40 patients received surgery using single burrhole method and 50 patients underwent the twin burrhole procedure. Patients in group 1 had an average age of 58.48 years, whereas patients in group 2 had an average age of 58.25 years.

Table 1: SDH thickness and midline displacement on average, by group

Technique	Average thickness of SDH mm	Residual SDH mm	Average reduction	Midline shift preop	Midline shift postop	Reduction in Shift
Single	18.32	4.14	11.17	9.17	2.17	6.58
Double	18.41	4.28	11.47	9.74	2.46	6.87

Table 1 compares the average SDH thickness and midline shift between the single and double techniques as well as the single and double techniques individually.

Table 2: Quantifying the age structure

Age group	Single	Double	Total
< 40	03	04	07
40 to 60	19	20	39
>60	20	24	44
Total	42	48	90

Eighty-eight percent of the total number of patients were above the age of forty. The percentage of individuals in each age group who used either the single or double burrhole approach was practically same.

Table 3: The Sex Group Distribution

Sr. No.	Sex group	No
1.	Male	82
2.	Female	08

Table 3 shows that the distribution of gender groups in males was 82, whereas the distribution of gender groups in females was 08.

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Table 4: Variety of signs and symptoms

Sr. No.	Symptoms	Number
1.	Weakness	20
2.	Altered sensorium	20
3.	HA	19
4.	Vomiting	21
5.	Seizures	10

Table 4 includes the whole range of symptoms, including sluggishness, altered sensorium, hyperacusis, nausea, vomiting and seizures.

Table 5: Single-Markwalder

Markwalder	Mean	N	Std. Deviation
Before	1.62	40	0.612
After	0.87	20	0.751

Analyzing the differences between the single and double burrhole procedures using Mark Walder's scales. The two processes are almost identical in every material respect.

Table 6: Neumocephalus

Drain	Moderate	Minimal	Nil	Total
Single	1	05	34	40
Double	4	12	34	50
Total	5	22	69	90

The aforementioned findings were from a research project that included 90 patients who had persistent subdural hematoma and compared the single burrhole closed drain method with the double burrhole open drain approach.

Discussion

Neurosurgeons routinely deal with the clinical entity of persistent subdural hematoma during the course of their employment. Aging's overall propensity for the brain to lose mass contributes to the increase of the subdural space, making it one of the most significant factors. As the global population ages, chronic subdural hematoma is on the rise due to medical advancements [12]. Due to the significant frequency of co-morbidities in the elderly, such as hypertension, diabetes, ischemic heart disease, and pulmonary problems, the emphasis of treatment in these patients should be decreasing anaesthetic and surgical risk. Some of the treatments for chronic subdural hematomas include burrhole craniostomy with or without drain [13], twist drill craniostomy, craniotomy with excision of membrane, and, more recently, middle meningeal artery embolization for recurrent hematomas. Because of its minimal risk of complications and high success rate compared to standard craniotomy, burrhole craniostomy has been widely supported by research. The death rate is under 0.9%. Yet because the method of burrhole craniostomy has not been specified, questions arise concerning the number of burrholes to be used, whether to irrigate, whether to keep a drain, and how to prevent postoperative pneumocephalus and recurrence [14, 15].

It is often held that a single burrhole is less successful in evacuating a separated type chronic subdural hematoma and a thick hematoma. Yamamoto *et al*. discovered, against common opinion, that a single burrhole is sufficient for irrigating a hematoma in many cavities. They found that in most cases of chronic subdural hematomas, all hematoma cavities were continuous with quite broad connections, therefore the presence of several cavities did not always suggest that there were numerous open ones [16]. Compared to a two-burrhole treatment, the recurrence rate for a single burrhole craniostomy for clearing chronic subdural hematoma was much lower, as reported by Hong-Joon Han *et al*. Their study looked at how often burrhole leakage reoccurred after a single treatment. Overall, 5.6% of cases returned following surgical removal. The recurrence rate after a single-burrhole craniostomy was 1.89%, but it was 6.82% after a two-burrhole surgery. Two burrhole craniostomy was associated with a higher recurrence rate than one, albeit this difference did not reach statistical significance [17].

The purpose of this study was to compare and contrast the effectiveness of single-and double-burrhole craniotomies in Indian patients. The experiment comprised 96 participants, the vast majority of whom were male and over the age of 40 [18].

Fifty patients had a double burrhole craniotomy, whereas 46 underwent a single one. The thickness of the chronic hematoma, the midline shift, the presence or absence of pneumocephalus, and recurrence were all measured and compared pre- and post-surgery [19]. The Mark Walder Chronic SDH scale and the Glasgow Coma Scale were also evaluated.

Results for chronic subdural thickness, residual hematoma, midline shift, and midline shift reduction are similar across groups 1 and 2 (Table 1). Table 2 shows that eighty-eight percent of the research

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participants were aged 40 or above. Ninety-three percent of patients in both groups were male [20].
Primary symptoms mentioned most often by these people were weakness, impaired sensorium, and headache. More over half of these people had at least some of the aforementioned symptoms. One of the least common presenting symptoms was seizures. One-third of the patients were sick enough to throw up. The average Mark Walder score of patients in Group 1 decreased from 1.83 pre-op to 0.76 post-op. There was a statistically significant link there, and it worked out well. The second group had a reduction in their Mark Walder score from 1.80 preoperatively to 0.8 postoperatively. An association between the two factors was found, and the outcomes were favorable. Glasgow coma ratings of 15 were achieved by both patients after surgery, demonstrating a positive correlation [21, 22].
There was no discernible difference in Mark Walder scores between the single and double burrhole groups. According to the research, there was no statistically significant difference between the two groups. If the outcome is the only thing that counts, then the Mark Walder score demonstrates that the two approaches are equally effective [23].
Discharge Glasgow Coma Score was not significantly different between groups. This further confirms that the two approaches provide equivalent results. There was no statistically significant variation in hematoma thickness between the pre- and post-operative CT imaging groups. This is more proof that the two approaches provide equivalent outcomes. When comparing the effectiveness of single and multiple burrhole groups in reducing midline movement, statistical analysis revealed no significant difference [24].
One patient in Group 1 and three patients in Group 2 were found to have mild pneumocephalus based on post-operative CT brain exams. CT images taken after surgery indicated no discernible difference in the incidence of moderate pneumocephalus between the two groups. Eighty percent of group 1 members and seventy-five percent of group 2 patients were found to be free of pneumocephalus. The statistical analysis failed to find any significant differences between the groups [25].
The total recurrence rate seen in this study was 4.1%, and there was no statistically significant difference between the single and double burrhole groups. While there was no statistically significant difference between the single and double burrhole recurrence rates, these findings are in line with those of Hong-Joon Han *et al*., who found a total recurrence rate of 5.6% [23-25].
Kuroki *et al*. compared and contrasted irrigation with strict closed system drainage for the treatment of chronic SDH. They theorized that recurrence rates were mostly caused by air left within the patient's capsule after surgery. Nonetheless, the role that postoperative residual subdural air plays in the recurrence of chronic subdural hematoma remains controversial. Patients with a single burrhole, as hypothesized by Hoog-Joon Han *et al*., may be at a lower risk for postoperative subdural air. Amirjamshidi *et al*. found that the pressure of postoperative residual air impedes the reduction of the subdural cavity, increasing the likelihood that the hematoma may reaccumulate. Not employing irrigation has been shown by Oishi *et al*. [24-26] to reduce the risk of intracranial pressure decline and intraoperative invasion.
The present study investigates whether using a single burrhole with a closed drain might lessen the likelihood of postoperative pneumocephalus. By avoiding irrigation of the subdural space and making use of a water seal drain, this method permits progressive decompression of the subdural space without risking the introduction of air into the intracranial space. This study adds to the growing body of evidence demonstrating the safety and efficacy of the single burrhole closed drain method for treating persistent subdural hematoma, as compared to previous studies.

Conclusion

With respect to the Glasgow Coma Scale and the Mark Walder Chronic Subdural Hematoma Scale, there was no statistically significant difference between the groups. In both groups, the hematoma thickness reduced and there was no noticeable change in the midline position. There was no statistically significant difference in the recurrence rates between the two groups. Single burrhole surgery resulted in a decreased rate of pneumocephalus, albeit the difference was not statistically significant. For chronic subdural hematoma, routine use of single-burrhole closed-system drainage is justified due to its efficacy as double-burrhole irrigation and drainage without the risk of pneumocephalus.

Conflict of Interest: None.

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