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ORIGINAL ARTICLE

Comparison of the results of different surgical techniques in the treatment of chronic subdural hematoma in a training and research hospital

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Abstract

Background: Chronic subdural hematoma can cause compression of brain tissue followed by neurological deficits. There are several methods for the treatment of chronic subdural hematoma, but the most appropriate treatment is still controversial. we compared 5 different surgical methods applied by five different surgeons in a single center and we suggest the most appropriate treatment method in the literature.

Methods: Chronic subdural hematoma can cause compression of brain tissue followed by neurological deficits. There are several methods for the treatment of chronic subdural hematoma, but the most appropriate treatment is still controversial. we compared 5 different surgical methods applied by five different surgeons in a single center and we suggest the most appropriate treatment method in the literature.

Results: We collected data from 185 patients who underwent surgery due to chronic subdural hematoma. Different surgical techniques were used in the treatment of patients. Only one burr hole was opened in 22 of the patients, one burr hole was opened in 40 of them and 1 drain was placed in the subdural space, only two burr holes were opened in 41 of them, two burr holes were opened in 58 of them and 1 drain was placed in the subdural space, and mini craniotomy was performed in 24 patients.

Conclusions: Five different surgical methods used in the treatment of chronic subdural hematoma have advantages and disadvantages. We believe that a study conducted by increasing the number of patients, ensuring homogenization of groups, and increasing surgical techniques will shed light on the literature.

Key words: Subdural hematoma, burrhole, mini craniotomy, drainage

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INTRODUCTION

A subdural hematoma (SDH) is a congestion of blood between the dura and arachnoid meningeal layers surrounding the brain and chronic SDH develops over the course of 3 or more weeks (1). Chronic subdural hematoma can cause compression of brain tissue followed by neurological deficits. While chronic subdural hematoma may be asymptomatic, it may lead to a heterogeneous clinical picture ranging from headache, seizure, ataxia, focal neurological deficit, language disturbance, confusion and parkinsonism (2). The probability of recurrence varies between 12% and 20%, while the mortality rate is thought to be 5%. Risk factors include age, chronic alcoholism, therapeutic interventions such as ventricular shunting, long-term use of anticoagulants (3).

There are several methods for the treatment of chronic subdural hematoma, but the most appropriate treatment is still controversial. While there are patients who have been followed, there are also surgical techniques with or without subdural drainage such as twist drill, 1 burr hole, 2 burr hole, mini craniotomy (4).

In our study, we compared 5 different surgical methods applied by five different surgeons in a single center and we suggest the most appropriate treatment method in the literature.

MATERIALS AND METHODS

This retrospective study was conducted at a single center and at a tertiary hospital. After obtaining the approval of the the Bursa City Hospital Ethics Committee (Dated: 26.06.2024; Approval Number: 2024-11/7), the files of the patients with a diagnosis of chronic subdural hematoma -who were operated on at the S.B.U Bursa City Hospital Neurosurgery Clinic between July 2019 and April 2024- were retrospectively reviewed. The patients were evaluated in terms of their complaints, neurological examinations, type of operations, use of subdural drains, and postoperative complications. 5 different surgical techniques were applied to the patients. The surgical method was determined by taking into account the surgeon's experience and the area where chronic subdural hematoma was found in the cranial CT examination.

Collection of data

Demographic data included age, gender, presenting symptoms, preprocedural GCS score , medical comorbidities and anticoagulation/antiplatelet status. All radiographic data were collected from examination of the patients' brain computed tomography (CT). The thickest point of the subdural hematoma was defined in millimeters from the inner table to the cortex in the axial view. Hematoma density was classified as hyperdense, hypodense or isodense, and this classification was based on the density in which more than 50% of the hematoma predominated. Hematoma classification was divided into homogeneous, laminar, separated and trabecular types. Midline shift was determined by millimeter displacement of the septum pellucidum relative to the midline at the level of the foramen of Monro on axial CT. It was understood that it improved, worsened or remained unchanged during follow-up.

Surgical Techniques

One burr hole

The dura was opened after a burr hole was opened 1 cm above the squamous suture. After the bleeding that caused increased intracranial pressure was evacuated, the patient was not irrigated with saline solution and no drain was placed. The operation was completed by closing the skin and subcutaneous tissue (Figure-1).

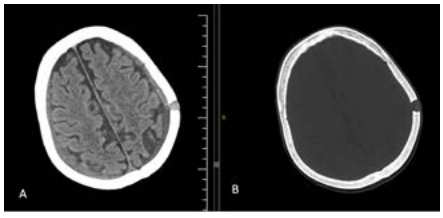

Figure 1:

A: Brain dose computed tomography image of the patient who

underwent surgery by opening a one burr hole and no drain,

B: Bone dose computed tomography image of the patient who

One burr hole + drainage

The dura was opened by making a burr hole 1 cm above the squamous suture. The bleeding causing intracranial pressure was drained and the subdural space was irrigated with saline. Since there was no blood coming from the subdural space, a drain was placed in the subdural space. The operation was completed by closing

the skin and subcutaneous tissue (Figure-2).

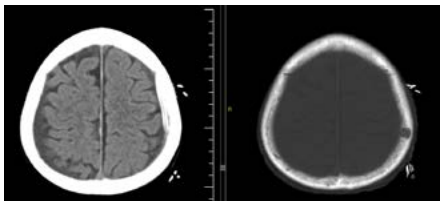

Figure 2:

A: Brain dose computed tomography image of the patient who underwent surgery by opening a one burr hole and placing a drain in the subdural space,

B: Bone dose computed tomography image of the patient who underwent surgery by opening a one burr hole and placing a drain in the subdural space.

Two burr holes

Two burr holes were drilled in the temporal and parietal regions. After the dura was opened, the bleeding that caused increased intracranial pressure was drained. The subdural space was irrigated with saline and it was observed that there was no bleeding in the space. No drain was placed. The operation was completed by closing the skin and subcutaneous tissue (Figure-3).

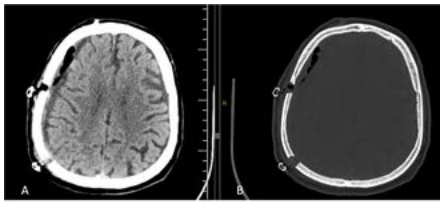

Figure 3:

A: Brain dose computed tomography image of the patient who underwent surgery by opening two burrhole and no drain,

B: Bone dose computed tomography image of the patient who underwent surgery by opening two burr hole and no

Two burr holes + drainage

After two burr holes were drilled in the temporal and parietal regions, the dura was opened. The bleeding that caused increased intracranial pressure was drained. The subdural space was washed with saline and a drain was placed in the subdural space from the burr hole opening to the parietal area. The operation was completed by closing the skin and subcutaneous tissue (Figure-4).

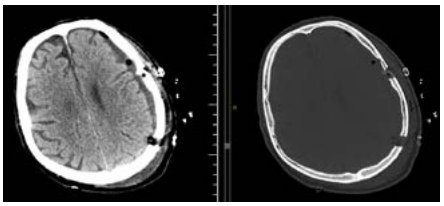

Figure 4:

A: Brain dose computed tomography image of the patient who underwent surgery by opening a two burr hole and placing a drain in the subdural space,

B: Bone dose computed tomography image of the patient who underwent surgery by opening a two burr hole and placing a drain in the subdural space.

Mini-Craniotomy

A craniotomy of approximately 3x3 cm was made in the temporal region with a drill. The dura was opened in a y-shape. After the bleeding in the subdural space was evacuated, irrigation with saline solution and membranectomy were performed. The arachnoid membrane was opened in several regions. A drain was placed in the subdural space. Dura was closed. The operation was completed by closing the skin and subcutaneous tissue (Figure-5).

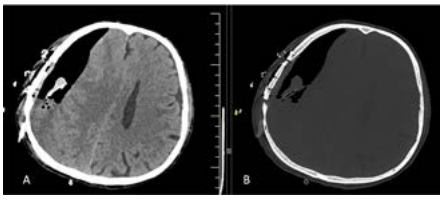

Figure 5:

A: Brain dose computed tomography image of the patient who was operated by opening a mini craniotomy,

B: Bone dose computed tomography image of the patient who was operated by opening a mini craniotomy.

RESULTS

Of the 185 patients participating in the study, 45 were female and 140 were male, and the age range was 70±13.2 years. The mean GCS of the patients at admission was 13.6±1.4. while 132 patients were admitted to the postop intensive care unit, the duration of hospital stay of the patients was 6.2±2.1 days. While the patients who were operated by one burr hole method with the least duration of stay in the hospital was 3.8±0.6 days, the longest remaining patient group was those who were operated with mini craniotomy. In the postoperative

period, 8 patients had seizures, and 6 of these patients consisted of patients who were operated with two burr hole + drainage method. The patient group with the highest pneumocephaly rate of 94.8% (55%) in postoperative control CT examinations was the patient group operated with two burr hole + drainage method.

We collected data from 185 patients who underwent surgery due to chronic subdural hematoma. Different surgical techniques were used in the treatment of patients. Only one burr hole was opened in 22 of the patients, one burr hole was opened in 40 of them and 1 drain was placed in the subdural space, only two burr holes were opened in 41 of them, two burr holes were opened in 58 of them and 1 drain was placed in the subdural space, and mini craniotomy was performed in 24 patients (Table-1). 8 patients were re-operated due to recurrent chronic subdural hematoma. 8 Patients were re-operated due to recurrent chronic subdural hematoma. none of these patients had a history of re-trauma. anticoagulant medication was not started in any of the patients. 4 out of 8 patients were operated again after chronic subdural hematoma, which caused a shift effect, was seen again on control cranial ct imaging., 2 of them were re-operated upon the occurrence of chronic subdural hematoma causing shift effect in cranial ct examination performed due to persistent headache,1 of them was re-operated upon the occurrence of chronic subdural hematoma causing shift effect in cranial ct thinning per formed upon the development of deficit, 1 of them was re-operated upon the occurrence of chronic subdural hematoma causing shift effect in cranial ct examination performed after seizure.

All of these patients had two burr holes opened and no drain inserted during their first surgery. In two surgeries, chronic subdural hematoma was drained from the same two burrholes and 1 drain was placed at the subdural distance. 6 patients died due to age and comorbidities.

DISCUSSION

Chronic subdural hematoma treatment was first described as twist drill craniotomy (TDC) in the 1930s, and since then, many different treatment methods such as one or two burr hole craniotomy and craniotomy have been applied (5,6). Although there are many studies on the advantages and disadvantages, reoperation and complications of surgical techniques, most of them are in the form of meta-analysis (4,7,8). Single-center studies are mostly comparisons of two different techniques (9,10).

When deciding on the most appropriate surgical method, the surgeon first considers the technique that has the lowest probability of complications, shorter hospital stay, and less re-operation (11,12). Meta-analysis studies are very valuable in finding the most accurate surgical technique to be applied. However, it is not fully informative since two different techniques are compared in the meta-analyses published in the literature (7,8,13). In our study, we compared five different surgical techniques applied in a clinic that has not been published before in the literature in terms of seizure, hospital stay and reoperation rates in the treatment of chronic subdural hematoma.

Historically, reoperation rates following surgical treatment of cSDH have generally been reported as %10– %20 (15,16). Modifications of the burr hole procedure to increase subdural fluid drainage, specifically the use of postoperative drains, have been associated with reduced reoperation rates. For example, in a randomized trial comparing subdural drain placement with no drain placement after burr hole evacuation, the rate of reoperation within 6 months was 9% with drain placement and 24% without . According to Santarius et al.'s suggestions in the study that 2(%1,1) of the patients who underwent reoperation (two burr holes were opened) and a drain was placed in the subdural space, while 6 (%3,2) of them (2 of them were patients with a single burr hole opened and 4 of them were patients with two burr holes) were patients in whom no drain was placed in the subdural space (17,18).

There were many studies regarding the preferred number of burr holes during chronic subdural hematoma surgery, the usefulness of intraoperative irrigation, and the most appropriate location for drain placement (subdural, subgaleal, subperiosteal) (19). Some studies have shown that there is no significant difference in the recurrence rate and complication rate in CSDH patients treated with a two-burr hole strategy compared to a one-burr hole strategy (19,20). A recent meta-analysis also showed that the outcomes of chronic subdural hematoma patients treated with a one burr hole in the postoperative period were similar to those treated with two burr holes (4,20).

In the literature, wound discharge, parenchymal

bleeding, and acute subdural hematoma are mentioned as complications that occur after chronic subdural hematoma treatment (4,21,22). However, seizures occurring after chronic subdural hematoma surgery are rarely mentioned in the literature (3,9,23). In our study, we considered patients' seizures in the postoperative period as a complication. Because it is a finding that is not present before surgery, it can be very difficult to treat. That's why we wanted to draw attention. In our study, 8 patients had seizures in the postoperative period and 2 patients were reintubated due to status epilepticus.

There are no studies in the literature showing a connection between pneumocephalus and seizures. In our study, we found that the rate of postoperative seizures in patients with pneumocephalus was proportional. However, we could not explain the connection between them because we did not have enough number of patients and data to establish the connection between them.

Fomchenko et al. In his study, as in our study, it was observed that the risk of pnemocephaly, recurrent and seizures was higher in patients with two burr holes compared to those with a single burr hole. Fomenchenko et al. thought that the reason for this is related to more irrigation, longer surgery time, and more incisions and burr holes, and our study also supports this theory (24).

A short hospital stay is an important criterion for reducing complications and hospital costs. One of the important criteria that reduces the hospital stay is the small incision and burr hole/craniotomy of the chosen surgical method (24,25). In our study, the patients with the shortest hospital stay were the patients operated with a single burr hole, 3.8±0.6 days, while the longest duration was the patient group operated with a mini craniotomy, 7.7±2.2 days.

Patients who underwent surgery with mini craniotomy are also the group of patients who are most frequently admitted to intensive care and whose stay in intensive care is the longest. Although mini craniotomy is not a preferred method, membranectomy is a method applied when necessary (26).

Our study has limitations due to the small number of patients, lack of homogeneous distribution, and not mentioning all the techniques used for chronic subdural hematoma surgery.

In conclusion; Five different surgical methods used in the treatment of chronic subdural hematoma have advantages and disadvantages. When we evaluated both postoperative pneumocephalus, seizure and patient length of stay according to the criteria we used in our study, we concluded that the most appropriate treatment method was to make a single hole in the subdural space without placing a drain. We believe that a study conducted by increasing the number of patients, ensuring homogenization of groups, and increasing surgical techniques will shed light on the literature.

Tablo1. Summary of patient groups

Technique	Sex	Age	First GCS	Hospitalization	Postop ICU	Postop Seizure	Postop Pneumocephaly	Recurrence
One burr hole	6F 16M	55.9±10.6	13.9±0.6	3.8±0.6	0.4±0.4	0	14(64%)	2
One burr hole + drainage	10F 30M	77.1±6.6	13.9±1	5.6±1.3	1.8±1.2	0	33(82.5%)	0
Two burr hole	9F 32M	67±13.5	13.6±1.4	6.3±2.6	1.9±1.8	1	31(71.6%)	4
Two burr hole + drainage	14F 44M	68.1±13.9	13.5±1.8	7.2±1.5	1.7±1.4	6	55(94.8%)	2
Mini Craniotomy	6F 18M	71.9±10.8	13.7±0.8	7.7±2.2	3.1±1.7	1	21(87.5%)	0

Declarations

The authors received no financial support for the research and/or authorship of this article. There is no conflict of interest. This study was approved by the Bursa City Hospital Ethics Committee (Dated: 26.06.2024; Approval Number: 2024-11/7).

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