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Efficacy of Burrhole Craniostomy in Chronic Subdural Hematoma: A Retrospective 9-Year Study

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Abstract

Objective: To demonstrate the effectiveness, possible complications, and difference of Burr-hole craniostomy surgical technique applied to patients diagnosed with chronic subdural hematoma from other surgical techniques.

Methods: The surgical techniques and postoperative clinical and radiological details of 36 patients who were operated on with the diagnosis of chronic subdural hematoma in the Neurosurgery Clinic of Ordu University Training and Research Hospital between 01.01.2013 and 15.08.2022 were retrospectively analyzed. In all patients in the post-op period, control brain CT was taken within the first 24 hours and compared with the pre-op CT. Again, at the end of post-op 1st, 2nd week and 1st month, control brain CT was taken for all patients and GCS was compared with pre-op scores. After determining the post-op complications, the treatment and results of these complications were examined.

Results: One patient who was operated on with Burr-Hole developed motor dysphasia in the post-op period, and intraparenchymal hemorrhage was detected in the post-op tomography of this patient. . Post-op clinical and radiological results of patients who underwent burr-hole craniostomy were significantly better than pre-op clinical and radiological results, and the recurrence rate was low, consistent with the literature. All drains placed in the subdural area after the burr hole opened during the operation were removed before discharge.

Conclusions: Although the drainage of chronic subdural hematoma with bur-hole craniostomy has a higher recurrence rate compared to the craniotomy method, it has a lower complication rate and is a more easily applicable surgical technique. In our study, some important points about patients who underwent burrhole craniostomy for cSDH evacuation were highlighted. It was observed that our patients who underwent burrhole craniostomy had higher reoperation rates compared to our patients who underwent craniotomy. We think that the presence of residual hematoma in the controls performed with CT in the post-op period should not be the sole criterion for re-operation. We think that CT controls are sufficient if there is improvement in the neurological status of the patient and a better GCS score in the post-op follow-up.

Key words: Chronic subdural Hematoma, Burr-Hole craniostomy, Craniotomy

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INTRODUCTION

Chronic subdural hematoma (cSDH), a complex condition with an annual prevalence of 1.7-20.6 per 100,000 people, is more common among the elderly. Trauma and inflammation play a role in the pathophysiological cycle of cSDH formation and growth by promoting membrane formation with permeable neovessels (1). cSDH is a pathology characterized by blood accumulation in the subdural space and the inflammatory reaction it causes. The cSDH recurrence rate is between 9.2% and 26.5%. A distinctive membrane was identified surrounding the SDH, a source of fluid exudation and bleeding. As a result of angiogenesis, fragile blood vessels develop within the membrane walls, but continued bleeding is caused by fibrinolytic processes that prevent blood clots from forming. Membranes and subdural fluid contain a variety of inflammatory cells and markers that are expected to contribute to the propagation of an inflammatory response that supports continued membrane growth and fluid accumulation (2).

Radiological imaging shows a crescent-shaped stratification of fluid on non-contrast CT (Figure 1).

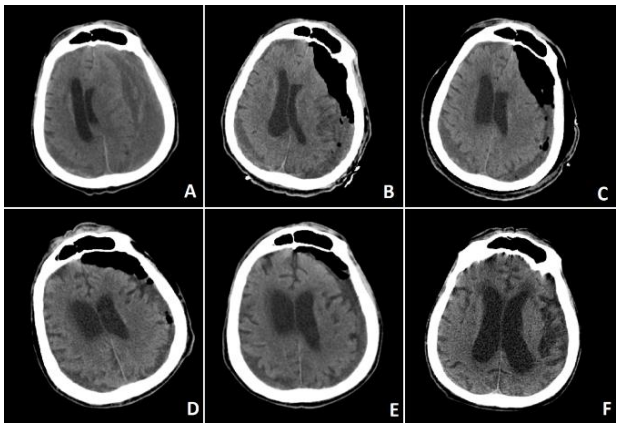


Figure 1. Cranial tomography images of the patient; A: Preoperative B: Postoperative 1st day C: Postoperative 3rd day D: Postoperative 10th day E: Postoperative 1st month F: Postoperative 3rd month

The most common symptoms of chronic subdural hematoma are headache, confusion, hemiparesis, and aphasia. Asymptomatic patients can be followed carefully, while symptomatic patients are indicated for surgical treatment (3). Tranexamic acid can be used to treat chronic subdural hematomas without requiring additional surgery. Inhibiting both the inflammatory (kinin-kallikrein) and fibrinolytic (tranexamic acid) systems at once can dissolve cSDH (4). 443 neurosurgeons practicing throughout the world responded to a survey on the non-surgical and surgical management of cSDH. Dexamethasone is sometimes used as a monotherapy by the responders, 46.2%. The majority of neurosurgeons around the world are unwilling to address cSDH with conservative therapy techniques. Which clinical characteristics of cSDH were considered to be the key indicators of surgery, according to the respondents? The Glasgow Coma Score (GCS) of less than 12

(57.8%), followed by a motor response of 5 or less on the GCS, is the most significant clinical justification for surgery. Another crucial indicator is the hematoma's size on the computed tomography (CT) scan (5).

Surgical treatment should be considered if the hematoma constituting compression in patients undergoing imaging causes clinical neurological symptoms. Surgery with irrigation, burr-hole craniostomy, or craniotomy with or without drainage is the mainstay of treatment for patients with clinical symptoms of cSDH and a large mass impact. Cranitomy, twist-drill craniostomy, and burr-hole craniostomy are the surgical procedures utilized for this. The selection of these operations, however, is debatable and mostly based on surgeon preference. Burr-hole craniostomy with drainage is the surgical technique that is most frequently utilized worldwide (6). Both craniotomy and craniostomy (burr hole/twist drill) are successful operations (7). Although endoscopic surgery for cSDH takes more time, it is effective and safe. Endoscopic treatment may be the most appropriate surgical technique for complicated cSDH (8). Neuroendovascular intervention, which is a minimally invasive procedure, is used for treatment because the condition is essentially dysfunction of the meningeal blood arteries (9). On bilateral cSDH, drilling drainage and neuroendoscopic aided surgery are effective treatments. The drilling drain has a shorter working period. For the treatment and prognosis of individuals with bilateral cSDH, neuroendoscopic assisted drainage may be more appropriate when surgical circumstances are present (10). The dissemination of level 1 support for drain use has had a favorable effect on this practice globally. After hematoma drainage, some surgeons are still hesitant to insert drains, especially when the subdural space is constrained. Placing a subperiosteal drain would be a suitable choice. However, larger research should assess its results and efficacy (11). After burr-hole drainage of a subdural hematoma, the use of drains is safe and associated with a 6-month reduction in recurrence and death (12). The drain can be placed subgaleally or subdurally. In addition, the drain may have active suction, passive suction, or continuous subdural irrigation. With standardization, passive subdural postoperative drainage is currently applied in Denmark (13). Drainage with irrigation is a risk factor for postoperative delirium and longer hospital stay. In high-risk patients with delirium, drainage without irrigation may be the most appropriate treatment for cSDH (14). Bilateral subdural hematomas should be treated as soon as feasible due to their severe symptoms, quick progression, and easy deterioration (15,16). One of the risk factors for the surgical treatment of chronic subdural hematomas is preoperative administration of

antithrombotic drugs. Craniotomy has significantly reduced the incidence of recurrence (17). The incidence of calcified or ossified CSDH is high, with a steady increase in recent years in some countries, including the United States, Japan, and Turkey. Surgery is the primary course of treatment for these individuals, and as it is uncommon following shunt in children or head trauma in adults and the clinical picture is varied, it should be taken into consideration in the differential diagnosis at the time of presentation (18). In adults with posterior fossa cSDH, the cause is often unclear. It may develop from an acute hematoma due to direct head trauma or from another type of spontaneous bleeding (19). Compared to younger patients, cSDH surgery in the elderly results in excellent neurological outcomes without an increased risk of overall complications, recurrence, or reoperation. However, older people may have a higher risk of death after surgery. (20). Neurosurgical intervention for cSDH in some non-young individuals may be a safe and advantageous technique, according to Ewbank F. et al. The patients who profited most from the procedure were those who were autonomous at home and had little medical history (21). Another type of chronic subdural hematoma is organized subdural hematoma, and the ideal surgical technique has not been determined. According to the experience of Chen K. et al., a smaller craniotomy can be considered instead of a larger craniotomy in the treatment of organized cSDH (22). Pediatric cSDH is concerning, and the doctor needs to be informed in order to look into the underlying reason and rule out child abuse. Incidences in children are rather infrequent. The main causes include child maltreatment, birth trauma, coagulopathy, and shunt operations (23). Most patients with non-traumatic cSDH are on AC (anticoagulant) or AP (antiplatelet) medication, which is an important condition and increases the risk of a poor neurological outcome. Large hematoma sizes that occur with the use of ACs worsen the conditions of cSDH patients and are more common in non-traumatic individuals. Patients with cSDH who use ACs have greater hematoma volumes and non-traumatic patients are more likely to use ACs. While AP treatment does not increase the probability of cSDH recurrence, AC treatment does (24). There may also be chronic comorbidities such as hypertension and renal failure, which may increase the risk of rebleeding in patients using antithrombotic drugs. It has been determined that these combinations, as well as antithrombotic drugs, can cause re-bleeding. After evacuation surgery, individuals using anticoagulants and antithrombotics did not have a worse mortality rate or clinical outcome (25).

METHODS

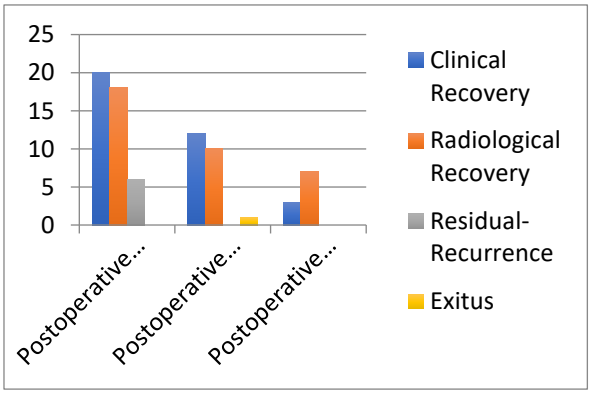
The surgical techniques and postoperative clinical and radiological details of 36 patients

who were operated on with the diagnosis of chronic subdural hematoma in the Neurosurgery Clinic of Ordu University Training and Research Hospital between 01.01.2013 and 15.08.2022 were retrospectively reviewed. As a surgical technique, 2 Burr-Hole craniostomy and 72 hour closed drainage system were applied to all patients. Craniotomy + membranectomy was performed in 6 patients who relapsed. Of the cases, 28 (77.7%) were male and 8 (22.3%) were female. The mean age was 70, with an age range of 54-87. Ten of the cases had a GCS of 15 (28%), 20 had a GCS of 13-14 (56%), and 6 had a GCS of 8-12. The most prominent complaints of the patients were headache and confusion. While 22 patients (61.1%) had a history of head trauma, 14 patients (38.9%) had no history of trauma. 9 patients (25%) had a history of anticoagulant and antiaggregant drug use.

RESULTS

Control brain CT was taken within the first 24 hours of all patients in the post-op period and compared with the pre-op CT. Again, at the end of post-op 1st, 2nd week and 1st month, control brain CT was performed for all patients and GCS was compared with pre-op scores. Craniotomy+ membranectomy was performed in 6 patients because of residual bleeding in the post-op period and no improvement in their neurological status. One of the patients who were operated on by craniotomy died due to sepsis in the later period. One patient who was operated with Burr-Hole developed motor dysphasia in the post-op period, and intraparenchymal hemorrhage was detected in the post-op tomography of this patient. This patient's dysphasia resolved at the end of the post-op 1 month. Although pneumocephalus developed in the post-op period in 9 patients who underwent burr-hole craniostomy, they did not require surgical treatment and were observed to be spontaneously resorbed.

In addition, wound infection developed in the post-op period in 4 patients who underwent burr-hole craniostomy. Appropriate antibiotic therapy was given to these patients. At the end of the first week, no residual hematoma or recurrent hematoma was observed in the radiological examination of 18 patients with CT. The radiological improvement of 10 patients was completed at the end of the 1st month and the radiological recovery of 7 patients was completed at the end of the 3rd month (Graphic 1).



Graphic 1. Postoperative clinical and radiological recovery, residual and recurrence, exit rates

DISCUSSION

There is debate over the best course of action for treating chronic subdural hematomas (cSDH). It is among the most frequent neurosurgical conditions, and it is typically treatable with straightforward and efficient surgical techniques (26). The surgical management of cSDH is burr hole craniostomy with irrigation and closed system drainage. An independent predictor of cSDH recurrence is mixed density hematoma. The main factor contributing to the recurrence of cSDH may be the existence of a thick inner neomembrane (27). More study is required due to the poor methodology of the existing studies because neither performing two burr-hole craniostomies nor one burr-hole craniostomy provides particular differences in improvement in patient outcomes after chronic subdural hematoma surgery (28). The unilateral cHSH recurrence rate is not impacted by the quantity of burr holes used. Similar to this, the length of subdural drainage has little bearing on the frequency of postoperative infection or the unilateral cSDH recurrence rate (29). Compared to patients who underwent craniotomy, Raghavan A et al showed that patients treated with burr-hole required more reoperations. The outcomes in both groups were poorer when the participants were older and scored lower on the Glasgow Coma Scale (30). For refractory cSDH without organized hematoma, middle meningeal artery embolization can be necessary. For refractory organized cSDH cases, a large craniotomy or endoscope-assisted small craniotomy may be necessary (31). Through a retrospective review, Zhang, Jibo et al. shown that endoscopic aided trepanation drainage (EATD) is a more efficient and secure approach of treating isolated chronic subdural hematoma (ICSH) than craniotomy (32). In this investigation, Idowu OE and colleagues found a strong correlation between age and death. They added that the patients' age, gender, or type of anesthesia did not affect the recurrence of cSDH (33). The majority (92%) of recurrences, according to Rauhala M et al., happened within 60 days. They stressed that CT controls should only be used for symptomatic individuals and that a 2-month follow-up time following cSDH is sufficient for the majority of patients (34). According to Hideki Nakajima and colleagues, adopting an upright position straight after surgery does not increase the likelihood of a recurrent subdural hematoma (35). Patients without neurological symptoms may not need to get a delayed cerebral CT scan throughout the recovery phase (36). Complications that may occur after surgical treatment of chronic subdural hematoma are recurrent bleeding, seizures, intraparenchymal bleeding, and infections (37). Even for older patients who have lived longer than typical, surgical treatment for cSDH can result in outcomes that are both safe

and acceptable (38).

Although the majority of patients with posterior fossa cSDH have positive results, prior research indicates that significant posterior fossa cSDH may occasionally require surgical treatment (39). According to a meta-analysis by Sherrod, Brandon A. et al., preoperative MRI T1 hypo- or isointensity cSDH signal may indicate a higher likelihood of postoperative SDH recurrence (40). Due to increased mortality and lower GCS scores in patients with cSDH without a history of head trauma, more care should be taken in the follow-up of these patients (41).

CONCLUSION

In our study, some important points about patients who underwent burr hole craniostomy for cSDH evacuation were highlighted. It was observed that our patients who underwent Burr Hole craniostomy had higher reoperation rates compared to our patients who underwent craniotomy. We think that the presence of residual hematoma in the controls performed with CT in the post-op period should not be the sole criterion for re-operation. We think that CT controls are sufficient if there is improvement in the neurological status of the patient and a better GCS score in the post-op follow-up.

Although the drainage of chronic subdural hematoma with bur-hole craniostomy has a higher recurrence rate compared to the craniotomy method, it has a lower complication rate and is a more easily applicable surgical technique.

Ethics Committee Approval: This prospective study was approved by the ethical review committee of Ordu University (OMU) Hospital (2022/195)

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Author Contributions: Externally peer reviewed. Author Contributions: Concept, Design, Materials, Data Collection and Processing, Literature Review, Writing, Critical Review: HÖ, ÖFŞ

Conflict of Interest: The authors have no interests to declare.

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