BURR-HOLE DRAINAGE WITH DRAIN VERSUS BURR-HOLE DRAINAGE WITH DRAIN AND IRRIGATION IN TREATING CHRONIC SUBDURAL HEMATOMA: A CASE-CONTROL STUDY

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ABSTRACT

Background

Chronic subdural hematoma is a common neurosurgical condition. Its prevalence is increasing worldwide due to the increasingly aged population. Craniotomy, twist-drill craniostomy, and burr-hole drainage and drain with or without irrigation are among the very first lines of its management.

Objectives

We used burr-hole drainage with drain versus burr-hole drainage with drain and irrigation to find out which method is better regarding the outcome of chronic subdural hematoma treatment.

Patients and Methods

a case-control study design was used to inspect retrospectively both techniques in 47 patients. Twenty-one patients were treated with burr-hole drainage with drain only, and 26 were treated with burr-hole drainage with drain and irrigation.

Results

We found no statistically different association between the two types of operations and their outcomes (P value= 0.083 and Pearson's R Correlation= 0.029).

Conclusion

As long as there is no differences between the two techniques, irrigation is not necessary after burr-hole drainage of chronic subdural hematoma. It requires more time, more exposure of the patient to anesthetic agents, and increases the risk of both infection and pneumocephalus.

Keywords: *Chronic subdural hematoma (CSDH); Burr-hole drainage; Irrigation, Outcome.*

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INTRODUCTION

Chronic subdural hematoma (CSDH) is one of the most commonly encountered neurosurgical conditions. Its prevalence in the elderly population is about to increase as the average age of the population rises in most of the communities in the world [1]. It is defined as a liquefied hematoma in the subdural space which has an outer and inner membrane, and it usually becomes apparent at least 3 weeks after head injury [2]. The annual estimated incidence of CSDH is 13.5 per 100,000 individuals per year [3]. However, it is much more common in the elderly population and it might reach up to 58 per 100,000 individuals in patients 65 years of age or older [1, 4].

The first description of CSDH was done by J.J. Wepfer back in 1657 [5]. Later on, in 1857, Virchow described the pathophysiology behind its occurrence and named it patchymeningitis hemorrhagic interna [6]. By the time that description was made, the condition was regarded as fatal. But over the last 150 years, advancements in our better understanding of its pathology, imaging, and operative techniques made a dramatic improvement regarding its morbidity and mortality while treating it [6].

The exact pathophysiology of CSDH is still not clear [7]. Usually, it follows a minor trauma to the head, where the bridging veins are traversing between the dural border cell layer and arachnoid barrier cell layers, the injury to these veins causes slippage between these two layers and hence a subdural space will be formed in which there will be a collection of the upcoming blood [8].

The CSDH space is surrounded by an outer thick and an inner thin membrane [7]. The outer membrane contains macro-capillaries and endothelial gap junctions with increased permeability, which allows further bleeding into already established space and further enlargement of the hematoma [7, 8].

Multiple possible theories regarding occurrence and enlargement of CSDH were mentioned in the literature, like; osmotic gradient theory, inflammatory process theory, and capsule re-bleeding with enhanced fibrinolysis. Several vasoactive cytokines, inflammatory mediators, angiogenic factors like vascular endothelial growth factor (VEGF) and basic fibroblast growth factor (bFGF) and fibrinolytic agents were found within the fluid of CSDH [1, 9].

Its neurological symptoms and signs are variable which may include: headache, confusion, speech difficulties, cognitive difficulties, memory loss, seizures, and motor weakness (usually in the form of hemiparesis, although patients may present with quadriparesis as well) and involves various age groups [10].

Surgery is usually the preferred way to treat symptomatic CSDH. The treatment is usually either burr-hole drainage with drain and irrigation (BHDI) or burr-hole drainage with drain only (BHD) after which a closed drain system will be placed, twist drill craniostomy, or craniotomy. Although there is no universal consensus over which one is the best way [1, 11].

Burr-hole drainage is one of the most common procedures for treating CSDH. In which, a hole is usually drilled either on the frontal or parietal bone or both of them at the same session. Next, dura will be visualized, then cauterized and dissected with hematoma membranes after which the hematoma will be drained. Here, the subdural space is either irrigated (BHDI) with body temperature saline or not (BHD). And a drain will be left for 24-48 hours [1, 12].

In our hospitals, we usually use burr-hole drainage with irrigation or without irrigation, for irrigation we use body temperature saline until the fluid gets cleared, after each, we usually place a subdural closed system drain for approximately two days. Being part of the management, craniotomy for treating CSDH rarely is used in our centers.

When it comes to the treatment with drainage and irrigation or without it; the primary goal of every surgeon should be toward minimum exposure of the patient to both anesthetic drugs and time used to complete the procedure with the best clinical outcome.

So, we conducted this study to determine which of these two options (BHDI and BHD) are best, regarding the outcome of the patients both radiologically and clinically.

PATIENTS AND METHODS

A case-control design was used in our study in which patients' records were collected retrospectively over four years during (2015- 2019), either patients themselves or their first-degree relatives were contacted; thereafter the patients were all rechecked. 47 patients were included in the study, all of them presented with symptomatic CSDH and underwent an operation in that duration. According to the surgeons' preference, patients were either underwent BHDI or BHD.

The operations were taken place in Shaheed Dr. Aso, Shar, and Sulaymaniyah Surgical Emergency hospitals.

At the time of presentation, some were referred from clinics and some were admitted to the emergency department after the appearance of symptoms. The exclusion criteria were: recurrent CSDH, subdural hygroma, and childhood subdural collections. None of the patients were operated upon unless the correction of coagulopathies were done. The collected data were: age, gender, presenting symptoms, and signs with corresponding Glasgow Coma Scale (GCS) score and computed tomography (CT scan) of the brain. The outcome of the patients was assessed clinically and radiologically.

The "IBM SPSS Statistics version 25" was used for the analysis of the data and both descriptive and inferential statistics were used. Furthermore, a P-values of ($\leq$0.05, and <0.001) were considered as statistically significant, and highly significant associations, respectively. Also, Pearson Chi-Square was used to find out the significance of the association between independent and dependent variable pairs, and Pearson's R Correlation was used to calculate the direction of the correlation between the two variables.

RESULTS

The mean ± standard deviation (SD) for age in years was 68.32 ± 15.389 (from 23 to 99). The male to female ratio was 3.3:1.

Out of the 47 patients who were included in the study, 21 (44.7%) of them underwent BHD, of whom male to female ratio was (2.5:1), and 26 (55.3%) underwent BHDI of whom male to female ratio was 4.2:1. The mean ± SD of GCS were (12.56 ± 2.572 and 14.20 ± 1.155) in BHD and BHDI groups respectively.

And those who had recurrence were 6 (12.8%) patients; all were among the BHDI group and were all re-operated.

Statistically, there was a positive insignificant association between the outcome and the types of operation. (Table 1).

There were no statistically significant gender and age difference among the groups. (Table 2 and 3)

Presenting symptoms and signs are shown in (Table 4).

Table 1. Association between the outcome and the types of operation.

Outcome		Operation		Total	P-value (Pearson's R Correlation)
		BHD	BHDI		
Good (no recurrence)	Count	15	17	32	0.083 (0.029)
	% of Total	31.9%	36.2%	68.1%	
Bedridden	Count	2	1	3	
	% of Total	4.3%	2.1%	6.4%	
Recurrence	Count	0	6	6	
	% of Total	0.0%	12.8%	12.8%	
Died	Count	4	2	6	
	% of Total	8.5%	4.3%	12.8%	
Total	Count	21	26	47	
	% of Total	44.7%	55.3%	100%	

Table 2. Association of gender with the type of operations.

Operation		Gender		Total	P-value
		Male	Female		
BHD	Count	15	6	21	0.452
	% of Total	31.9%	12.8%	44.7%	
BHDI	Count	21	5	26	
	% of Total	44.7%	10.6%	55.3%	
Total	Count	36	11	47	
	% of Total	76.6%	23.4%	100.0%	

Table 3. Association of age groups with the type of operations.

Operation		Age groups (year)			Total	P-value
		20-45	46-70	71-99		
BHD	Count	2	8	11	21	0.367
	% of Total	4.3%	17.0%	23.4%	44.7%	
BHDI	Count	1	15	10	26	
	% of Total	2.1%	31.9%	21.3%	55.3%	
Total	Count	3	23	21	47	
	% of Total	6.4%	48.9%	44.7%	100.0%	

Table 4. Presenting symptoms and signs.

Symptoms and signs		Operation		Total (%)
		BHD (%)	BHDI (%)	
Side of paresis	Right	5 (10.6)	17 (36.2)	22 (46.8)
	Left	11 (23.4)	6 (12.8)	17 (36.2)
	Bilateral	5 (10.6)	3 (6.4)	8 (17)
Headache		3 (6.4)	5 (10.6)	8 (17)
Slurred speech		0 (0)	6 (12.8)	6 (12.8)
Decreased level of consciousness		9 (19.1)	4 (8.5)	13 (27.7)
Vomiting		4 (8.5)	2 (4.3)	6 (12.8)

DISCUSSION

The main presenting symptoms in our study were hemiparesis (right side 46.8%, left side 36.2% and bilateral in 17%) and decreased level of consciousness (27.7%), which were also the main presenting symptoms (72% and 52.7%) and (33% and 35%) in Kareem et al. [13] and Santarius et al.[4] studies, respectively.

Headache was present in (17%) of the cases, which was (20% and 37%) in the two groups of Kim et al. [8] and (18%) in Santarius et al. [4] studies, respectively. Speech difficulties were (12.8%), which was (6% and 5.5%) in Kareem et al. [13] and Santarius et al. [4] studies, respectively. Treatment of CSDH with burr-hole drainage, irrigation, and drain was first reported by McKissock and Richardson in the 1960s and nowadays it became the most widely used method for managing uncomplicated hematomas [3]. Although the preferred way of its treatment until the 1970s was craniotomy [14].

Whether to do burr-hole drainage with drain only or with irrigation has long become an over questioned subject. In our study, n=26 (55.3%) underwent BHDI, and n=21 (44.7%) of them underwent BHD. There were 6 (12.8%) patients who had recurrence; all of them were in the BHDI group, although statistically; there was no significant association between the type of the operations and the outcome (Table 1).

Although, Ishibashi et al. [15] reported in their study of 92 patients that BHDI had a better outcome than BHD alone, in which recurrence was (2.9% vs. 10.3%) respectively. But, Gurelik et al. [16] reported that there is no significant difference between the two types of operation regarding its outcome in their study in which 80 patients were included. Also, Wang et al. [7] reported no significant association between the two, in terms of re-bleeding, recurrence and complications in their study of 151 patients ($p > 0.05$), in addition to that, he also elaborated that it may increase the chance for postoperative development of pneumocephalus. The same was also reported by Kim et al. [8].

A meta-analysis by Yuan et al.[1] of seven retrospective cohort studies and two randomized control trials involving 993 patients, suggested that there is no significant difference between the two approaches regarding the recurrence and complications.

So, as long as BHDI and BHD are not yielding any difference in their outcomes. BHDI usually is more time consuming and elongates the time of operation. Besides, it exposes the patient to more general anesthetic drugs, and the saline that's used for irrigation probably increases the chance for infection and development of postoperative pneumocephalus [8].

The complications that are mentioned in the current literature are the evolution of the CSDH on the contralateral side, or epidural hematoma on the ipsilateral side, pneumocephalus, and complications that are postoperative such as pneumonia, urinary tract infections, and heart related conditions together with the factors that are involved in CSDH recurrence [3, 13, 17].

In our study, we had six patients who had a recurrence. Five recurred within the first six months and one after one year, two of them had pneumocephalus on postoperative CT scans. All six patients were re-operated. Other mentioned complications that are in literature were not faced in the study.

Irrigation during burr-hole drainage in the treatment of CSDH has not added any long term efficacy in terms of recurrence, re-bleeding, and complications when compared with burr-hole drainage with drain only. Furthermore, the procedure requires more time and exposes the patient to more of the anesthetic substances, and the introduction of saline increases more chance for postoperative infections and pneumocephalus.

Despite all the current evidence, further studies are required to evaluate both techniques in treating CSDH.

There are a few limitations to this study. First, the small sample size. Second, shortage of information in the case sheets of the participants, as there is no electronic medical records or database that has all the relevant needed information regarding past medical and surgical history of the patients. Third, reluctancy of some of the participants regarding their follow up.

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Conflict of interest

Nothing to declare.

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