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Subperiosteal drain versus subdural drain in chronic and subacute subdural hematoma burr-hole evacuation. A comparative study (local experience)

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Abstract

Background: Chronic subdural hematoma (cSDH) is one of the most prevalent neurosurgical conditions, with burr-hole drainage being the standard surgical procedure. While subdural drain (SDD) insertion reduces recurrence rates, subperiosteal drain (SPD) placement has shown comparable recurrence rates with fewer complications.

Objective: To compare the outcomes of SPD and SDD in chronic and subacute subdural hematoma burr-hole evacuation.

Methods: A prospective, randomised study was conducted on 200 patients admitted to the Neurosurgery Department at Mansoura University Hospitals. Patients were allocated into two equal groups: SPD (n=100) and SDD (n=100). Outcomes measured included recurrence rate, infection, seizures, mortality, parenchymal injury, and new neurological deficits.

Results: The recurrence rate was significantly higher in the SDD group (14%) compared to the SPD group (4%). Infection rates were 6% (SDD) and 4% (SPD), seizures occurred in 10% (SDD) and 4% (SPD), mortality was 4% (SDD) and 2% (SPD), and parenchymal injury was observed only in the SDD group (4%). New neurological deficits were noted in 10% (SDD) and 6% (SPD) of cases.

Conclusion: SPD is superior to SDD in terms of recurrence rate, incidence of seizures, parenchymal injury, and new neurological deficits. Although infection and mortality rates were lower with SPD, the difference was not statistically significant.

Keywords
chronic subdural hematoma, subdural drain, subperiosteal drain, burr-hole evacuation

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Introduction

Chronic subdural hematoma (CSDH) is characterized by liquefied hematoma in the subdural space, often presenting as a hypodense or isodense crescentic collection on CT scans [1]. The elderly are most affected, with incidence rates ranging from 1.7 to 21 per 100,000 people annually [2]. Symptoms vary from headache and confusion to focal neurological deficits [3].

Burr-hole evacuation remains the preferred surgical technique, with postoperative drainage improving outcomes [4]. The choice between subdural (SDD) and subperiosteal drains (SPD) is contentious, with recent studies favoring SPD for its minimally invasive nature [5-9]. This study compares the efficacy and complications of SPD and SDD in a single-center experience.

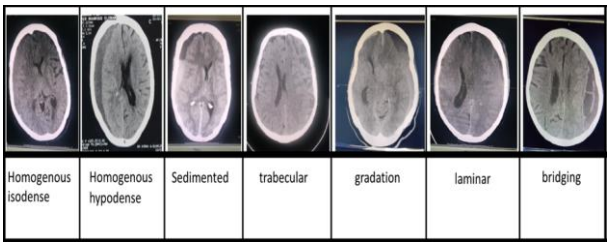


Figure 1. Types of chronic and subacute subdural hematoma in non-contrast CT brain.

PATIENTS AND METHODS

Study Design

A prospective, randomized study was conducted at Mansoura University Hospitals, including 200 patients (100 SPD, 100 SDD) with CSDH or subacute SDH.

Inclusion Criteria

- Adults >18 years.
- Hematoma size ≥10 mm or midline shift ≥5 mm.
- Focal neurological deficit or GCS ≤14.

Exclusion Criteria

- Acute subdural hematoma.
- Previous burr-hole evacuation for CSDH.

Surgical Procedure

- Patients were positioned supinely under general anesthesia.
- Two burr holes (frontal and parietal) were drilled, followed by hematoma evacuation.
- Drains (SPD or SDD) were placed and connected to a ventriculostomy bag.
- Postoperative care included antibiotics, antiepileptics, and supine positioning for 24 hours.

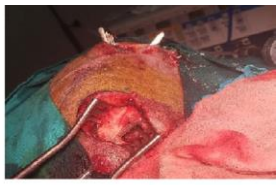
Outcome Measures

- Recurrence rate.
- Infection, seizures, mortality.
- Parenchymal injury and new neurological deficits.

Statistical Analysis

Data were analyzed using SPSS v26. Qualitative data were compared using Chi-Square and Fisher's exact tests ($p \leq 0.05$).

two subdural drains



subperiosteal drain

RESULTS

As regard recurrence rate between studied groups, it was 14(14%) in SD group while it was 4(4%) in SP group. As regard rate of infection between studied groups it was 6(6%) in SD group while it was 4(4%) in SP group.

As regard incidence of seizures between studied groups it was 10(10%) in SD group while it was 4(4%) in SP group. As regard mortality rate between studied groups, it was 4(4%) in SD group while it was 2(2%) in SP group.

As regard incidence of parenchymal injury between studied groups it was 4(4%) in SD group while there was no parenchymal injury in SP group. As regard incidence of new neurological deficits between studied groups there was deterioration in 10(10%) in SD group while there was deterioration in 6(6%) in SP group.

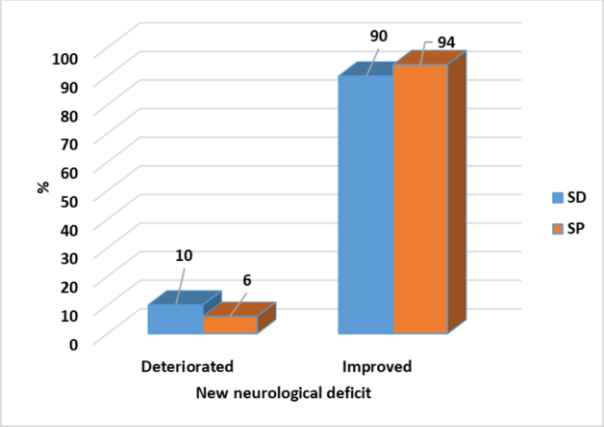
All the outcomes were comparable between the two groups except for the recurrence rate that was significantly higher in the SD group.

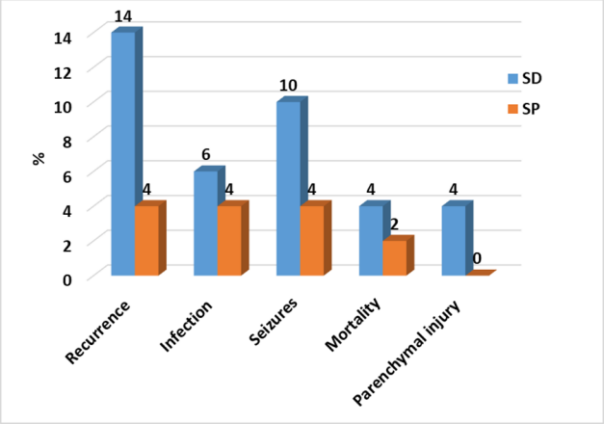
Table 1. Comparison of outcome among studied groups

	SD N=100(%)	SP N=100(%)	Test of significance
Recurrence			
-ve	86(86.0)	96(96.0)	χ^2**=6.11**
+ve	14(14.0)	4(4.0)	**P=0.013***
Infection			
-ve	94(94.0)	96(96.0)	χ^2=0.421
+ve	6(6.0)	4(4.0)	P=0.516
Seizures			
-ve	90(90.0)	96(96.0)	χ^2=2.76
+ve	10(10.0)	4(4.0)	P=0.096
Mortality			
-ve	96(96.0)	98(98.0)	FET =0.687
+ve	4(4.0)	2(2.0)	P=0.683
Parenchymal injury	96(96.0)	100(100.0)	FET=4.08

No **Yes**	4(4.0)	0	p=0.121
New neurological deficit **Deteriorated** **Improved**	10(10.0) 90(90.0)	6(6.0) 94(94.0)	χ^2=1.08 P=0.297

χ2=Chi-Square test, FET: Fisher exact test *: Statistically significant





Discussion

CSDH is a prevalent disorder in neurosurgical practice. Surgical therapy is necessary for people who exhibit symptoms. Level I research suggests that removing burr holes and installing drains can significantly lower the recurrence rate [10, 11]. According to an international study of surgeons' practices worldwide, the most popular approach for drain insertion was SDD placement (50%), whereas 27% of respondents utilized the SPD and 23% used an SDD predominantly and SPD otherwise [12]. The current study aims to compare the effectiveness of two strategies using our own single-center experience.

Due to its substantial influence on the prognosis of CSDH, the key outcome chosen was the postoperative recurrence rate [13-15].

Our results showed that SPD group has statistically better results than SDD in terms of recurrence. In accordance to our results, Soleman et al. showed that recurrence rate was lower in the SPD group (8.33%) than in the SDD group (12%) [16]

Zhang et al. (11 and 13%) [12], Chih et al. (7 and 10%) [17] and Oral et al. (6 and 8%) [18] did not reveal a noteworthy variation in recurrence rates, whereas Kaliaperumal et al.'s investigation revealed no recurrences at all [19]. On the other hand, Häni et al. (24 and 22%) [20], Glancz e t al. (9 and 8%) [21] and Ishfaq (13 and 10%) [22] revealed that the SDD group experienced fewer recurrences than the SPD group; however, none of these investigations found statistical significance.

A high death rate, poor prognosis, and recurrence are all caused by significant volumes of remaining hematoma. The dura and the subdural membrane were suggested to be involved to initiating an inflammatory response that yields the inflammatory exudates. This subsequently leads to hematoma formation and progression. The postoperative drainage when analyzed was shown to contain increased levels of fibrin degradation products, plasminogen activator, kallikrein, interleukin-6, platelet-activating factor, fibroblast growth factor and vascular endothelial growth. These factors are supposed to be responsible for recurrence of the hematoma [23, 24].

In our study , the risk of seizures and infection was higher in the SDD group, yet it showed no statistically significant difference when compared to SPD group.

This was consistent with the findings of a previous meta-analysis that found no discernible link between the frequency of epilepsy and postoperative infection [6].

The difference was significant in favor of the SPD as shown by Soleman and his colleagues, where the SPD group showed significantly lower rates of surgical infections (P = .0406) [16].

In previous investigations, neither group's participants experienced surgical site infections or post-operative seizures [7, 17].

The brain insult was suggested to be responsible for development of post-traumatic epilepsy. However, it didn't match the findings where the SDD

technique is associated with more injury to the parenchyma, but the rate of seizure was comparable between the two techniques [25]. This theory should be furtherly tested in subsequent studies.

It is theoretically possible that the contact from the drainage increases the likelihood of CNS infection in the SDD group. Overall infection rates were modest in all investigations, however, and SPD and SDD did not significantly differ from one another. Most likely, using antibiotics appropriately is enough to lower the risk of infection. However, because SDD insertion is more challenging than SPD, the frequency of superficial infections was shown to be greater in the SDD group [16].

As regard incidence of new neurological deficits between studied groups there was deterioration in 10 (10%) in SD group while there was deterioration in 6 (6%) in SP group.

This was in contrast to Pranata et al.'s findings, which demonstrated that parenchymal damage or new neurological impairments were substantially smaller (almost fourfold) in SPD than in SDD [26]. Compared to SPD, SDD is unquestionably more invasive and more likely to result in parenchymal damage.

In our study, mortality rate showed no statistically significant difference between two studied groups. This was in accordance with many previous studies. The mortality rate reported by Xie et al. was of 3.7 and 3.8% [27] and that reported by Ding et al. was 4.8% and 4.5% [28] while Pranata et al. showed that the mortality rate was 15.7% and 9.4% [26] in SPD and SDD respectively.

Limitations

Short period of follow up and a smaller number of cases limited our detailed assessment of various parameters in our study. surgeon experience may influence outcomes. Larger studies with longer period of follow up are mandatory to make more concise conclusions

Conclusion

SP drain is better than SD drain as regard recurrence rate, incidence of seizures, incidence of parenchymal injury and incidence of new neurological deficits also it was better than SD drain as regard rate of infection and mortality rate with no statistically significant difference between two studied groups.

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