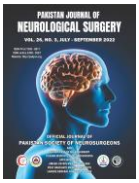

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Original Article

Effect of Drain Placement on Postoperative Radiology Following Burrhole Drainage of Chronic Subdural Hematoma

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ABSTRACT

Objective: The effect of drain placement on postoperative radiology following burrhole drainage of chronic subdural hematoma (ChSDH) is a topic that has been rarely addressed in the literature. Our study was designed to study the effects that postoperative drain placement has on different radiological parameters following ChSDH evacuation.

Materials & Methods: We studied the data of 117 patients operated on with burrhole drainage of ChSDH and divided the patients into two groups. In the first group, a postoperative subdural drain had been placed while the second was the no drainage group. The pre-and postoperative CT brain of the patients was analyzed and the change in the hematoma width and midline shift was noted.

Results: In the drainage group, 12 (18.2%) patients had a recurrence. In the no-drainage group also 12 (23.5%) patients had a recurrence. The difference in recurrence wasn't significant ($p = 0.4775$). The mean change in the width of the hematoma was 0.95 ± 0.37 mm in the drainage group, while in the no drainage group, this was 0.51 ± 0.37 mm. This difference was very significant ($p < 0.0000001$). The mean change in the midline shift was 0.51 ± 0.21 mm in the drainage group, while in the no drainage group, this was 0.26 ± 0.22 mm and this difference again was very significant ($p < 0.0000001$).

Conclusion: The placement of a subdural drain following burrhole evacuation of ChSDH leads to significantly decreased postoperative hematoma width and mass effect providing the radiological corroboration for drain placement.

Keywords: Postoperative radiology, chronic subdural hematoma, subdural drain, hematoma width, midline shift.

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INTRODUCTION

One of the commonest surgical interventions carried out in a neurosurgical center is the

drainage of a ChSDH.[1,2] The incidence of ChSDH varies between 8.2 to 14 per hundred thousand per year and is increasing because of the increase in the aged population.[3] Surgical evacuation of the ChSDH through burrhole drainage is the gold standard treatment.[4,5] Recurrence following a surgical evacuation is high and may reach up to 33%.[6,7,8] Recurrence deteriorates the clinical outcome and leads to increased morbidity and mortality.[1,9] The association between radiological parameters and recurrence is a topic that has been studied extensively, although the evidence remains conflicting and the association between different radiological parameters and recurrence remains controversial.[3] The passage of a subdural drain postoperatively following burrhole drainage of ChSDH reportedly leads to decreased recurrence and improved outcomes.[5,9,10] The effect of postoperative drain placement on postoperative radiology following ChSDH evacuation is a topic that has been, however, rarely addressed in the literature.[3] Only a few studies have assessed the changes that the passage of a drain has on postoperative radiology. Glancz et al,[3] addressed this topic in detail and studied the effect of postoperative drain placement on different radiological parameters. We designed to study the effects that postoperative drain placement has on different radiological parameters by comparing the pre- and postoperative CTs of the patients that had undergone burrhole evacuation of ChSDH.

MATERIALS & METHODS

Study Design

Our study was a retrospective observational study. We collected the clinical data of all the ChSDH patients operated on with burrhole drainage in the neurosurgery center of Lahore General Hospital from December 2013 to March 2015 and studied it retrospectively.

Inclusion Criteria

Patients that had their ChSDHs treated surgically with burrhole drainage and in whom a preoperative CT, as well as a postoperative CT obtained within seventy-two hours, were available were included in the study.

Exclusion Criteria

Patients with bilateral ChSDHs had been excluded.

Patients that developed hemorrhagic postoperative complications had also been excluded from our study.

Patients in whom a postoperative CT had been obtained after seventy-two hours were also excluded.

Patient Management Protocol

The patients had been operated on with either a single or double burrhole. The passage of a subdural drain postoperatively had been at the discretion of the treating neurosurgeon. The patients were then divided into two groups. The first was the drainage group and in these patients, a postoperative subdural drain had been placed. The second was the no drainage group. In this group were included the patients in whom a postoperative drain had not been placed. The pre-and postoperative CT brain of the patients was then analyzed. The change in hematoma width and the change in the midline shift (MLS) between the pre-and postoperative CT brain were then noted for all the patients. Recurrence was defined as the re-accumulation of hematoma on postoperative CT brain accompanied by either no improvement in patient symptomatology or a recurrence of clinical symptoms. The decision of revising the surgery was at the discretion of the treating neurosurgeon. All the patients had a follow-up of at least three months after the surgical intervention.

Statistical Analysis

The drainage and no drainage group were compared for recurrence by employing a Chi-square test. The two groups were also compared for the change in hematoma width and MLS between the pre-and postoperative radiology using an independent t-test. We deemed the results as statistically significant when the p-value was < 0.05.

Ethical Committee Approval

As the acquirement and analysis of the data were retrospective so ethical committee approval wasn't required.

RESULTS

The data of one hundred and seventeen patients were included in the study. Ninety-six of them were males and twenty-one were females.

Age Distribution

The mean age of the drainage group was 67.9 years and of the no drainage group was 58.5 years.

Postoperative Recurrence, Change in MLS, and Width of the Hematoma

Overall, 24 (20.5%) patients out of 117 patients had a recurrence. In the drainage group, 12 (18.2%) patients had a recurrence. In the no-drainage group again also 12 (23.5%) patients had a recurrence. In all the patients except one the revision surgery for recurrence was carried out within two weeks of the initial surgery with the mean timing of revision surgery being 6.1 days postoperatively. In one patient the revision surgery was carried out on the 26th postoperative day.

The difference in recurrence did not reach statistical significance (p = 0.4775) as has been shown in Table 1.

The mean change in hematoma width on pre- and postoperative CTs was 0.95 ± 0.37 mm in the drainage group, while in the no drainage group, the change in the hematoma width was 0.51 ± 0.37 mm. This difference was found to be very significant (p < 0.0000001) as depicted in Table 2.

The mean change in the midline shift on pre- and postoperative CTs was 0.51 ± 0.21 mm in the drainage group, while in the no drainage group, the change in the midline shift was 0.26 ± 0.22 mm. This difference was again very significant (p < 0.0000001) as depicted in Table 3.

Table 1: Relationship between postoperative drainage and recurrence.

	Drainage Group (n = 66)	No Drainage Group (n = 51)	p-value
Recurrent	12 (18.2%)	12 (23.5%)	0.4775
Non-recurrent	54 (81.8%)	39 (76.5%)	

Table 2: Relationship between postoperative drainage and change in hematoma width.

	Drainage Group (n = 66)	No Drainage Group (n = 51)	p-value
Change in hematoma width Mean ± SD (mm)	0.95 ± 0.37	0.51 ± 0.37	< 0.0000001

Table 3: Relationship between postoperative drainage and change in midline shift.

	Drainage Group (n = 66)	No Drainage Group (n = 51)	p-value
Change in midline shift Mean ± SD (mm)	0.51 ± 0.21	0.26 ± 0.22	< 0.0000001

DISCUSSION

The relationship between ChSDH recurrence and its radiological predictors is an extensively studied topic. The results though remain conflicting and there is a lack of consensus on the topic.[3] Evidence now suggests that postoperative drain placement decreases ChSDH recurrence and leads to improved outcomes.[3,5,9,10,11,12] Glancz et al,[3] in their study noted that the medical data of ChSDH evacuation in the UK showed that the group of patients in whom a subdural drain had been placed was much larger than the group of patients in whom no drain had been placed showing the preference of neurosurgeons for placing subdural drains postoperatively following ChSDH evacuation.

One of the earliest studies that reported the beneficial effects of drain placement on reducing ChSDH recurrence was carried out by Wakai et al.[13] They reported that drain placement led to a more rapid reduction of hematoma volume. Erol et al,[14] in their study reported a higher postoperative resolution rate in patients in whom a drain had been placed compared to patients that had undergone simple burrhole drainage without drain placement (60% vs. 40%). Glancz et al[3] in their study studied the changes in postoperative radiology after drain placement following ChSDH evacuation. They reported that the median width of the hematoma decreased significantly in patients in whom a postoperative subdural drain had been placed compared to patients in whom no drain had been placed (11 mm vs. 6 mm, $p < 0.01$). Similarly, a significant decrease in median MLS was noted in patients in whom a drain had been placed (4 mm vs. 3 mm, $p < 0.01$). In our study, we noted a reduced recurrence rate of 18.2% in patients in whom a subdural drain had been placed compared to a 23.5% recurrence rate in the no drainage group but this difference did not turn out to be statistically significant ($p = 0.4775$). The decrease in hematoma width and midline shift were however found to be very significant in the drainage group ($p < 0.0000001$). Our findings are thus quite similar to those reported by Glancz et al,[3] also found a significant decrease in hematoma width and midline shift after drain placement compared to the no-drainage group.

Limitations

The radiology had been assessed by a neurosurgeon only without involving a radiologist. To mitigate this only simple radiological parameters had been studied. Data were collected from a single center and the patient population was rather small. A randomized study involving a radiologist with a larger sample size is required to clearly define the effects of subdural drain placement on postoperative radiology following ChSDH evacuation.

CONCLUSION

The placement of a subdural drain following burrhole evacuation of ChSDH leads to significantly decreased postoperative hematoma width and mass effect providing the radiological corroboration for its recommended placement.

RECOMMENDATIONS

Subdural drains should be placed following burrhole evacuation of ChSDH as they lead to significantly improved postoperative radiology.

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Additional Information

Disclosures: Authors report no conflict of interest.
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Human Subjects: Consent was obtained by all patients/participants in this study.
Conflicts of Interest:
In compliance with the ICMJE uniform disclosure form, all authors declare the following:
Financial Relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.
Other Relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

AUTHORS CONTRIBUTIONS

Sr.#	Author's Full Name	Intellectual Contribution to Paper in Terms of:
1.	Imran Altaf	1. Study design, methodology, data collection, calculations, and paper writing.
2.	Imran Altaf, & Muhammad Rizwan Sarwar	4. Analysis of data and interpretation of results.
3.	Imran Altaf	5. Literature review and referencing.
4.	Imran Altaf, & Muhammad Rizwan Sarwar	6. Editing and quality insurer.