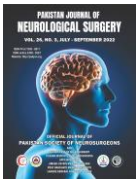

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Original Article

Surgical Modality as a Determinant of Survival and Neurological Outcome Following the Evacuation of Acute Subdural Hematomas

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ABSTRACT

Objective: Traumatic acute subdural hematoma (AcSDH) is one of the most devastating brain injuries and the optimal surgical modality for treating it still to date remains controversial. We designed the present study to compare the clinical outcomes of the craniotomy and the decompressive craniectomy procedures that we had performed in our department for evacuating traumatic acute subdural hematomas.

Material and Methods: We retrospectively analyzed the medical data of all the adult patients in whom a craniotomy or a decompressive craniectomy had been performed for evacuating acute traumatic subdural hematoma. The demographic data, the preoperative Glasgow Coma Scale (GCS), and the clinical outcome were studied.

Results: A craniotomy had been carried out in five patients for traumatic AcSDH evacuation while in twelve patients a decompressive craniectomy had been performed. The mean preoperative GCS was 9 in the patients that underwent a craniotomy, whereas the mean preoperative GCS in the decompressive craniectomy group was 6.8. The overall mortality was 47%. In the craniotomy group, 4 (80%) patients survived and 1 (20%) patient expired. In the decompressive craniectomy group, 5 (41.7%) patients survived and 7 (58.3%) patients expired. The outcome in all the 9 surviving patients was favorable based on the Glasgow Outcome scale and all of them were independent of follow-up.

Conclusion: Better clinical outcome was observed in patients who had undergone a craniotomy compared to those in whom a decompressive craniectomy had been performed. Patients that underwent a craniotomy were also in a better clinical status preoperatively compared to patients who underwent a decompressive craniectomy.

Keywords: Traumatic acute subdural hematoma, craniotomy, decompressive craniectomy, preoperative clinical status.

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INTRODUCTION

Acute subdural hematoma has been described as one of the most devastating brain injuries.[1] It occurs in 10-30% of traumatic brain injuries.[2] The mortality is high and the quoted range in the literature varies between 40-90%.[3-6] The two primary surgical procedures available for evacuating an Ac SDH are a craniotomy and decompressive craniectomy.[2,7] Multiple studies have been carried out comparing the results of these two surgical modalities for treating acute subdural hematomas. These studies have shown conflicting results. Some authors concluded that the outcome remains the same irrespective of the fact whether a craniotomy or a decompressive craniectomy had been carried out for evacuating an AcSDH, and the results of these surgical modalities didn't significantly differ from each other.[8- 9] Others found the craniotomy to be the better of the two surgical options and these authors concluded that patients in whom a craniotomy had been performed had a significantly better outcome as compared to patients that had undergone a decompressive craniectomy.[2,7] The results of many studies favoring craniotomy, however, got complicated by the fact that the patients that underwent a decompressive craniectomy were in a worse preoperative clinical condition compared to the patients in whom a craniotomy had been carried out to start with, and thus there lay an intrinsic framework for a worse outcome in the decompressive craniectomy group patients.[7,10]

Our study was designed to address this issue of the optimal surgical modality for evacuation of an acute subdural hematoma and we compared the clinical outcome of patients that had undergone a craniotomy or decompressive craniectomy for treating traumatic AcSDHs in our setup.

MATERIAL AND METHODS

Study Design and Setting

The study was a retrospective observational study carried out in the department of neurosurgery Khawaja Safdar Medical College Sialkot. We retrospectively collected the data of the patients that had undergone a craniotomy or decompressive craniectomy for evacuation of an AcSDH from 21st June 2021 to 12th May 2022. The parameters of age, sex, preoperative GCS, and clinical outcome based on the Glasgow Coma Scale (GOS) were studied.

Inclusion Criteria

We included all the adult patients that had been operated on with a craniotomy or decompressive craniectomy for treating an AcSDH. The AcSDH had been diagnosed on CT brain in all our cases. The size of the subdural hematoma was more than 1 cm and the midline shift exceeded 5 mm in all the cases.

Exclusion Criteria

Patients that were operated on for pathologies other than an acute traumatic subdural hematoma such as for a large contusion or a spontaneous acute subdural hematoma were left out. Patients whose follow-up was shorter than4 months were also excluded from the study.

Patient Groups and Operative Technique

We divided our patients into two groups. In the first group, we included those patients in whom a craniotomy had been performed. In the second group, we included those patients that had been operated on with a decompressive craniectomy.

The craniotomy was a standard burrhole craniotomy with the bone flap being replaced at the end of the procedure. For performing a decompressive craniectomy one of the two

methods had been followed. Either the bone flap was not replaced after a burr hole craniotomy had been performed or we had carried out a primary temporal craniectomy that usually extended up to the base of the skull. We followed all the patients for more than 4 months. The clinical outcome was classified based on the GOS score. A GOS score of 4 or 5 was deemed favorable, while a score of 3 or less was to be classified as unfavorable.

Ethical Committee Approval: As we had carried out a retrospective study so there was no requirement for approval from an ethical committee.

Data Analysis

An independent t-test was performed for comparing the preoperative GCS of the craniotomy and the decompressive craniectomy groups. The two groups were also compared for mortality using a chi-square test. The results were to be considered statistically significant if the p-value was < 0.05.

RESULTS

Gender Distribution

Our study included seventeen patients. Sixteen of them were males and there was one female.

Age Distribution

The mean age was 36 years in patients that underwent a craniotomy. The mean age of patients in the decompressive craniectomy group was 42.2 years.

Clinical Outcome in the Craniotomy and the Decompressive Craniectomy Groups

In five patients a craniotomy had been performed for traumatic AcSDH evacuation. In twelve patients a decompressive craniectomy had been carried out. The mean preoperative GCS was 9 in the patients that underwent a craniotomy, whereas the mean preoperative GCS in the decompressive craniectomy group was 6.8. The difference in preoperative GCS between these two groups didn't reach statistical significance (p = 0.2369) as table 1 shows.

Table 1: Comparison of preoperative GCS between the craniotomy and the decompressive craniectomy groups.

	Craniotomy (n = 5)	Decompressive Craniectomy (n = 12)	p-value
Preoperative GCS Mean ± SD	9 ± 2.83	6.8 ± 3.46	0.2369 (insignificant result)

The overall mortality was 47%. In the craniotomy group, 4 (80%) patients survived and 1 (20%) patient expired. In the decompressive craniectomy group, 5 (41.7%) patients survived and 7 (58.3%) patients expired. The difference in the clinical outcome between our two surgical groups, however, didn't reach statistical significance (p = 0.07459) as depicted in table 2.

Table 2: Relationship between the surgical modality and survival.

Procedure	Alive	Dead	p-value
Craniotomy	4	1	0.07459 (Insignificant result)
Decompressive craniectomy	5	7	
Total	9	8	

There were nine surviving patients, four in the craniotomy group and five from the decompressive craniectomy group. The outcome of all these

nine patients were favorable based on the Glasgow Outcome scale and all of them were independent of follow-up.

DISCUSSION

The optimal surgical modality for evacuating an AcSDH remains a controversial and debated topic.[2,7,9,11,12,13] The clinical practice amongst neurosurgeons regarding the choice of surgical modality for treating an acute traumatic subdural hematoma varies widely around the globe.[2] The decision for carrying out a craniotomy or a decompressive craniectomy remains empirical and the treating neurosurgeon makes this decision based on his personal experience and the clinical status of the patient.[7,14,15]

Studies conducted on the topic have failed to evolve a consensus on the subject of whether a craniotomy or a decompressive craniectomy leads to a better clinical outcome. Multiple studies concluded that for an acute subdural hematoma a craniotomy leads to a better clinical outcome compared to a decompressive craniectomy.[2,7,16,17] Ahmed N et al[8] and Chen SH et al[9] however concluded that the results do not differ significantly between a craniotomy and a decompressive craniectomy when treating acute subdural hematomas. In the analysis of the studies that found craniotomy to be associated with a better outcome, it was noted that Kwon YS et al[7] and Phan K et al[17] in their studies had stated that although the results of craniotomy were better than decompressive craniectomy yet the fact was that the patients in whom a decompressive craniectomy had been performed were the ones in whom the preoperative clinical status was worse to start with compared to the craniotomy group, and thus there existed an intrinsic framework for a poorer outcome in the decompressive craniectomy group compared to the craniotomy group. In our study, we observed a similar tendency. The treating neurosurgeon tended to perform decompressive craniectomy in patients who were in a comparatively poor clinical status (Mean GCS = 6.8) compared to patients in whom a craniotomy (Mean GCS = 9) had been performed. Similarly, a better clinical outcome was observed in patients who had undergone a craniotomy. Although not reaching statistical significance, a survival rate of 80% in patients who had undergone a craniotomy was better than a survival rate of 41.7% observed in patients in whom a decompressive craniectomy had been performed. We thus conclude that better clinical outcome was observed in patients who had undergone a craniotomy compared to patients in whom a decompressive craniectomy had been performed, although patients who underwent a decompressive craniectomy were in a comparatively poor preoperative clinical status to start with.

Limitations

Ours was a retrospective study confined to data acquirement from one neurosurgical center. The sample size was also small. A prospective study involving multiple centers with a larger patient population is required to clearly define the relationship between the clinical outcome and the surgical modality employed for evacuating acute traumatic subdural hematomas.

CONCLUSION

Better clinical outcome was observed in patients who underwent a craniotomy compared to those in whom a decompressive craniectomy had been performed. Although patients that underwent a craniotomy were also in a better clinical status preoperatively compared to patients who underwent a decompressive craniectomy.

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Additional Information

Disclosures: Authors report no conflict of interest.
Ethical Review Board Approval: The study conformed to the ethical review board requirements.
Human Subjects: This was the retrospective 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

Author's Full Name	Intellectual Contribution to Paper in Terms of:
Imran Altaf	Study design, methodology, data collection, analysis, editing and paper writing.
Muhammad Rizwan Sarwar	Literature review, data collection, referencing, editing and calculations.