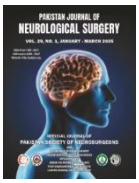

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Original Research

Functional Outcome of Chronic Subdural Hemorrhage on Glasgow Comatose Outcome Scale Extended

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ABSTRACT

Objectives: Chronic Subdural hemorrhage is one of the most common neurosurgical disorders, mainly affecting the older population. The main objective is to assess the functional outcome of patients with Chronic Subdural hematoma on GCOSE.

Materials and Methods: This is a prospective cross-sectional study conducted at Liaquat University Hospital Hyderabad with a duration of January to December 2023. Patients presented with CSDH and different management was performed at the time of discharge or death GCOSE scale was recorded on a predesigned questionnaire.

Results: A total of 63 patients were included in the study, the mean age was 58.26, of which 69.8% were males, the most common presentation was One-sided weakness 58.9%, followed by the altered level of consciousness 57.3%. The mean pre and postoperative GCS was 10.98 and 11.87 respectively. Most of the patients had unilateral collection 89% with a few having bilateral CSDH 11%. The outcome GCOSE was such that 50% of the patients were found in grade VIII i.e. upper good recovery, all the patients that underwent through and through drainage had the best outcome with a p-value of 0.001, however, 22% of the patients were found in grade I (dead).

Conclusion: The functional outcome of Chronic subdural hematoma is best delineated with GCOSE as compared to the modified ranking scale and GOS.

Keywords: CSDH, functional outcome, GCS, GCOSE, head trauma, Glasgow outcome scale, Glasgow outcome scale extended, modified ranking scale.

Abbreviations: CSDH; Chronic Subdural Hemorrhage, GCS; Glasgow Comatose Scale, GCOSE; Glasgow Coma Outcome Scale Extended, GOS; Glasgow Outcome Scale.

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INTRODUCTION

Chronic subdural hemorrhage (CSDH) is one of the most common neurosurgical disorders of senescence with an incidence rate of 8.2 to 36.6%.[1] This incidence is rising globally due to increased usage of anticoagulation but in Pakistan, more than 80% of the cases are the result of any form of trauma to the head, which most commonly results in laceration of bridging vein in subdural space.[2-4] Other causes of CSDH may be antiplatelet, anticoagulation drug therapy, cerebral atrophy, and alcoholism.[5]

CT scans are the gold standard for diagnosis and provide crucial insights that guide surgical decision-making.[6] The evacuation of hematoma is considered with burr hole drainage however alternative approaches could be performed according to the situation of the patient.[6,7] Despite surgical intervention, recurrence rates are from 10-30%, and long-term functional outcomes remain to be found.[8,9] The Functional assessment of patients' outcomes in CSDH, especially cognitive ones is currently being performed in literature by using a modified ranking scale and GOS scale.[1,10] However one study that measures the functional outcome by using GCOSE showed that 50.8% of patients have an upper good recovery and 22.2% were ranked as Dead as compared to the modified Rankin Scale which shows that 27% of patients have worse functional outcome measured by modified Rankin scale, even though the surgical procedure was successful.[9,11] This highlights the outcome assessment limitation associated with the modified Rankin scale.[12]

As in the literature, the functional outcome of chronic subdural hematomas is mostly assessed with the modified Rankin scale and Glasgow outcome scale (GOS).[3,11] However, both scales. i.e. modified Rankin scale and GOS have a good correlation but scores are broadly interpreted with poor neuropsychological assessment.[12,13] To better evaluate the recovery in CSDH, this study employs the Glasgow Comma Outcome Scale Extended (GCOSE), which is an updated version of GOS, and it provides more precise measurement of functional outcomes especially in cognition and neuropsychological dimensions, which are often overlooked by broader scales.[14] The focus on GCOSE allows a detailed assessment of patient independence and quality of life, offering valuable insights into the effectiveness of different treatment methods.[14,15] The study aims to clarify which management approach yields optimal functional outcomes that will be critical for improving patient care.

MATERIALS AND METHODS

Study Design and Setting

It is a cross-sectional study, conducted at the Department of Neurosurgery, Liaquat University Hospital Hyderabad with a time duration of January 2024 to December 2024 with the approval of ERC # ref; 2024/NSE/512.

Study Population

Patients presented with Chronic Subdural Hematoma and went through different medical procedures.

Sample Size and Technique

Consecutive sampling was done by calculating sample size through the standard formula for qualitative analysis in cross-sectional study, by taking values from previous studies.[16,17]

Inclusion Criteria

Diagnosed cases of chronic subdural hematoma on radiology with no age restriction, underwent different kinds of management approaches and those who are willing to enroll in the study.

Exclusion Criteria

The patient presented with acute subdural hematoma, and the patient was associated with any pre-existing severe neurological disorders like Stroke, or neurodegenerative disease. Patients with associated coagulopathy and on Anti-coagulopathy therapy, lack of consent, and severe comorbidities.

Data Collection

The patients were admitted through OPD or ER and were included in the study after evaluation of inclusion and exclusion criteria, and data was recorded on the questionnaire predesigned. The patients were subjected to investigations like CT brain for diagnosis and hematological profile. Then different management was performed. The management is done either conservatively or surgically, moreover, surgical intervention is done by either burr hole drainage, through and through burr hole drainage, or decompressive craniotomy. The patients after management were followed up on discharge and GCOSE was recorded on discharge or in case of death on the pre-designed questionnaire.

Statistical Analysis

Statistical Analysis of data is done via SPSS version 21, the data was coded and divided into, Ordinal, Categorical, and Continuous categories. The descriptive analysis was performed initially, by calculating mean for continuous and frequency for categorical data. To see the association between categorical variables (type of management) and parametric continuous variable (Age), ANOVA was performed. In comparison with non-parametric continuous variables (pre and post-operative GCS) Kruskal Wallis test was performed. To the difference between two related non-parametric continuous variables (pre and postoperative GCS), the Wilcoxon signed-rank test was performed. To see the association between categorical (type of management) and ordinal dataset (GCOSE) chi-square test was performed. The p-value of 0.05 was considered to be a significant one.

RESULTS

Background Clinical Information

A total of 63 patients were included in the study with a mean age of 58.26 $\pm$ 14.88, with 44 males and 19 females making 69.8% and 30.2% respectively. The distribution of age is normal. Most of the patients presented with one-sided weakness 58.9%, then altered level of consciousness 57.3% a few presented with only headache 3.2% and fits 1.6%. Among them, 56 (88.9%) patients had a unilateral hematoma and 7 (11.1%) patients had bilateral. The mean preoperative GCS is 10.98 $\pm$ 3.53 and the mean postoperative GCS is 11.87 $\pm$ 3.66.

Management Analysis

The most common management plan was burr-hole drainage (90.5%). In this study, only one female of age 65 underwent decompressive craniotomy (Figure 1). The Effect of age, Pre and post-operative GCS on management had been seen The ANOVA was performed between age (parametric, continuous data) and Surgical procedure (categorical) to check the association but it was concluded that age has no significant association with the type of management (see Figure 2). For The pre and postoperative mean GCS was not normally distributed (non-parametric) as compared to age. The association between GCS and type of surgical management (> 2 categorical) was seen with the Kruskal-Wallis test, which was found to be insignificant. However, the difference between preoperative and postoperative GCS was found with Wilcoxon signed rank, which was significant with a p-value of 0.001.

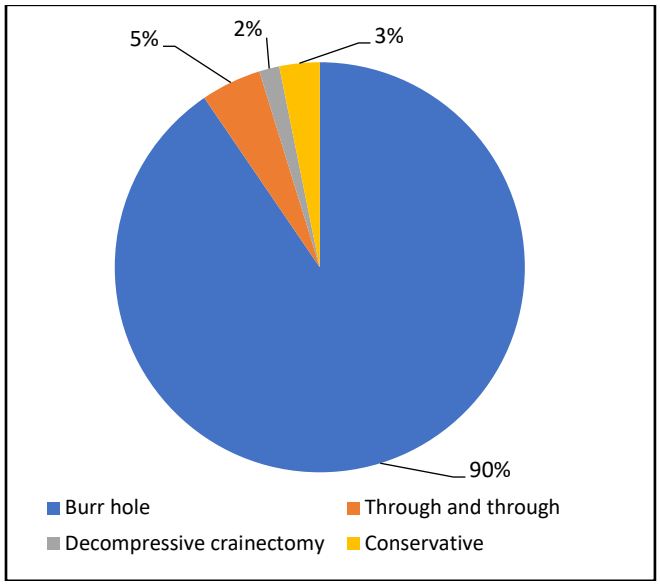

Figure 1: *Different Management courses for CSDH.*

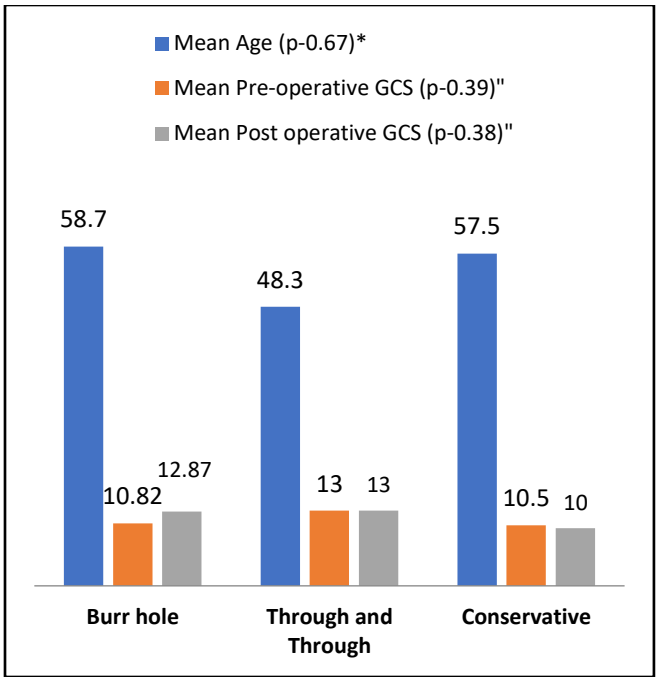

Figure 2: *Effect of Mean Age and Mean GCS on Management.*
*Anova, " Kruskal Wallis Test

Table 1: *GCOSE according to Different management courses.*

GCOSE: Glasgow Coma Outcome Scale Extended	Burr Hole Drainage (Number)	Through and Through (Number)	Decompressive Craniectomy (Number)	Conservative (number)
Dead	13	0	0	1
Lower Severe Disability	1	0	1	0
Upper Severe Disability	2	0	0	0
Lower Moderate Disability	3	0	0	0
Upper Moderate Disability	2	0	0	1
Lower Good Recovery	7	0	0	0
Upper Good Recovery	29	3	0	0
Total	57	3	1	2

(P value: 0.001)

Outcome Analysis

The functional outcome as calculated concluded, that 22.2% of the patients died, however, 50.8% of patients had an upper good recovery. When the association was plotted against GCOSE (ordinal) with surgical management (categorical), it was found that all through and through burr hole drainage had placed patients in upper good recovery with a p-value of 0.001 which is calculated with Chi-square test, however, the significance was not found with other management Course (See Table 1).

DISCUSSION

Chronic subdural hematoma (CSDH) is one of the most prevalent neurosurgical conditions, primarily affecting the elderly population. The increasing incidence of CSDH in aging individuals, along with a reported 12% recurrence rate in Pakistan, has been documented in previous studies.[1,2,9] The functional outcome of chronic subdural hematomas is typically assessed using mostly modified Rankin scale (mRS) and Glasgow

outcome scale (GOS) with reports indicating that 27% of the patients experience poor functional outcomes according to the GOS.[3,11]

In our study, a total of 63 patients were included, with a mean age of 58.26 years, and a predominance of male patients. This finding aligns with the studies like P.M. Gonzalez-Vargas, et al, and Rauhala et al, which reported a higher incidence rate of CSDH in males and geographical variation in the affected age groups.[3,18] Regarding the clinical presentation, one-sided weakness (hemiparesis) was the most common symptom, followed by cognitive impairment such as altered consciousness. These findings are consistent with studies like Rauhala et al, (2020) and Ahmed et al, (2020), which also reported hemiparesis and vertigo are the common presenting symptoms of CSDH.[18,9] In terms of hematoma location, most cases in our study were unilateral, with only 11.1% of cases being bilateral. This is consistent with the findings of studies by Ou et al, which reported a higher prevalence of unilateral cases compared to bilateral ones. However, prior research further classified cases based on the presence of trauma.[20]

The mean preoperative Glasgow Coma Scale (GCS) score in our study was lower than reported in the systematic review by Nouri et al, which highlighted the cohort of the studies that reported both higher and lower values.[21] The mean post-operative GCS in our study was also lower as compared to Sara et al, (2019) which was prospective and cohort in nature and reported better GCS values.[22] This variation may be attributed to geographical differences, Time frame of assessment, age of patients, level of consciousness at presentation, and underlying etiological factors when comparison was performed with Sara et al.[22] Nonetheless, our study observed significant post-operative improvements in GCS, which is similar to the study performed by Cristopher et al, (2019) and it reported the effect could be due to the type of surgical procedures performed, baseline level of consciousness, and advanced age of some patients.[23] Regarding surgical intervention, burr hole drainage was the preferred method in our study, performed in 90.5% of patients. This aligns with the work of Ahmed et al, which identifies burr hole drainage as the standard surgical treatment for CSDH, yielding favorable outcomes.[24] However, we also performed through and through drainage technique, but due to lack of randomization and unequal group sizes, we cannot generalize our findings regarding its efficacy. The available clinical and meta-analysis work of Ahmed et al, and Aljabali does show the effect of single burr hole drainage but the two-burr hole technique was not included and its efficacy is unknown, further clinical trials are required.[24, 25]

Beyond improvement in GCS, functional and cognitive recovery remains a critical concern which was highlighted by Blaauw et al, (2021) and (2023) by performing a clinical study and systematic review.[26,27] In our study, the Glasgow Coma Outcome Scale Extended (GCOSE) was used to assess functional outcomes. Our findings indicate that more than half of the patients achieved an upper good recovery, while an additional 11.1% attained a lower good recovery. This rate of good recovery is higher than reported in Blaauw et al, and Bhand et al, studies, where only 29 to 50% of patients achieved upper good recovery.[9,7] The discrepancy may be related to differences in sample size or the timing of functional outcome assessment concerning different categories by CSDH as depicted in Bhand et al.[9] Patients who underwent the through-and-through drainage approach demonstrated better functional recovery in our study, though data on this technique remain sparse. In the previous study by El Rahal et al, the author relied on the modified Rankin Scale (mRS), which is broader and simpler, whereas the GCOSE which is used by Bhand et al, and Pathan et al, provides greater granularity and better assesses both functional and cognitive outcomes.[1,2,9] Our

findings also suggest that GCOSE performed better at assessing lower spectrum recovery compared to previous studies done by Ishida et al, they used mRS, which reported 27% of patients having poor functional outcomes despite successful surgical intervention.[11] This difference highlighted by Grastra et al, reported inter-rated variability, emphasizing the need for further research or clinical trials to evaluate the reliability and variability of different functional assessment scales, particularly GCOSE.[12]

CONCLUSION

The functional outcome of Chronic subdural hematoma is best delineated with GCOSE on discharge and the two burr hole technique results from a higher score on GCOSE. These findings underscore the importance of adopting GCOSE in future studies on CSDH or any other neurosurgical disease enhance the precision of functional outcome reporting and provide actionable insights into patient's recovery trajectories.

LIMITATIONS

This study doesn't include an assessment of follow-up and hasn't used any other functional scale like GOS or mRs. This study also doesn't address the associated comorbidities which required further validation that GCOSE performed better or not.

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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: 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.
Availability of Data: The data is available on request after obtaining consent from the corresponding author.

AUTHOR'S CONTRIBUTIONS

Sr.	Authors Full Name	Intellectual Contribution to Paper
1	Abdul Rauf Memon	Study design and methodology.
2	Muzafar Ali Bhand	Paper writing.
3	Sanaullah Pathan	Data collection and calculation.
4	Suhail Ahmed Aghani	Analysis of Data and interpretation of results.
5	Hameedullah khan	Literature review and referencing.
6	Peer Asad Aziz	Editing and quality insurer.
7	Zeeshan Nasir	Results analysis infra-structure.