

Factors Affecting the Outcome of Traumatic Brain Injured Patients with Acute Epidural Haematoma in National Hospital, Abuja

Abstract

Objective: The objective is to determine the prognostic factors affecting the surgical outcome of patients surgically treated for acute epidural haematoma. **Materials and Methods:** A retrospective review of 71 consecutive patients who underwent neurosurgery for acute epidural haematomas over a 5-year period (from January 2015 to December 2019) was conducted. Clinical characteristics and the time intervals were investigated to determine the interactions between all these factors and the outcome. The outcome was graded according to the Glasgow Outcome Scale (GOS) at subsequent follow-up clinic visits. **Results:** The severity of traumatic brain injury using the Glasgow Coma Scale score (chi-square test, $P = 0.033$) had a statistically significant relationship with the outcome. The patients' age, gender, and total length of time until surgical intervention ($P > 0.05$) were of no statistical significance in relation to the outcome. The mortality rate of patients presenting at our centre is 16.9%. Overall, after surgery, 47 of 71 with epidural haematoma had good recovery (GOS 5). Twelve of 71 patients had GOS of 2–4. Twelve patients died. The median duration from injury to presentation was 15 hours with an interquartile range of 15 hours. **Conclusion:** Our results indicate that the severity of brain injury is an independent risk factor in determining the outcome of epidural haematoma in traumatic brain injury.

Keywords: Acute epidural haematoma, craniotomy, Glasgow Coma Scale, Glasgow Outcome Scale, traumatic brain injury

Introduction

Acute epidural haematoma (EDH) is the collection of blood in the potential space between the dura mater and endocranium within 3 days of an incident and is usually a neurosurgical emergency that may cause an acute rise in intracranial pressure.^[1] EDH commonly results from traumatic brain injury and accounts for 2.7%–4% of all intracranial haemorrhage, making it one of the leading causes of death in the age group 16–40 years with an overall mortality of 9.4%–33%.^[2-4]

The outcome may be influenced by preoperative Glasgow Coma Scale (GCS), time between injury and surgery, associated intracranial injuries, anisocoria, and haematoma volume.^[1,5]

In this study, the preoperative variables in patients with acute EDH were correlated with the outcome on discharge and a subsequent follow-up in 71 consecutive cases operated in National Hospital, Abuja (NHA). The aim is to determine the degree to which these proposed variables impact the outcome of patients with

acute EDH. This information will help not only in preoperative counselling but also in prioritising patients as well as minimising mortality and morbidity in a resource-poor setting like ours.

Materials and Methods

This retrospective study was conducted at the trauma centre of NHA, the largest neurotrauma centre in North Central Nigeria. The records of 71 patients admitted for acute EDH between January 2015 and December 2019 were retrieved and reviewed. Data were collected from the patient records using a standardised structured *proforma*. The data variables included demographic data (gender and age), admitting GCS, loss of consciousness, mechanism of injury, and length of time from injury to surgical intervention.

The GCS was used to classify the severity of the injuries. Patients with GCS of ≤ 8 , 9–12, and 13–15 were classified as severe, moderate, mild head injuries, respectively. The outcome was measured using a Glasgow Outcome Scale (GOS) at the 3-month follow-up visit. GOS 1

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indicated death and GOS 2–4 (GOS 2 = vegetative state, GOS 3 = severe disability, GOS 4 = moderate disability) were used to indicate residual disabilities or poor outcomes, whereas the GOS score of 5 (good functional recovery) indicated a favourable outcome. This scale was chosen because of the wide acceptability as a standard means of describing outcome in head injured patients and has established validity and interobserver consistency.

The data were coded and analysed using Statistical Package for Social Sciences (SPSS), version 26.0. Mean ± standard deviation were employed for numerical variables such as age, whereas frequencies and percentages were computed for categorical variables such as gender, time between injury and surgery, and GCS and GOS score. The stratification was done with regard to age, gender, and time from injury to surgery. The time from injury to surgery was identified as time before presentation and time from presentation to surgical intervention also referred to as the react time. Chi-square test was used to observe the relationship between different variable factors and surgical outcome. Any association having a probability value (*P* value) of <0.05 was considered statistically significant.

Results

Seventy-one patients were managed over a 5-year period (66 males and five females) with a male to female ratio of 13.5:1. The mean age was 30.25 years (±13.42). The age distribution saw most of the patients (61.9%) being in the 25–45 years age group.

Thirty-eight percent of patients (27 of 71) presented with a GCS score of 13–15. The GCS was 9–12 and 3–8 in 36.5% (26 of 71) and 25.5% (18 of 71) of patients, respectively.

The median duration from injury to presentation was 15 hours with an interquartile range of 15 hours. The time from injury to presentation ranged from 30 minutes to 6 days. 58.6% of patients presented within 12 hours of the injury and 27.1% presented between 13 hours to 24 hours of the injury. 10.5% of patients presented 1–3 days after the injury and 4.3% presented >3 days after the injury [Figure 1].

The average total delay (i.e., the total time from injury to surgery) was 45 hours (±45.7 hours). The majority of patients (45.8%) received surgical intervention between 1 and 3 days of injury. 37.1% of patients had surgical intervention within the first 24 hours of injury, whereas the remainder had surgical intervention from 4 to 7 days postinjury (14.2%) and more than 1-week postinjury, 2.8% (two of 71).

The average react time (i.e., the duration from presentation to surgical intervention) was 25.3 hours (±30.66). The majority of patients, 48 of 71, had surgery done between 6 and 24 hours of presentation. Thirty-one of 48 had a good outcome postevacuation. Five patients had surgical evacuation in less than 6 hours from when they presented, there were four (80%) with a good surgical outcome and one mortality [Table 1]. The quickest time of intervention was 4 hours, and on one occasion, intervention did not occur until 9 days postpresentation.

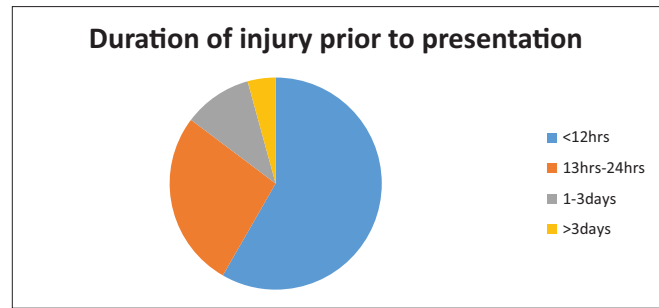


Figure 1: Duration from the time of injury to presentation

Table 1: The relationship between the react time and the Glasgow Outcome Score

| React time | GOS | | | | |
|------------|-----|---|---|---|----|
| | 1 | 2 | 3 | 4 | 5 |
| <6 hours | 1 | 0 | 0 | 0 | 4 |
| 6–24 hours | 9 | 1 | 2 | 5 | 31 |
| 1–3 days | 2 | 0 | 1 | 3 | 9 |
| >3 days | 0 | 0 | 0 | 0 | 3 |

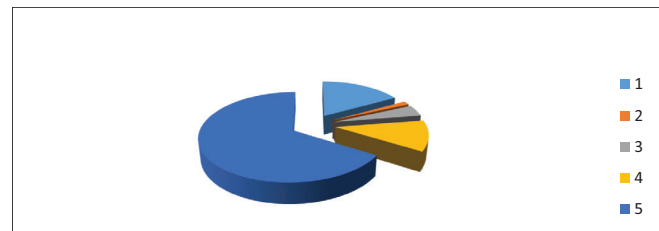


Figure 2: Proportions of patients and their respective Glasgow Outcome Score

Overall, after surgery, 47 of 71 with EDH had good recovery (GOS 5). Twelve of 71 patients had GOS of 2–4. Twelve patients died [Figure 2].

Age and gender had no significant effect on the outcome when analysed statistically with chi-square; *P* values of 0.963 and 0.620; chi-square values of 108.1 and 2.64, respectively.

Presenting GCS had a statistically significant effect on the outcome. Twenty-three of 27 patients (85.2%) with GCS 13–15 had a good surgical outcome and GOS of 5. Eighteen of 26 (69.2%) patients with GCS of 9–12 had a good outcome, GOS of 5. Of the patients with severe traumatic brain injury (TBI) (GCS 3–8), 12 of 18 (66.7%) had a poor surgical outcome, 33.3% mortality, 33.3% GOS 2–4, whereas 33.3% had a good neurological outcome (*P* value = 0.033) [Table 2].

The outcome of patients decreased with a worse GCS at presentation. Unfavourable recoveries were recorded in 67% of patients with GCS 3–8 as opposed to 30.7% for GCS 9–12 and 14.8% for GCS 13–15.

Discussion

In our study, most of the victims were in their most active period of life with a mean age of 30.25 years. This age is comparable with the age mentioned in studies of Mezue *et al.*, Nnadi *et al.*,

Table 2: Age and gender tabulated against outcome

| Clinical variables | No of patients (n = 71) | Mortality (n = 12) | Residual disability (n = 12) | Functional recovery (n = 47) | P value |
|--------------------|----------------------------|-----------------------|---------------------------------|---------------------------------|------------|
| Age | | | | | 0.963 |
| 0–13 | 8 | 1 | 1 | 6 | |
| 14–25 | 17 | 3 | 2 | 12 | |
| 26–45 | 39 | 5 | 9 | 25 | |
| 46–60 | 4 | 3 | 0 | 1 | |
| >61 | 3 | 0 | 0 | 3 | |
| Gender | | | | | 0.620 |
| Male | 66 | 10 | 12 | 44 | |
| Female | 5 | 2 | 0 | 3 | |

Table 3: Proportion of outcome and P values of selected clinical variables

| Clinical variables | No of patients (n = 71) | Mortality (n = 12) | Residual disability (n = 12) | Functional recovery (n = 47) | P value |
|-----------------------------|----------------------------|-----------------------|---------------------------------|---------------------------------|------------|
| Time from trauma to surgery | | | | | 0.947 |
| <24 hours | 26 | 5 | 5 | 16 | |
| 1–3 days | 33 | 7 | 5 | 21 | |
| ≥4 days | 12 | 0 | 2 | 10 | |
| GCS at presentation | | | | | 0.033 |
| ≥8 | 18 | 6 | 6 | 6 | |
| 9–12 | 26 | 5 | 3 | 18 | |
| 13–15 | 27 | 1 | 3 | 23 | |

Niaz *et al.*, Ozkan *et al.*, and Cheung *et al.*, who found the mean age of patients with traumatic extradural haematomas 30.2, 30.28, 30.13, 26.9, and 37.7 years, respectively, in their series.^[2,6-9]

In our series of 71 patients, 66 were males and five were females with a male to female ratio of 13.5:1. This ratio is a reflection of our social culture where females are less exposed to unskilled external work. A similar male predominance of 13:1 was reported in a Pakistani study on 38 patients, whereas a higher male predominance was reported in an Indian study of 29 patients. Emejulu *et al.* in Enugu, South Eastern Nigeria reported a close incidence with a male to female ratio of 11.5:1.^[5,10,11] Several other studies with larger subjects report lower ratios of male to female ranging between 2.2:1 and 6.27:1. Mezue *et al.* reported a male to female ratio of 4.75:1 in 2012 based on data collected from 2003 to 2009.^[6]

Patients with traumatic EDH frequently present with altered state of consciousness that is measured in terms of GCS. In our study, there was a near even spread of patients amongst the GCS categories. Twenty-seven patients (38.0%) presented with a GCS 13–15, whereas the GCS was in 9–12 in 26 patients (36.5%) and 3–8 in 18 patients (25.5%). This percentage distribution is similar with the work of Mezue *et al.* (39% [GCS 13–15], 27% [GCS 9–12], 34% [GCS 3–8]) but differed from that of Nnadi *et al.* (51% [GCS 13–15], 26% [GCS 9–12], 23% [GCS 3–8]) when compared with other Nigerian studies.^[6,7]

A good outcome had positive correlation with increasing GCS scores at presentation, whereas unfavourable outcomes were more common in lower GCS scores. In our series, 66.2% of the

patients had good functional recovery and 16.9% had residual disability, whereas 16.9% suffered mortality. Emejulu *et al.* reported similar mortality rates (14.9%) with 78.4% of the patients having good functional recovery in that study.^[5] In comparison to previous studies in other climes, good outcomes were reported in 86%–89%.^[8,9,12]

A poor surgical outcome is increased with reducing GCS scores at admission. In total, 44 patients had GCS score <13 at presentation. 45.5% (20 of 44) of these patients had GOS scores 1–4. In contrast, only four unfavourable recoveries (14.8%), including one death, were found for the 27 patients with GCS score 13–15. This suggests that unfavourable outcomes in patients with EDH are more likely to be influenced by the severity of primary brain injury, as is reflected by the low GCS. Bivariate analysis of these variables revealed a significant correlation between GOS of 5 and GCS at presentation ($P = 0.033$). Numerous authors reported a similar correlation between GOS and GCS at presentation.^[6-9,13]

This study failed to demonstrate an association between outcome and the following factors: age, gender, time interval from trauma until surgery, and time interval from presentation until surgical decompression. Although some previous studies have indicated that unfavourable outcomes were associated with the time interval from injury until surgical decompression, our study did not demonstrate this. This is in line with the results reported by Nnadi *et al.* in which the time to surgery had no effect on functional outcome.^[7] This might be explained by the high number of patients with mild TBI (GCS 13–15) in this study who may not require urgent surgical intervention unlike

the critically ill patients who require urgent intervention. The react time did not also significantly affect outcome. Patients operated on within the first 6 hours of presentation did not show a significantly better outcome when compared with patients who had their surgery later than 6 hours of presentation ($P = 0.083$).

In summary, this study statistically evaluated five variables and identified the GCS at presentation as an independent predictor of outcome in surgically treated patients with acute EDH.

Conclusion

The key determinant of surgical outcome using GOS in patients with acute EDH is the GCS at presentation. The duration of injury prior to presentation and reaction time showed no net effect on the surgical outcomes of patients.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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