

Functional Outcome of the Patients with Acute Subdural Hematoma Treated Surgically within 4 hours of Injury

Farhan Gulzar, Muhammad Aamir Sagheer, Farhad Hussain*, Muhammad Rafay, Salman Yousuf Sharif

Department of Neurosurgery, Liaquat National Hospital, National Stadium Road, Karachi, Pakistan

ABSTRACT

Introduction: Traumatic Brain Injury (TBI) is a common cause of morbidity and mortality worldwide. Post-traumatic acute subdural hematoma, one of the most difficult tasks faced by neurosurgeons. Reliable prognostic factors for acute subdural hematoma to improve the surgical results in these patients are important. The magnitude of this study outcome of early intervention for removal of acute subdural hematoma, may decrease the morbidity and mortality.

Objective: Functional outcome of the patients with acute subdural hematoma treated surgically within 4 hrs. of injury.

Setting: The study was conducted in the Department of Neurosurgery, Liaquat National Hospital Karachi.

Study Design: Case series.

Subject and Methods: A total of 100 patients having acute subdural hematoma diagnosed on CT scan brain who underwent surgical intervention were included in this study. Detailed history, clinical examination, and GCS assessment were performed. Surgery was performed by a consultant neurosurgeon. Patients were followed after 3 months of surgery and assessed on GOS. A score of 4 and above was taken as functional recovery.

Results: The average age of the patients was 34.74 ± 13.92 years. There were 84% male and 16% female. Mortality was observed in 47% cases and functional recovery was seen in 39% cases. Functional recovery was significantly high in below 40 years age ($p=0.0005$) and in female (0.004).

Conclusion: The magnitude of outcome of early intervention for removal of acute subdural hematoma found to be satisfactory and should be followed, which may decrease the morbidity and mortality.

Keywords: Traumatic brain injury; Acute subdural hematoma; Mortality

INTRODUCTION

Traumatic Brain Injury (TBI) is a common cause of morbidity and mortality worldwide [1]. Its incidence varies from 150-250 cases per 100,000 populations annually [2]. In Pakistan, it is 81 per 100,000 with a mortality rate of 15% [3]. It is the most common cause of death among males in their most productive years of life with road traffic accidents being the most common cause followed by fall and assault [4-6].

Post-traumatic acute subdural hematoma, resulting from tears in bridging veins that cross the subdural space, remains one of the most difficult tasks faced by neurosurgeons [7].

Despite development and improvements in emergency medical service systems, neuro-intensive monitoring, and treatment, acute subdural hematoma has still very high mortality [8-10]. Therefore, identifying reliable prognostic factors for the acute subdural hematoma to improve the surgical results in these patients is important. However there are relatively few studies that have focused on the timing of operative intervention in relation to overall outcome [11].

In a study, 113 patients had 36.7% mortality and 56.7% functional recovery ($p<0.003$) who were operated within the first 4 hours as compared to 59.3% mortality and 15.7% functional recovery ($p<0.0001$) in those who were operated later [12].

Correspondence to: Farhad Hussain, Department of Neurosurgery, Liaquat National Hospital, Karachi, Pakistan; Tel: +923003791958; E-mail: petarian1070@gmail.com

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The rationale of this study is to estimate the magnitude of outcome of early intervention for removal of acute subdural hematoma, if found to be satisfactory then the same should be followed, which may decrease the morbidity and mortality.

OBJECTIVE

Functional outcome of the patients with acute subdural hematoma treated surgically within 4 hrs of injury.

Operational definitions

Patients with subdural hematoma which is a collection of blood in the space between the outer layer (dura) and middle layers of the covering of the brain (meninges). It was diagnosed through CT scan Brain plain as the crescent shape hyperdense (blot clot) area between the dura and brain parenchyma.

The outcome was assessed on the basis of mortality and functional recovery, through GOS after 3 months.

Glasgow outcome scale (GOS)

GOS scores to the level of 4 or 5 were accepted as having undergone a Functional Recovery (FR) and patients with GOS less than 4 were labeled as not undergone functional recovery (unable to recover) (Table 1).

Table 1: GOS score showing the recovery of patients.

Score	Meaning
5	Good recovery Able to return to work or school
4	Moderate disability Able to live independently; unable to return to work or school
3	Severe disability Able to follow commands/unable to live independently
2	Persistent vegetative state-unresponsive and speechless
1	Death

MATERIAL AND METHODS

The study was conducted in the Department of Neurosurgery, Liaquat National Hospital Karachi.

Sample size

According to the study sample size was calculated, for Functional Recovery (FR) and mortality. Total 100 patients was included in this study using $P=36.7\%$, 95% confidence interval and $d=9\%$ [12]. Sampling technique was Non-probability consecutive sampling.

Sample selection

Inclusion criteria:

- Patient of both genders
- Age from 15 years to 60 years
- Patients having acute subdural hematoma diagnosed on CT scan brain defined as in the operational definition, who underwent surgical intervention
- Patients having acute subdural hematomas came within 4 hrs of injury

Exclusion criteria:

- Patients having acute subdural hematomas managed conservatively
- Patients younger than 15 years
- Patients having acute subdural hematomas came after 4 hrs of injury
- Patients having metabolic disorders like clotting disorders, cirrhosis, chronic renal failure etc.

Procedure of data collection

All the patients with acute subdural hematoma, admitted in the Department of Neurosurgery Liaquat National Hospital Karachi fulfilling the inclusive and exclusive criteria were included in this study. Detailed history were documented like the history of fall/ trauma. Clinical examination and GCS assessment was performed followed by complete blood count, urea, creatinine, electrolytes, ECG, chest X-ray, and related investigation CT Scan Brain plain to see subdural hematoma was done before including the patient in the study. After counseling of patient or his attendant regarding benefits and risks of surgery, informed consent is and all ethical issues explained, Surgery was performed by consultant neurosurgeon having an experience of at least 5 years. Patients were followed after 3 months of surgery and assessed on GOS. A score of 4 and above was taken as functional recovery.

Data analysis procedure

Statistical packages for social science (spss-17). Mean and standard deviation were calculated for age, duration of hospital stay and Glasgow outcome scale. Frequency and percentage were calculated for gender and outcome variable i.e functional recovery and mortality.

Stratification was done with respect to age, gender and duration of hospital stay to see the effect of these on outcome variable by applying chi-square test taken $p<0.05$ as significant.

RESULTS

A total of 100 patients having acute subdural hematoma diagnosed on CT scan brain who underwent surgical intervention were included in this study. The age distribution of

the patients is presented in (Figure 1). The average age of the patients was 34.74 ± 13.92 years (Table 2).

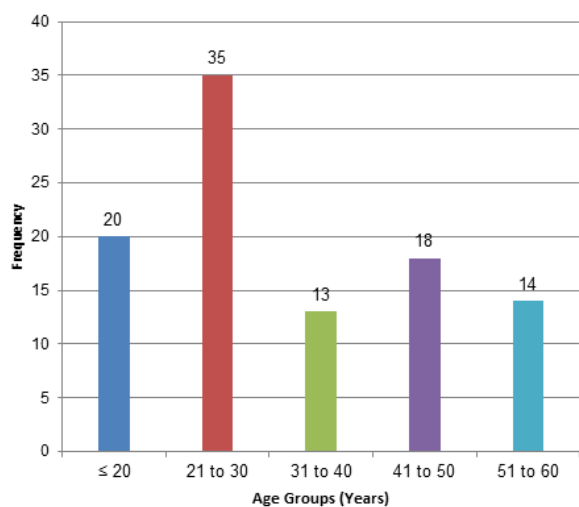


Figure 1: Age distribution of the patients.

Table 2: Descriptive statistics of the patients.

Statistics	Age (Years)	Hospital stay (days)	Glasgow Outcome Scale (GOS)
Mean	34.74	14.8	2.47
95% Confidence Interval for Mean	Lower	31.98	12.44
	Upper	37.5	17.16
Median	30	12	2
Std. Deviation	13.92	11.8	1.56
Minimum	15	3	1
Maximum	60	58	5
Interquartile Range	21	15	3

There were 84% were male and 16% female as presented in (Figure 2). The average hospital stay of the patients was 14.8 ± 11.8 days (Range: 58-3 days) and distribution of stay in hospital of the cases is presented in (Figure 3). The functional outcome of the patients with acute subdural hematoma treated surgically within 4 hrs of injury is presented in (Figure 4). Mortality was observed in 47% cases and functional recovery was seen in 39% cases. Functional recovery was significantly high in <40 years age as compared to above 40 years of age ($p=0.0005$) as presented in (Table 3). Similarly functional recovery was significantly high in females than males (75% vs. 32.1%; $p=0.004$) as shown in (Table 4). Rate of recovery was also observed in patients with respect to hospital stay as presented in (Table 5).

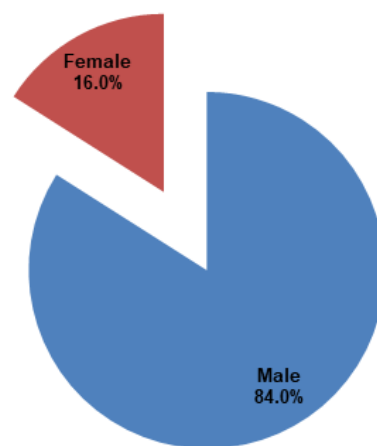


Figure 2: Gender distribution of the patients.

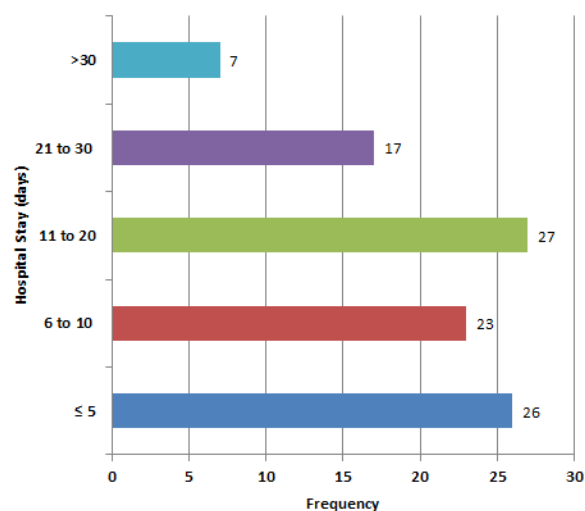


Figure 3: Hospital stay.

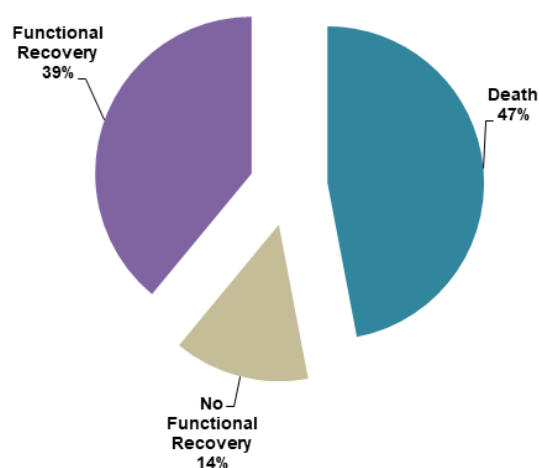


Figure 4: Functional outcome of the patients with acute subdural hematoma.

Table 3: Functional outcome of the patients with acute subdural hematoma by age groups.

Age groups	n	Functional outcome		
		Death	No recovery	Recovery
≤ 20 Years	20	12 (60%)	0 (0%)	8 (40%)
21 to 30 Years	35	11 (31.4%)	11 (31.4%)	13 (37.1%)
31 to 40 Years	13	2 (15.4%)	0 (0%)	11 (84.6%)
41 to 50 Years	18	13 (72.2%)	0 (0%)	5 (27.8%)
51 to 60 Years	14	9 (64.3%)	3 (21.4%)	2 (14.3%)
Chi-Square=33.64; df=8; p=0.0005				

Table 4: Functional outcome of the patients with acute subdural hematoma by gender.

Gender	n	Functional outcome		
		Death	No recovery	Recovery
Male	84	43 (51.2%)	14 (16.7%)	27 (32.1%)
Female	16	4 (25%)	0 (0%)	12 (75%)
Chi-Square=10.95; df=8; p=0.004				

Table 5: Functional outcome of the patients with acute subdural hematoma by a hospital stay.

Hospital stay	n	Functional outcome		
		Death	No recovery	Recovery
≤ 5 days	26	21 (80.8%)	3 (11.5%)	2 (7.7%)
6 to 10 days	23	7 (30.4%)	0 (0%)	16 (69.6%)
11 to 20 days	27	8 (29.6%)	6 (22.2%)	13 (48.1%)
21 to 30 days	17	6 (35.3%)	3 (17.6%)	8 (47.1%)
>30 days	7	5 (71.4%)	2 (28.6%)	0 (0%)
Chi-Square=32.26; df=8; p=0.0005				

DISCUSSION

In developing countries like Pakistan trauma has the main burden on economy. One of common neurosurgical emergencies includes Acute Traumatic Subdural Hematoma (ASDH). Surgical intervention is often required in Acute Traumatic Subdural Hematoma (ASDH). Among severe head injury the incidence of ASDH is 12% to 30% and mortality varies from 36% to 79% after they went surgical intervention [7]. Despite vast developments during last two decades in emergency medical service systems, critical care, and treatment,

still, mortality rate for ASDH is very high and has the worst prognosis among traumatic brain injuries [10]. Rapid diagnosis and aggressive neurosurgical intervention, doesn't decrease the mortality rate of traumatic ASDH and ranges between 39% to 75%. In a study its been recently reported that the overall mortality from traumatic ASDH is 66% and functional recovery 19% [13]. In present study total of 100 patients having acute subdural hematoma diagnosed on CT scan brain who underwent surgical intervention. The average age of the patients was 34.74 ± 13.92 years. Functional outcome of the patients with acute subdural hematoma treated surgically within 4 hrs of injury. In our series, the overall mortality was 47% and functional recovery 39%.

A significant decrease in mortality and morbidity rate was found that if patients with ASDH were operated within the first four hours after the trauma compared to those operated later. Furthermore mortality rate rose to 85% and the functional recovery to 7% in patients operated more than four hours of trauma, suggesting that the timing of surgery is main factor in prognosis of acute subdural hematoma [14]. No significant difference between the results of the operations carried out in the first four hours following the trauma and those performed beyond this time [15]. Another study found 36.7% mortality rate and 56.7% FR for the patient group operated upon in the first four hours after trauma, and rates of 63.8% and 15.7%, respectively, in those operated beyond the fourth hour following trauma [12]. Posttraumatic Acute Subdural Hematomas (PASHs) are more common in males than females in the literature 18. In this study 84% were male and 16% female. A study showed that 90 of the patients were male (79.6%) and the total mortality rate was found to be 56.3%, which is similar to the rates in the literature [16].

In this study functional recovery was significantly high in below 40 years age as compared to above 40 years of age ($p=0.0005$). Similarly functional recovery was significantly high in females than males (75% vs. 32.1%; $p=0.004$). Mortality and FR rates were 34.7% and 43.4% in the age group 0-17, 57.5% and 24.2% in the age group 18-60, and 75% and 16.6% in the age group >60 [12]. There was a statistically significant difference between mortality and morbidity rates of patients above the age of 18 and those younger than 18. Researchers reported a statistically significant difference between mortality and morbidity rates of patients below 34 years and those older than 65 years [17]. Nevertheless, in some of the studies that have reported that the age of the patient affects mortality, there was no significant difference in terms of statistics [18]. According to a study [19] the mean age of survivors was 41 years and of non-survivors was 59 years. We observed a similar trend and found that age was an independent predictor of outcome in traumatic ASDH. In a study [20], those patients younger than 40 years showed significantly higher rate ($OR=4.91$, $p=0.002$) of functional recovery by multivariate logistic regression analysis. The mechanism by which age has such an effect on outcome is unknown [21], but suggestions include a poor regenerative capacity of the older brain and predisposition to develop a more lethal injury [10]. In another study [5] first decade of life is most common age to be affected but the frequency is almost double (56%) than ours. The second and third decades of life are most

productive age regarding economic issues and these two decades are more vulnerable period regarding head injury. They contributed to about 40% of the cases in our series, a fact supported by others [6,22].

A study [14] concluded that a delay from injury to operation was the factor of the greatest therapeutic importance in traumatic ASDH. But the relationship between time to surgery and outcome is still controversial. The study reported that 47% died and 32% had a favorable outcomes among the patients operated within two hours after the onset of coma [18]. However, mortality in patients operated on later was 80% with only 4% favorable outcomes. In another series of 101 comatose patients, the mortality rate for those operated on within 4 hours was 59% versus 69% for those operated later and favorable recovery rates for these groups were 26% and 16% respectively with no statistical significance [23]. On the other hand, Researchers [17] reported no difference in patients operated within 4 hours of injury compared with those operated later. In a series [18], patients who underwent subdural evacuation within 4 hours had worse outcomes (functional recovery 32.4%, mortality 48.6%) than those operated later (functional recovery 49.7%, mortality 33.1%). This does not suggest that delaying operation leads to better outcomes, but patients with the most severe brain injuries, who require emergent evacuation of hematoma, are sent to neurosurgical units more rapidly than those with less severe brain injury. There is a strong correlation between the GCS score on admission and prognosis of PASH [24,25] Phuenpathom and colleagues [9] reported that the GCS score is one of the most critical factors. In a study, the mortality and FR rates of patients according to GCS scores on admission were 70.2% and 7.0% respectively [12].

CONCLUSION

Functional recovery was more likely to be achieved in patients who were under 40 years of age and was significantly high in females than males. These results would be helpful for neurosurgeon to improve outcomes from traumatic acute subdural hematomas. The magnitude of outcome of early intervention for removal of acute subdural hematoma, found to be satisfactory and should be followed, which may decrease the morbidity and mortality.

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