Original Research Article

Prognostic significance of haematoma thickness to midline shift ratio in patients with acute subdural haematoma

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Abstract

Background: Acute intracranial subdural hematoma is usually associated with the high risk of morbidity and mortality. The factors to choose the surgical procedure for hematoma are occasionally controversial. Therefore in this study we aim to evaluate the prognostic significance of hematoma thickness (mm), midline shift (mm) and hematoma thickness to midline shift ratio level in patients with acute subdural hematoma. **Methods:** Total 50 traumatic brain injuries with acute subdural hematoma diagnosed patients were enrolled in this study. The Glasgow coma scale (GCS) score was determined on admission and post-operative 1, 3 and 7 day. Outcome evaluation was done using Glasgow outcome scale (GOS) score at time of discharge; follow up at 1 month and 3 month. **Results:** The mean Glasgow Outcome Scale was 3.9 ± 0.32, 4 ± 0.47 and 4.4 ± 0.52 in mild, 3.57 ± 0.85, 4.23 ± 0.6 and 4.77 ± 0.44 in moderate and 2.77 ± 1.18, 3.89 ± 0.57 and 4.26 ± 0.56 in severe Glasgow Coma Scale at discharge, 1 month and 3 months, respectively.The hematoma thickness (mm) and Midline shift (mm) were significantly negative and Glasgow Coma Scale on admission and hematoma thickness to midline shift ratio were significantly positive correlated with Glasgow Coma Scale at post-operative day 1, day 3 and day 7. The hematoma thickness (mm), Midline shift (mm) and age (years) were significantly negative and Glasgow Coma Scale on admission and hematoma thickness to midline shift ratio were significantly positive correlated with Glasgow Outcome Scale at discharge only. **Conclusion:** A positive correlation between preoperative hematoma thickness to midline shift ratio and negative correlation of hematoma thickness (mm), Midline shift (mm) with postoperative Glasgow Coma Scale and Glasgow Outcome Scales were found in traumatic intracranial acute subdural haematoma.

Keywords: Subdural haematoma, Glasgow Coma Scale, Glasgow Outcome Scales, Head injury.

Introduction

Head injury is an insult to the brain that is capable of producing physical, intellectual, emotional, social and vocational changes ranging from scalp laceration to loss of consciousness to focal neurological deficit. Intracranial hematomas are pooling of blood within the cranium either within brain parenchyma or adjoining meningeal spaces due to head injury or other causes. In spite of recent advancements and improvement made in the field of neuro-traumatology and emergency medical services intracranial hematomas still carry a grave prognosis[1].

Cerebral contusion are brain parenchymal bruising and consists of hemorrhagic, necrosis and infarction contusions at site of impact are known as coup and those opposite to impact known as countercoup contusion. Parenchymal hematoma is end result of coalescence of multiple hemorrhages within contusion[2]. A subarachnoid is bleeding between subarachnoid spaces the area between arachnoid

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membrane and piamater surrounding brain. Spontaneously occurs due to ruptured aneurysm, due to vasculitis, coagulation disorder and cerebral arterio-veinous malformations[3].

Subdural Hematoma (SDH) is a collection of blood below the inner layer of dura mater but external to the brain and arachnoid membrane. Acute Intracranial Subdural Hematoma (ASDH) is frequently associated with severe prognosis citing a greatprevalence of morbidity and mortality. The components which decide on surgical evacuation of hematoma are sometimes controversial. Acute intracranial subdural hematoma mostly results from significant head injury[4-7]. The acceleration and deceleration force inflicted during the traumatic insult results in stretching of bridging veins and cortical arteries. Both provide source for hematoma formation. The worst prognosis encountered in Acute Intracranial Subdural Hematoma is at least somewhere attributed to associated brain injuries inflicted by the trauma leading to brain edema and diffuse axonal injuries which determine the progress of patients diagnosed with Acute Intracranial Subdural Hematoma and is often difficult to take decision of surgery controversial in many instances and sometimes taken on subjective basis.

The pressure imposed on the cerebral tissues by the hematoma is not the sole factor governing the neurological outcome as Acute

Intracranial Subdural Hematoma is mostly associated with other forms of brain injury including brain edema, contusions and diffuse axonal injury that may further contribute to increasing midline shift[8-10]. Hence makes evacuation of hematoma inadequate for better patient outcome [11-14]. The thickness of Acute Intracranial Subdural Hematoma was postulated as a key determining factor governing the surgical decisions mostly a hematoma thickness in excess of 1 cm in adults and 0.5 cm in children to be taken as estimated cutoff to decide on surgery[15-18].

Hematoma thickness to midline shift ratio is a useful prognostic tool in patients diagnosed with acute intracranial subdural hematoma and can be added to be a major decisive factor. However, the degree of midline shift may be an additional important determining factor for the postulated treatment decision. Having a midline shift more than thickness of the hematoma could mean an added contribution of brain edema which in turn means a possible degree of brain injury that could be an additional factor worsening the prognosis.

The maximum thickness of the hematoma in mm (H) measured guided by CT scale starting from inner table of the skull to the inner most boundary of hematoma. The extent of midline shift (MS) in mm, measured using the CT scale starting at a line drawn in the midline taking septum pellucidum as a reference to the shifted brain tissue. Prediction of prognosis of traumatic acute subdural hematoma based on early neurological signs including degree of focal neurological deficit as measured by Glasgow coma scale, brain stem reflexes, lesion type, site, increased intracranial pressure, time and size of injury together with comorbid conditions and associated injuries. Injury to brain stem is generally irreversible. Elevated intracranial pressure indicates unfavourable outcomes if not managed. Therefore, in this study we aim to identify the prognostic significance of hematoma thickness (mm), midline shift (mm) and hematoma thickness to midline shift ratio level in patients with acute subdural hematoma

Materials and Methods

This prospective study was carried out in P.G. Department of surgery, S.R.N. Hospital associated with M.L.N Medical College, Prayagraj from October 2020 to September 2021. After ethical approval from the ethical committee, Total 50 acute subdural hematoma diagnosed patients were enrolled in this study at tertiary care institute on the basis of well define inclusion and exclusion criteria. Informed written consent was obtained either from patient or their legal heir.

Patients must be a traumatic brain injury, age between 18-80 years, maximum thickness of hematoma >1 cm in immediate preoperative surgery, operated for Acute Intracranial Subdural Hematoma evacuation through a craniotomy and at least one month of follow-up were included in this study. Patients with severe co-morbid injuries involving other organs (POLYTRAUMA), Firearm Injury, mortality and inability to give consent were excluded from the study.

The age of the patient, gender, mode of injury, GCS score, pupillary abnormalities, hypoxia at admission, type of hematoma, midline shift, hematoma thickness, operated and time elapsed from onset of complaint to surgery were recorded. The GCS score was determined on admission and all patients were divided into three groups, GCS score 3 to 9, 9 to 12, 13 to 15. On the basis of pupillary response, patients were divided into two groups; anisocoric but reactive (AR), reactive(R). Outcome evaluation was done using Glasgow outcome scale (GOS) score at time of discharge; follow up at 1 month and 3 month

All patients with acute subdural hematoma resuscitated according to Advance Trauma Life Support Guidelines. NCCT obtained after stabilising patients. Patient were operated further taking standard guidelines into consideration.

Outcome was measured using GLASGOW OUTCOME SCALE score at discharge and divided into two groups, Good Outcome (GOS 5, 4) and poor outcome (GOS 3, 2, 1).

Statistical Analysis

The presentation of the Categorical variables was done in the form of number and percentage (%). On the other hand, the quantitative data were presented as the means ± SD and as median with 25th and 75th percentiles (interquartile range). The comparison of the variables which were quantitative in nature was analysed using Independent t test (for two groups) and ANOVA test (for more than two groups) and Paired t test was used for comparison across follow up. Pearson correlation coefficient was used for correlation of Glasgow Coma Scale, Glasgow Outcome Scale and improvement in Glasgow Coma Scale with age, Glasgow Coma Scale on admission, Hematoma thickness to midline shift ratio, Time of onset of complaint to onset of surgery(hours) and Surface of craniotomy(cm^2). Receiver operating characteristic curve was used to find cut off point of hematoma thickness, midline shift and Hematoma thickness to midline shift ratio for predicting good outcome. The p value of less than 0.05 was considered statistically significant. The data entry was done in the Microsoft excel spreadsheet and the final analysis was done with the use of Statistical Package for Social Sciences (SPSS) software, IBM manufacturer, Chicago, USA, ver 21.0.

Results

The baseline characteristics and outcome data such as age, hematoma thickness (mm), midline shift(mm), hematoma thickness to midline shift ratio, time of onset of complaint to onset of surgery (hours), Surface of craniotomy (cm^2), Glasgow Coma Scale at admission, post-operative day 1, day 3 and day 7, Glasgow Outcome Scale at discharge, 1 month and 3 months, gender, laterality of hematoma, hypoxia and pupillary abnormality of the patients are shown in Table 1.

Table 1: Baseline and outcome data collected from the records

	Mean ± SD	**Median (IQR)**	**Range**
Age	42.64 ± 17.6	39 (29-55.75)	18-76
Hematoma thickness(mm)	16.5 ± 2.6	16.5 (14-18)	12-22
Midline shift(mm)	19.35 ± 4.49	19.5 (16.575-22.2)	11.8-29.8
Hematoma thickness to midline shift ratio	0.87 ± 0.1	0.84 (0.791-0.928)	0.73-1.08
Time of onset of complaint to onset of surgery (hours)	15.08 ± 6	14 (10-18)	8-40
Surface of craniotomy (cm^2)	60.92 ± 9.41	60(55-66)	40-80
Glasgow Coma Scale			
at admission	8.78 ± 3.47	8 (6-11)	4-15
at post-operative day 1	8.16 ± 3.46	8(5.25-11)	3-15
at post-operative day 3	9.8 ± 3.76	10(8-12)	2-15
at post-operative day 7	11.48 ± 4.36	13(11-15)	2-15
Glasgow Outcome Scale			
At discharge	3.22 ± 1.07	4 (3-4)	1-4
At 1 month	4.02 ± 0.56	4 (4-4)	3-5
At 3 months	4.45 ± 0.55	4 (4-5)	3-5
		n	**%**
Gender	Female	18	36.00%

	Male	32	64.00%
Laterality of hematoma	Left	21	42.00%
	Right	29	58.00%
Hypoxia	Absent	23	46.00%
	Present	27	54.00%
Pupillary abnormality	Anisocoric but reactive	17	34.00%
	Reactive	33	66.00%

The data was present as mean±SD, median (IQR), range, number and percentage.

Table 2 shows the association of Glasgow Outcome Scale with Glasgow Coma Scale on admission.

Table 2: Association of Glasgow Outcome Scale with Glasgow Coma Scale on admission

Glasgow Outcome Scale	Mild (13 to 15)	Moderate (9 to 12)	Severe (<=8)	Total	†p-value
At discharge	3.9 ± 0.32	3.57 ± 0.85	2.77 ± 1.18	3.22 ± 1.07	0.004*
At 1 month	4 ± 0.47	4.23 ± 0.6	3.89 ± 0.57	4.02 ± 0.56	0.255*
At 3 months	4.4 ± 0.52	4.77 ± 0.44	4.26 ± 0.56	4.45 ± 0.55	0.032*

*=Significant (p<0.05), † ANOVA

The mean Glasgow Outcome Scale was 3.9 ± 0.32, 4 ± 0.47 and 4.4 ± 0.52 in mild, 3.57 ± 0.85, 4.23 ± 0.6 and 4.77 ± 0.44 in moderate and 2.77 ± 1.18, 3.89 ± 0.57 and 4.26 ± 0.56 in severe Glasgow Coma Scale at discharge, 1 month and 3 months, respectively.

The mean Glasgow Coma Scale was 5.75 ± 2.22, 9 ± 0.82, 12.5 ± 1.91 in time of onset of complaint to onset of surgery within 8 hours and 8.37 ± 3.49, 9.87 ± 3.91, 11.39 ± 4.51 in beyond 8 hours at post-operative day 1, at post-operative day 3, and at post-operative day 7, respectively. The men Glasgow Outcome Scale was 3.75 ± 0.5, 4.25 ± 0.5, 4.75 ± 0.5 in time of onset of complaint to onset of surgery within 8 hours and 3.17 ± 1.1, 4 ± 0.57, 4.42 ± 0.55 in beyond 8 hours at discharge, 1 month and 3 months, respectively. The mean value of Glasgow Coma Scale and Glasgow Outcome Scale were not significantly different in time of onset of complaint to onset of surgery within 8 hours and beyond 8 hours during follow-up (Fig. 1).

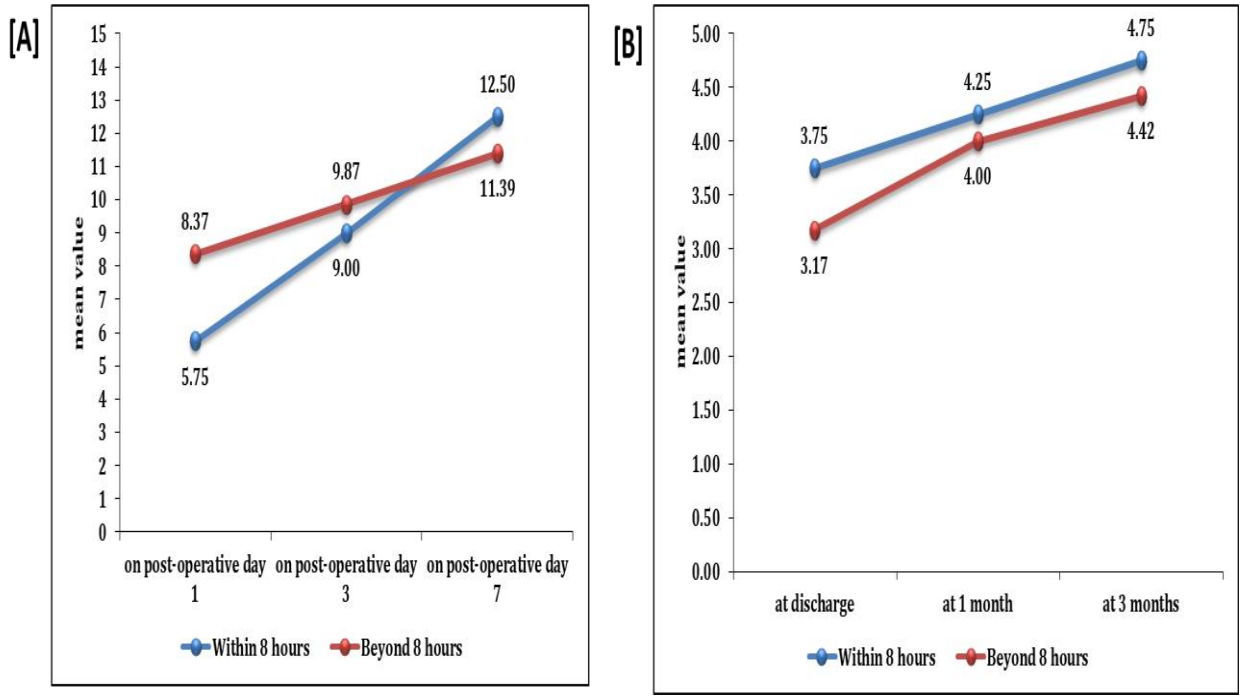

Fig. 1:-Association of trend of [A] Glasgow Coma Scale and [B] Glasgow Outcome Scale at different time intervals with time of onset of complaint to onset of surgery(hours).

The mean Glasgow Coma Scale was 10.87 ± 2.24, 12.35 ± 2.44, 13.87 ± 2.34 in without hypoxia patients and 5.85±2.51, 7.63±3.32, 9.44 ± 4.67 in hypoxia patients at post-operative day 1, at post-operative day 3, and at post-operative day 7, respectively. The men Glasgow Outcome Scale was 3.74 ± 0.69 and 4.64 ± 0.49 in without hypoxia patients and 2.78 ± 1.15 and 4.25 ± 0.55 in hypoxia patients at discharge and 3 months, respectively. The mean value of Glasgow Coma Scale at post-operative day 1, at post-operative day 3, and at post-operative day 7 and Glasgow Outcome Scale at discharge and 3 month were significantly different in without hypoxia and hypoxia during follow-up (Fig. 2).

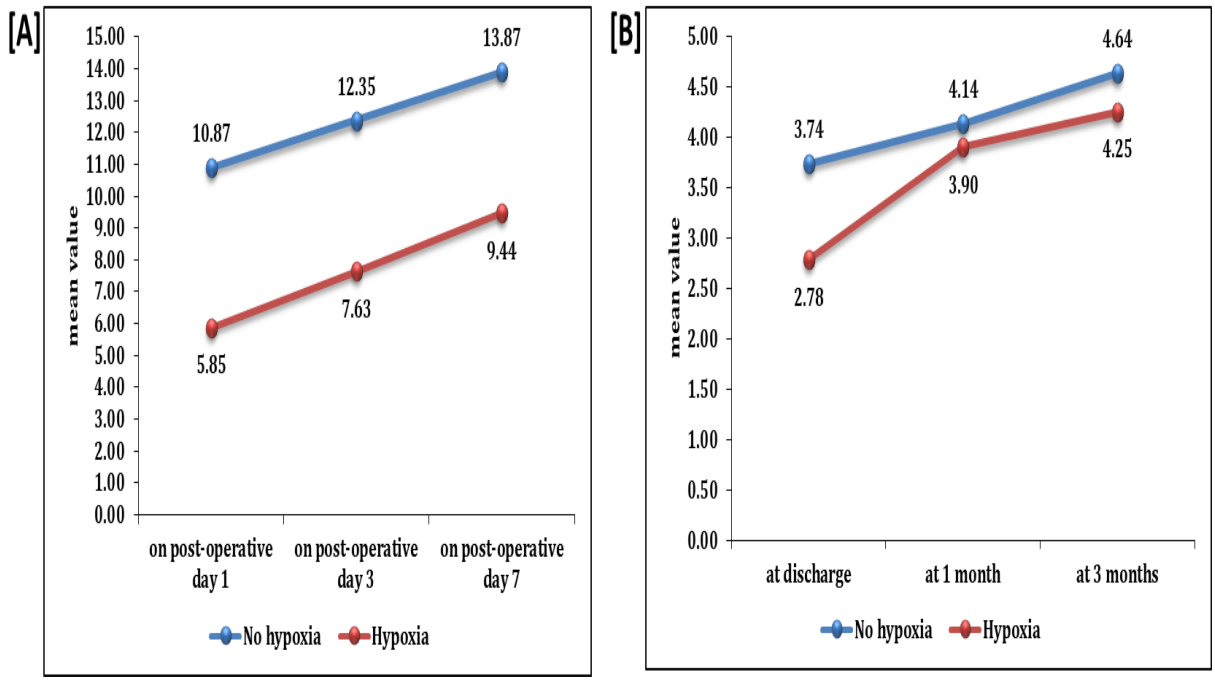

Fig. 2: Association of [A] Glasgow Coma Scale and [B] Glasgow Outcome Scale at different time intervals with hypoxia

The Mean Glasgow Coma Scale at post-operative day 1, on post-operative day 3, on post-operative day 7 in reactive was 9.27 ± 3.22, 10.88 ± 3.22, 12.73 ± 3.49 in reactive as compared to anisocoric (6±2.89, 7.71±3.95 and 9.06±4.93) respectively. The Mean of Glasgow Outcome Scale at discharge, at 3 months was 3.48 ± 0.91 and 4.57 ± 0.5 in reactive significantly higher as compared to anisocoric (2.71 ± 1.21, 4.17 ± 0.58) respectively (Fig. 3).

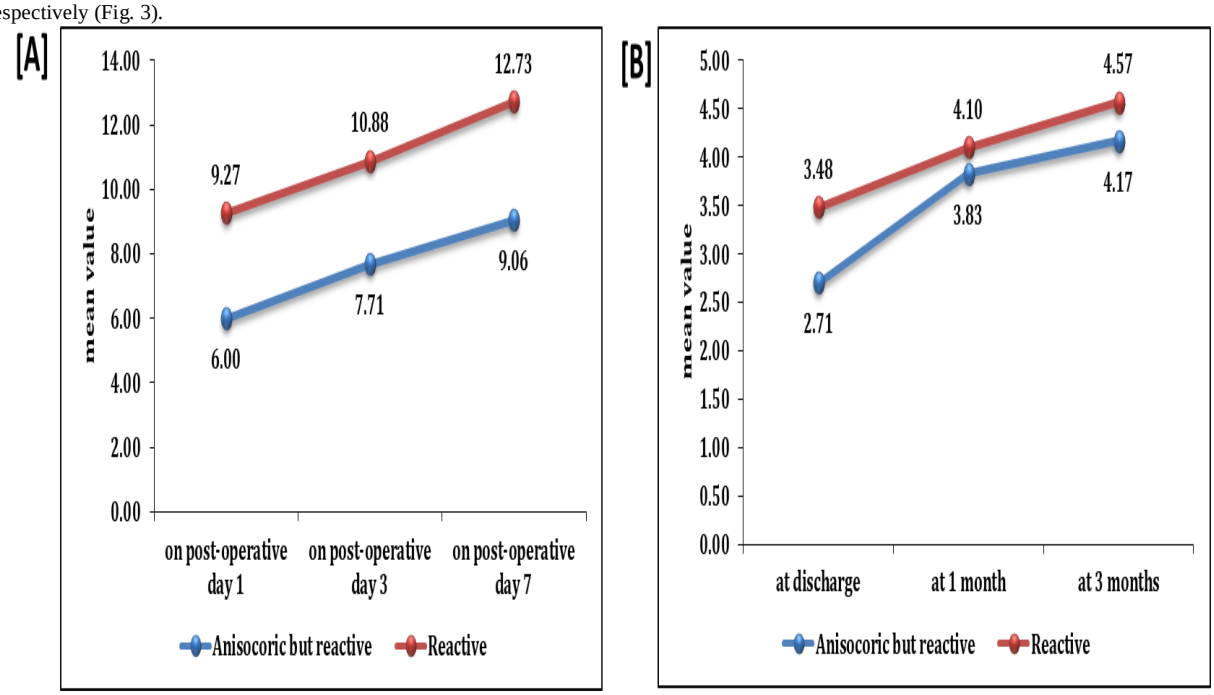

Fig. 3: Association of [A] Glasgow Coma Scale and [B] Glasgow Outcome Scale with pupillary abnormality

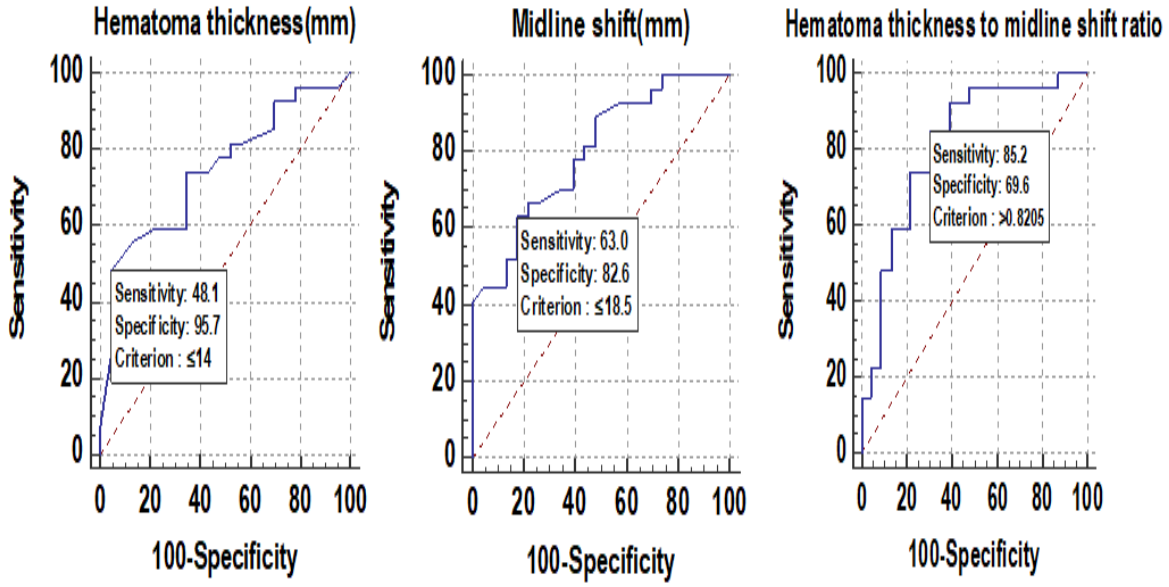

Fig. 4: Receiver operating characteristic curve of hematoma thickness, midline shift and hematoma thickness to midline shift ratio for predicting good outcome.

The hematoma thickness (mm), Midline shift (mm) and age (years) were significantly negative correlated with Glasgow Coma Scale at post-operative day 1, day 3 and day 7. The Glasgow Coma Scale on admission and hematoma thickness to midline shift ratio were significantly positive correlated with Glasgow Coma Scale at post-operative day 1, day 3 and day 7. Whereas time of onset of complaint to onset of surgery (hours) was significantly positive correlated with Glasgow Coma Scale at post-operative day 1 and day 3 only (Table 3).

Table 3: Correlation of Glasgow Coma Scale with Hematoma thickness (mm), Midline shift (mm), Hematoma thickness to midline shift ratio, age, Glasgow Coma Scale on admission, Time of onset of complaint to onset of surgery (hours) and Surface of craniotomy (cm²)

	Glasgow Coma Scale at post-operative day 1		Glasgow Coma Scale at post-operative day 3		Glasgow Coma Scale at post-operative day 7	
	Correlation coefficient	p-Value	Correlation coefficient	p-Value	Correlation coefficient	p-Value
Hematoma thickness(mm)	-0.560	<0.001*	-0.570	<0.001*	-0.512	<0.001*
Midline shift(mm)	-0.691	<0.001*	-0.702	<0.001*	-0.642	<0.001*
Hematoma thickness to midline shift ratio	0.672	<0.001*	0.641	<0.001*	0.556	<0.001*
Age (years)	-0.462	0.001*	-0.52	<0.001*	-0.464	0.001*
Glasgow Coma Scale on admission	0.764	<0.001*	0.654	<0.001*	0.538	<0.001*
Time of onset of complaint to onset of surgery(hours)	0.296	0.037*	0.313	0.027*	0.233	0.103
Surface of craniotomy(cm²)	-0.139	0.335	-0.015	0.915	-0.003	0.983

*=Significant (<0.05)

The hematoma thickness (mm), Midline shift (mm) and age (years) were significantly negative correlated with Glasgow Outcome Scale at discharge only. The Glasgow Coma Scale on admission and hematoma thickness to midline shift ratio were significantly positive correlated with Glasgow Outcome Scale at discharge only (Table 4).

Table 4: Correlation of Glasgow Outcome Scale with Hematoma thickness (mm), Midline shift (mm), Hematoma thickness to midline shift ratio, age, Glasgow Coma Scale on admission, Time of onset of complaint to onset of surgery (hours) and Surface of craniotomy (cm²)

	Glasgow Outcome Scale at discharge		Glasgow Outcome Scale at 1 month		Glasgow Outcome Scale at 3 months	
	Correlation coefficient	p-Value	Correlation coefficient	p-Value	Correlation coefficient	p-Value
Hematoma thickness (mm)	-0.481	<0.001*	-0.055	0.731	-0.037	0.818
Midline shift (mm)	-0.600	<0.001*	-0.126	0.428	-0.153	0.334
Hematoma thickness to midline shift ratio	0.506	<0.001*	0.161	0.308	0.249	0.112
Age (years)	-0.419	0.003*	-0.148	0.350	-0.086	0.587
Glasgow Coma Scale on admission	0.457	0.001*	0.109	0.491	0.11	0.489
Time of onset of complaint to	0.118	0.416	-0.066	0.678	0.067	0.673

onset of surgery (hours)						
Surface of craniotomy (cm²)	0.058	0.688	-0.343	0.026	-0.258	0.099

*=Significant (<0.05)

Table 5: Receiver operating characteristic curve of hematoma thickness, midline shift and Hematoma thickness to midline shift ratio for predicting good outcome

Good outcome at discharge	Hematoma thickness (mm)	Midline shift (mm)	Hematoma thickness to midline shift ratio
Area under the ROC curve (AUC)	0.746	0.798	0.815
Standard Error	0.07	0.06	0.06
95% Confidence interval	0.60 to 0.86	0.66 to 0.90	0.68 to 0.91
p-Value	0.001*	<0.001*	<0.001*
Cut off	≤14	≤18.5	>0.82
Sensitivity (95% CI)	48.15% (28.7 - 68.1%)	62.96% (42.4 - 80.6%)	85.19% (66.3 - 95.8%)
Specificity (95% CI)	95.65% (78.1 - 99.9%)	82.61% (61.2 - 95.0%)	69.57% (47.1 - 86.8%)
PPV (95% CI)	92.9% (66.1 - 99.8%)	81.0% (58.1 - 94.6%)	76.7% (57.7 - 90.1%)
NPV (95% CI)	61.1% (43.5 - 76.9%)	65.5% (45.7 - 82.1%)	80.0% (56.3 - 94.3%)
Diagnostic accuracy	70.00%	72.00%	76.00%

*=Significant (<0.05)

ROC curves above the diagonal line are considered to have reasonable discriminating ability to predict good outcome. All the parameters had significant discriminatory power to predict good outcome. Discriminatory power of hematoma thickness to midline shift ratio (AUC 0.815; 95% CI: 0.680 to 0.911) was excellent and discriminatory power of hematoma thickness (mm) (AUC 0.746; 95% CI: 0.603 to 0.858) and midline shift (mm) (AUC 0.798; 95% CI: 0.660 to 0.898) was acceptable. Among all the parameters, Hematoma thickness to midline shift ratio was the best predictor of good outcome at cut off point of >0.82 with 81.50% chances of correctly predicting good outcome. Hematoma thickness to midline shift ratio had sensitivity of 85.19% followed by midline shift (mm) (62.96%), hematoma thickness (mm) (48.15%). In prediction of good outcome, Hematoma thickness (mm) had lowest sensitivity of 48.15%. On the other hand, hematoma thickness (mm) had specificity of 95.65% followed by midline shift (mm) (82.61%), hematoma thickness to midline shift ratio (69.57%). In prediction of good outcome, Hematoma thickness to midline shift ratio had lowest specificity of 69.57%. Highest positive predictive value was found in hematoma thickness (mm) (92.90%) and highest negative predictive value was found in hematoma thickness to midline shift ratio (80.00%).

Discussion

This study showed a useful prognostic value of the hematoma thickness to midline shift level in patients with acute subdural hematoma. The prognostic biomarkers for acute subdural hematoma are optimized; therefore we performed this study in an attempt to find out a prognostics value on the basis of radiological data hereafter the decision of surgery.

In this study the mean age was 42.64±17.6 with median (IQR) 39 (29-55.75). Similarly, the Faeadh, (2011) reported that the old age, low GCS, multiple head/extra cranial injury, diffuse, axonal injury, acute SDH after severe head injury were significantly associated with high mortality[19]. The possible explanation for higher frequency of head injury in youth is that second and third decade of human life are most active phase of life and thus people in these decades are more vulnerable to trauma.

In our study total 64% male and 36% female patients were involved in head trauma. The male to female ratio was approximately 16:9. Our study was supported by various studies, who reported that the head injury was more common in male[20-22]. In males, increased risk of head injury is attributed to greater exposure and increased risk taking attitude during occupation or life and traumatic injuries among females are under reported.

In this study we found that the road traffic accidents are most common cause of head trauma, which contributes to 31 (62%) of total injuries. Similarly, Umerani et al. (2014) reported that the total 62.6 % injuries cause by road traffic accidents[23]. Agrawal et al. (2012)observed that the person working near or along busy roads get involved in road traffic accidents more frequently according to 80.9% of all traumatic brain injuries[24]. The mode of injury did not affect the outcome it also because there are less number of assaults patients in the study and others confounding factors[25].

In our study the majority of patients (52%) of patients had severe (<9), 28% patients had moderate (9 to 12) and 20% patients had mild (13-15) Glasgow coma scale on admission.The Glasgow Coma Scale was significantly improved post-operatively from day 1 to day 7. The pre-operative GCS was also important factor predicting the outcome of patients with acute subdural hematoma.

Similarly, numerousstudies reported that there is a significant relationship between outcome and GCS score at admission[26-29]. In this study patient with GCS score 13-15 are having favourable final outcome (mean 14.5±0.85 GCS at post-operative day 7), than moderate GCS between 9 -12 (mean 13.36±2.87GCS at post-operative day 7) than severe GCS score of less than 8 (mean 9.31±4.71 GCS at post-operative day 7). These findings are also confirmed by a study indicating the severity of injury determining the outcome of patients in post-surgical period[30].

In our study mean value of hematoma thickness(mm), midline shift(mm) and hematoma thickness to midline shift ratio of study subjects was 16.5±2.6, 19.35±4.49 and 0.87±0.1 with median(25th-75th percentile) of 16.5(14-18), 19.5(16.575-22.2) and 0.84(0.791-0.928) respectively. In majority (34.00%) of patients, site of hematoma was fronto-parietal followed by fronto-parieto-occipital in only 2 out of 50 patients (4.00%). In majority (58.00%)) of patients, laterality of hematoma was right and on left in only 21 out of 50 patients (42.00%). Significant positive correlation was seen between hematoma thickness to midline shift ratio with Glasgow Coma Scale on post-operative day 1, day 3, day 7 with correlation coefficient of 0.672, 0.641, 0.556 respectively suggesting as ratio increases GCS score improves post operatively. Ratio more than 0.8 had better outcome. Significant negative correlation was seen between hematoma thickness(mm) with Glasgow Coma Scale on post-operative day 1, day 3, and day 7 with correlation coefficient of -0.56, -0.57, -0.512 respectively depicting as hematoma thickness increases the post-operative GCS score decreases. Hematoma thickness more than 14 mm had poor outcome Significant negative correlation was seen between midline shift(mm) with Glasgow Coma Scale on post-operative day 1, day 3 and on day 7 with correlation coefficient of -0.691, -0.702, -0.642 respectively showing poor outcome with increased hematoma thickness supported by Alagoz et al. (2017) and. D'Amato et al. (2007), suggested that there is larger midline shift in

those patients who died and in patients with severe disability or vegetative state 6 months after the trauma[31,32].

Our study showed that the GCS score was inversely proportional to the thickness of hematoma and interval between onset of trauma and surgery. The hematoma thickness to midline ratio of > 0.8 is of favourable outcome and patients with higher hematoma thickness present with lower GCS score on admission. Supported by a study in which shows that the significant correlation with lower admission GCS and lower GCS score at 2 week post operatively with higher GOS score by end of follow up, positive correlation with GOS [22].Petridiset al. (2009) showed that low GCS score (3 – 8), pupil abnormalities, the presence of contusions and subarachnoid bleeding, midline shift > a SDH thickness as well as a highly elevated[33]. Also supported by Bartels el al.(2015)they found a strong correlation between a midline shift exceeding the thickness of the hematoma by 3 mm or more, and subsequent mortality[21]. They suggested that for the future development of prediction models, the relation between midline shift and thickness of the hematoma could be included as a separate factor.

In this study hypoxia was significantly associated with outcome. Hypoxia is one among several preventable secondary brain injuries affecting outcome mainly in patients with traumatic acute subdural hematoma of greater severity. The mean value of Glasgow Coma Scale at post-operative day 1, at post-operative day 3, and at post-operative day 7 and Glasgow Outcome Scale at discharge and 3 month were significantly different in without hypoxia and hypoxia during follow-up).This is in agreement with several previous studies, the reported that the hypoxia was significantly associated with outcome[34,35].

In our study theGlasgow Outcome Scale at discharge, at 3 months was 3.48 ± 0.91 and 4.57 ± 0.5 in reactive significantly higher as compared to anisocoric (2.71 ± 1.21, 4.17 ± 0.58) respectively. Similarly, various study reported that the pupillary abnormalities are having strong correlation with prognostic outcomes in acute subdural hematoma with increased hematoma thickness >1 cm and hematoma thickness/midline shift (H/S) ratio < 0.8 with poor outcomes. It is being considered that pupillary dilatation is strongly associated with brainstem ischemia[33,36-38].

Lifesaving surgeries ideally should be done in hospitals with neurosurgical unit within 4 hours of injury and with management in intensive care units delay in treatment is one of the major factors which can be preventive leading to mortality and morbidity. Time of onset of injury to surgical decompression effects mortality. In this study significant association was seen in improvement in Glasgow Coma Scale on post-operative day 7 with time of onset of complaint to onset of surgery (hours). Similarly, several study reported that the early surgery after injury was significantly decreased the mortality and morbidity[5,8,32,39,22], Contrary, a study observed that the time interval from injury to craniotomy and direct admission to a neurosurgical unit were not found to be significant prognostic factors[40].

Conclusions

A positive correlation between preoperative hematoma thickness to midline shift ratio and negative correlation of hematoma thickness (mm), Midline shift (mm) with postoperative Glasgow Coma Scale and Glasgow Outcome Scales were found in traumatic intracranial acute subdural haematoma. The important prognostic factors significantly affecting the outcome of traumatic intracranial acute subdural haematoma include: age of patients, mechanism of injury, severity of head injury (GCS), SpO2, pupillary response to light, haematoma thickness, midline shift, and mode of treatment.

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