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ORIGINAL ARTICLE

Prognostic Factors after Acute Subdural Hematoma

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ABSTRACT

Background: Acute subdural hematoma is a lesion caused by traumatic brain injury. Computed topography, hematoma thickness and midline shift analysis are important factors in evaluating its prognosis.
Aim: To evaluate the factors involved in prognosis of acute subdural hematoma.
Study design: Retrospective study
Place and duration of study: Department of Neurosurgery, Chandka Medical College Hospital, Larkana from 1st October 2020 to 30the June 2021.
Methodology: One hundred patients from both genders and between age 18-55 years were enrolled. Clinical examination and radiological complete examination was done in each patient. Zumkeller Index (ZI) was calculated and Glasgow scoring was performed.
Results: The mean age were 44.1±15.8 years with 87% males having major reasoning of head injury as a motor cycle accident. Traumatic brain injury was recorded as >3mm ZI in 10 cases. The mean midline shift was 12.4±6.06 mm with a significant difference between three categories.
Conclusion: Midline shift and hematoma thickness are useful predictors of prognosis related to acute subdural hematoma.
Keywords: Prognostic factor, Acute subdural hematoma, Computed tomography (CT)

INTRODUCTION

Acute subdural hematoma is a blood clot formed between the brain and dura mater, which is brains outer covering. This can be caused as a result of tearing of brain veins. Acute subdural hematoma is the major reason of subdural hematomas accounting up to 50-60% of all the reported cases. The main cause of these acute subdural hematoma (ASDH) is a traumatic brain injury, however anticoagulant, antiplatelet or aneurysmatic tearing of posterior communicant artery can also be justified causes of ASDH.[1] There are two major types of ASDH, first is called burst lobe syndrome which involves contusion of brain, oedema and laceration in addition to hematoma ofintracerebral area. The second type occurs as a consequence of reputed blood vessels involved in bridging of dura mater within the brain. A delayed neurological damage has been noticed in first type of ASDH with absence of lucid interval making this type more lethal. In second type violent jerky movement of head causes brain acceleration or deceleration. In this case the lucid interval is present with less hazardous brain damage[2-3]. Despite the fact that ASDH requires crucial treatment plan still a major number of cases are unfortunate making ASDH related morbidity ratio to be very high[4-5].

The recent guidelines support that acute subdural hematoma greater than thickness of 10mm or having a midline-shift > 5mm requires CT scan evaluation. This should be performed mandatory despite of patients score on Glasgow scale. Those patients who are comatose and show Glasgow score <9 in addition to ASDH size <10 mm and midline shift also below 5mmalso requires to be surgically evaluated in case their Glasgow score decreased within the interval of injury time to emergency room by 2 or greater points. Patients with asymmetric, dilated or fixed pupils and those with intracranial pressure above 20mmHg needs immediate surgical evaluation for their ASD.[6]

Road accident are the major cause of head injuries all over the globe in people <45 years of age. In western countries the incidence of traffic accident have been decreasing due to strict safety rules, however elderly population is more prone towards head injuries in those countries As a consequence of aging, cardiovascular disease and Parkinson related falls[7].

The prognosis of ASDH depends on various factors including coagulopathy, the neurological condition of patient before surgery, age of patient or post-operative condition such as pneumocephalus. There have been many surgical as well as non-surgical techniques for treating ASDH including burr hole – trephination and removal of hematoma .Although neurosurgeons phase neurological damaging in many such cases[8]. The present study was designed to evaluate the prognosis factors associated with treatment of ASDH.

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PATIENT AND METHOD

It was a retrospective study enrolling 100 patients between 18-55 years of age suffering from acute sutural hematoma caused by head injury through accident, fall, violence or any other trauma. The study was conducted at Department of Neurosurgery, Chandka Medical College Hospital, Larkana from 1st October 2020 to 30the June 2021. Those patients having spontaneous/subacute ASHD, or bilateral ASDH, and or epidural hematoma were excluded from study. Patient with poly-trauma were also not included in the study.The Glasgow score and pupil response were also included. An informed consent was signed form patient or attendees for sharing their data for study purpose, however their personal address and names were kept confidential. Computed topography scan was performed in traumatic ASDH.

ASDH was diagnosed by computed topography (CT) scan using 64 channel scanner with multi-detector specs (Philips Medical Systems; Netherlands). A neurosurgeon with help of radiologist performed and confirmed the diagnosis. Rotterdam score (RS) as well as Helsinki scores (HS) were consideredas described earlier.[9-10]These scores have several complex models and tools for radiological variables in their valuation. Higher RS and HS meant poor clinical prognosis withtraumatic brain injury.

Midline shift assessment was made in axial plane at interventricular foramen level. The measurement was made as longest upright distance of most dislocated point of pellucid-septum from imaginary sagittal line associating the frontal ridge and the inner occipital swelling.

Midline shift was assessed in the axial plane at the level of the interventricular foramen. This was measured as the longest perpendicular distance between the most displaced point of the pellucid septum and an imaginary sagittal line that associates the inner occipital protuberance and the frontal ridge. Hematoma thickness was evaluated through longest space from inner table to the cortex.

Patients were categorised as those having lower midline shift in comparison to hematoma thickness and those whose measurements were between the range of 0.01 mm to 3 mm. Another categorization was done in those havingmidline shiftand hematoma thickness difference as >3mm taking the fact into consideration that brain protuberance is presented when midline shift > than hematoma thickness. Patient's prognosis was recorded during14 days of hospitalization. The midline shift value was subtracted from hematoma thickness value to get ZI value (Zumkeller index).[11]

Qualitative variables were analysed using frequencies whereas quantitative variables were assessed as mean and standard deviations and one way ANOVA.

RESULTS

There were 87(87%) males and rest were females 13 (13%). The mean age of patients was 44.1±15.8 years. Majority of the head injury cases such as 55% were as a result of bike accidents. Seventy three percent of cases showed negative Z Index value. The mean Z index value was 4.33±5.9. One way ANOVA showed only 5 cases had both pupil reactivity >3mm ZI (Table 1).

The pair wise comparison showed significant difference in ZI categories with a p value <0.05. Trauamtic brain injury was noticed as >3mm ZI in 10 cases. The mean midline shift was 12.4±6.06 mm with a significant difference between three categories. The mean hematoma thickness was 12.6±7.6mm (Table 2).

The radiological imaging through CT scan showed significant variation between ZI values with 48 such cases having negative value of Z index (Table 3). Hematoma thickness was correlated with clinical outcomes and midline shift was seen to be associated with 14 day morbidity outcomes. Hematoma thickness was also significantly related with mortality prediction. Fig 1

Table 1: Comparison of Age, GCS and pupil reactivity with ZI values

Variable	ZI <0	ZI 0–3 mm	ZI >3	P value
Age (years)	47.9±19.5	35.7 ± 12	48.9±16)	0.06
Glasgow coma score	5 (3–9)	6 (3–10)	2 (3–5)	0.031
Pupil reactivity				0.26
Both pupils (n)	58	11	5	
One pupil	12	2	3	
Neither pupil	3	2	4	

Table 2: Clinical characteristics according to ZI categories

Clinical characteristics	ZI <0	ZI 0–3 mm	ZI >3	P value
Traumatic brain injury class				0.86
Mild	15	1	1	
Moderate	12	2	1	
Severe	50	8	10	
MLS (mm)	6.7±5.5	14±7.7	16.5 ±5	<0.001
HT (mm)	11± 7.1	13±8.0	14±7.8	0.368
Rotterdam score	6 (3–7)	5 (4.5–5.5)	6(6–6)	0.002
Helsinki score†	7(4–10)	8(5–11)	13 (9–15)	0.001

Fig 1: Comparison of mortality with ZI value

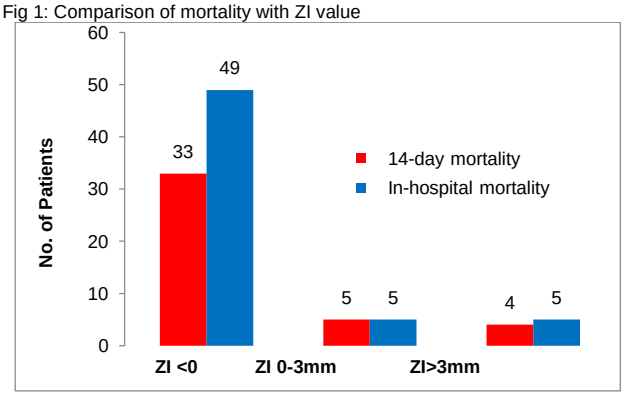

Table 3: Radiological characteristics in accordance to ZI categories.

Radiological characteristics	ZI <0	ZI 0–3 mm	ZI >3	P value
Other injuries				
Fractures	48	7	8	0.401
Traumatic subarachnoid hemorrhage	6	14	12	0.498
Intraventricular hemorrhage IVH	25	2	6	0.077
Intracerebral hematoma ICH	46	7	11	0.032

DISCUSSION

The present study used "Zumkeller index," values available in literature for assessing the prognostic factors involved in ASDH. The mean age in the current study was 44.1±15.8 years. The ZI values showed apositive relation with increased age group. Studies elsewhere also reported that prognosis value of old adults is much declined than young adults. [12] Advanced ages are associated with higher mortality rate as could be observed from the current study and also literature available from previous studies.[13]

The outcomes showed a poor prognosis of those patients having high ZI values and cerebral oedema with their associated injuries. Various studies[14,15] have also shown similar results. The research data shows that midline shift that exceeds hematoma thickness shows presence of cerebral oedema and poor prognostic values. This can be considered as a poor prognostic factor in ASDH patients.

Other prognosis factors depended upon the CT radiological findings. In current study interventricularhaemorrhages and intracerebral hematoma were very common as well as skull fractures. Researches from worldwide data elaborated the significance of these factors in prognosis of acute subdural hematoma cases[16-20].

The mortality rate in hospital was significantly higher at positive ZI value than 14 days mortality. Similar has been reported in other retrospective studies.[2]

CONCLUSION

A worst clinical staging was seen in patients with positive ZI value and in terms of Glasgow score. In addition to this poor Rotterdam and Helsinki scores were related with positive ZI and worst poor prognosis.

Conflict of interest: Nil

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