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Original Research Paper

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A PROSPECTIVE LONGITUDINAL CLINICAL STUDY OF PATIENTS ADMITTED WITH TRAUMATIC ACUTE SUBDURAL HEMORRHAGE AND UNDERGOING DECOMPRESSIVE CRANIECTOMY WITH SPECIAL REFERENCE TO PROGNOSTIC FACTORS

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ABSTRACT

INTRODUCTION: Traumatic brain injuries (TBIs) are a leading cause of mortality, disability and socioeconomic losses globally. The associated brain damage and effects of the injury is complex and hence the outcome is highly variable, articularly in patients who undergo Decompressive Craniectomy. Many factors have been identified to influence the morbidity and mortality in such patients. **AIMS:** This study aimed to detect prognostic factors that can be used to predict outcome in the management of traumatic acute subdural hemorrhage(SDH) patients undergoing Decompressive Craniectomy. **MATERIAL & METHODS:** The study was done at department of neurosurgery at Institute of Postgraduate Medical Education and Research, Kolkata from August 2017 to November 2019. Patients admitted with Traumatic acute SDH were included based on the inclusion and exclusion criteria and studied on various parameters. **OBSERVATION & RESULTS:** Among the various prognostic factors studied Abnormal pupils, low GCS at admission, >15mm Midline shift in NCCT Brain and completely effaced basal Cistern on CT scan were associated with the worst outcome but age, gender, External Injury and Associated Internal Injury do not bear a strong relationship with outcome, so they were not predictive factors in this study and caution should be taken when considering these factors in the surgical decision. **CONCLUSION:** The core of the decision-making process for traumatic acute SDH should be built not only by intrinsic hematoma features but also by prognostic factors that may help predicting the outcome and establishing a reasonable approach considering the invasiveness and aggressiveness of the therapeutic measures.

KEYWORDS : SDH, Decompressive Craniectomy, GCS, Prognostic Factors

INTRODUCTION

Traumatic brain injuries (TBIs) are a leading cause of morbidity, mortality, disability in India. [1] The associated brain damage and effects of the injury is complex and hence the outcome is highly variable among patients. This is particularly more relevant in patients who undergo Decompressive Craniectomy. Many factors have been identified to influence the morbidity and mortality in such patients. And hence, prognostication is very difficult. Road traffic injuries are the leading cause (60%) of TBIs. Alcohol involvement is known to be present among 15%-20% of TBIs at the time of injury. [1] Recently, there is a marked change in the evaluation & management of head injury and therefore there is a marked reduction in the number of deaths with a proportionate increase in the number of dependent patients. Development of modern Neuro-Surgical Intensive care units have made an enormous impact on the management of head injuries. Some institutes use decompressive craniectomies in all ASDH, whereas other institutes use cranioplastic craniotomies[2], or various procedures are used on different occasions.[3,4,5,] The choice of surgical procedures may depend on the surgeon's expertise, training, neurological status of patients, duration from deterioration, pre-operative radiological findings and availability of operating theater. In principle, the purpose of surgery is to release brain from intracranial hypertension to suppress secondary injury minimally. Thus, large craniotomy with hematoma evacuation may be principle. [6] When intra- and/or post-operative brain swelling is strongly expected, decompressive craniectomy may be suitable. It is supported by a recent publication which has demonstrated that decompressive craniectomy significantly improve outcome in patients with refractory intracranial hypertension due to extensive contusion, compared to routine craniotomy.[7] However, as it has been known that bony decompression result in apparent exacerbation of edema,[8] the superiority of decompressive craniectomy to craniotomy is still controversial.[9,10,11]

This study is an attempt to detect prognostic factors that can be used to predict outcome in the management of traumatic acute subdural hemorrhage patients undergoing Decompressive Craniectomy.

MATERIAL & METHODS

The study was done at department of neurosurgery at Institute of Postgraduate Medical Education and Research, Kolkata from August 2017 to November 2019. Patients who were admitted with Traumatic acute SDH were included based on the following inclusion and exclusion criteria after taking permission from the ethical committee of the concerned institute. The study protocol was explained to the patients/guardians and a written informed consent was obtained from each subject to be enrolled in the study. 45 patients were admitted during the timeline of the study who fulfilled the inclusion criteria and were studied after obtaining their written and informed consent.

INCLUSION CRITERIA

All the patients admitted during the study period with traumatic acute subdural hemorrhage to BANGUR INSTITUTE OF NEUROSCIENCES & SSKM HOSPITAL, IPGME&R, KOLKATA under the department of neurosurgery

and undergoing Decompressive Craniectomy.

EXCLUSION CRITERIA

(1) Individuals not willing to participate in the study.
(2) Conservatively managed acute subdural hematoma.
(3) SPONTANEOUS NON-TRAUMATIC acute SDH was excluded from the study.
(4) Patients with acute subdural hematoma who were not operated due to other reasons.
(5) Patients having associated injuries other than traumatic acute subdural hemorrhage like diffuse axonal injury, extradural hemorrhage, contusions or hydrocephalus were excluded from study.
(6) Patients having vascular brain lesions.
(7) Patients having previous brain surgeries.
(8) Patients having postoperatively developed acute subdural hemorrhage were not included in study.

PARAMETERS WHICH WERE STUDIED

(1) Age
(2) Gender
(3) Glasgow coma scale
(4) Mechanism of injury and Mode of transportation
(5) Hemispheric location
(6) Clinical features
(7) External injuries and associated injuries
(8) Pupillary response and oculocephalic response
(9) CT scan findings as Brain Bulge, Brain pulsations and clot volume.
(10) Time between injury and surgical intervention.
(11) Midline Shift
(12) S.D.H thickness.
(13) Glasgow outcome score at 6-month interval
(14) Postoperative Complications

STUDY PROCEDURE:

Patients included in the study based on the above inclusion and exclusion criteria. Detailed history of the patient was obtained. Data regarding the demographic characteristics such as age, sex, mode of injury, alcohol intake history, mode of transmission, Time Gap (time interval between injury to operation), clinical evaluation pertaining to GCS on admission, pupil, CT findings as SDH thickness, M.L.S (midline shift), brain pulsations, brain bulge, clot volume were recorded. GOS at 6 months following Decompressive Craniectomy was noted. It was followed by a thorough physical examination with special focus on central nervous system. Once clinical evaluation is done, patients will undergo routine blood investigations and all necessary radiological investigations.

OBSERVATIONS AND RESULT

Association of age group with Mortality and Survival rates:- Out of the total 45 cases of traumatic acute SDH, 18 cases (40.0%) have died with maximum death in >60 years i.e. 3(75.0%). Of those survived 27 cases (60.0%) maximum were from age group 20-60 years i.e. 23 (51.12%) however it has not come to be significant (p>0.05).

Association of Time Gap (Injury to operation) with Mortality and Survival rates:- (N=45) -The majority of patients with traumatic ASDH presented for surgery between 6 to 24 hours 25(55.6%) followed by >24 hours 13(28.9%) and <6 hours 07(15.5%). Out of those patients who were operated within 6 hours of injury, 05(71.4%) have survived compared to those who presented after 24 hours of injury for the operation 08(61.4%) have survived. This is statistically not significant at **p>0.05.**

Association of GCS scores at admission with Mortality and Survival rates:- Out of the total traumatic ASDH patients, those with GCS <8 have 85.7% mortality. Those who have GCS >13, 100.0% of them have survived. Among those who have GCS 8-13, 40.0% have died compared to 60.0% have survived, which is statistically significant (p<0.05).

Association of External Injury with Mortality and Survival rates:- Survival rate was more in individuals having no External Injuries i.e. 23(88.5%) and Mortality was more in patients with External Injuries i.e. 07(36.8%). Chi square test showed p value <0.05 which is statistically significant.

Association of Internal Injury with Mortality and Survival rates: Out of the total 21 patients in whom associated internal injury was present, 08(38.1%) have died and 13(61.9%) have survived. Of those 24 patients in whom associated internal injury was absent, 10(41.7%) have died and 14(58.3%) have survived. Chi-square test showed that this is statistically not significant (p>0.05).

Association of side of lesion with Mortality and Survival rates:

Out of 45 patients, 25 patients had acute SDH on the right side and remaining 20 patients had acute SDH on left side. On doing comparison of side of lesion with mortality patients having right sided lesions (25), 14 patients survived while 11 patients expired and patients having left sided lesions (20), 13 patients survived while 7 patients expired. On applying chi square test for comparison of mortality with right versus left side of acute SDH, p value was not >.05 so it was not statistically significant.

Association of clot volume with Mortality and Survival rates: Among patients having clot volume <25ml, 100.0% (01) have survived .Mortality is 100% in patients who have clot volume >50 ml.

Association of SDH Thickness in C.T. Scan with Mortality and Survival rates:-Survival was more in patients in whom SDH Thickness on C.T. scan was between 5-10 i.e. 16(76.2%) whereas there was 100.0% (05) mortality in patients having SDH Thickness on C.T. scan >15mm.

Association of Midline Shift (M.L.S.) on C.T Scan with Mortality and Survival rates.:- Cases having Midline Shift of >10mm, 85.7% (06) had died. Approximately equal number of cases had survived among Midline Shift of 5-10 mm i.e. 68.9% (20) and <5mm i.e. 66.6% (06). Chi square test showed p value <0.05 which is statistically significant.

Association of Basal Cistern Conditions on C.T Scan with Mortality and Survival rates :- Survival rate was more in individuals having normal Basal Cistern on C.T. scan i.e. 12(92.3%) followed by compressed Basal Cistern on C.T. scan i.e. 10(83.4%). Mortality was more in completely effaced Basal Cistern on C.T. scan i.e. 15(75.0%) followed by compressed Basal Cistern on C.T. scan i.e. 02(16.6%). Chi square test showed p value <0.005 which is statistically highly significant.

Association Of Mortality And Survival Rates with Pupils Reaction: Survival rate was more in individuals having normal Pupil Reaction i.e. 20 (90.9%) and Mortality was more in patients with abnormal Pupil Reaction i.e. 16 (69.6%). Chi square test showed p value <0.005 which is statistically highly significant.

Association Of Post-Op Complications With Mortality And Survival Rates: Survival rate was more in individuals having no Postoperative complications 24(63.2%) and Mortality was more in patients with Postoperative complications 04 (57.1%) after Decompressive Craniectomy. Chi square test showed p value >0.05 which is not statistically significant.

DISCUSSION

ASDH is a very major contributor to mortality after head injury. The mortality rate ranges from 40 to 90% in various series. In the present study it ranges from 25 to 75%.The high percentage of mortality is usually related to the degree of focal and diffuse brain damage associated with the traumatic ASDH. The most important other factors which has been studied in this present study include age, mode of injury, time gap between injury to operation, GCS at admission, SDH thickness, MLS and the state of basal cisterns on CT scan. Many studies have concluded that the most of the above factors affect the outcome in ASDH. In general increased age is associated with poor outcome in adults although for children the opposite may be true [12-14] as outcome effect can be contributed to other associated variables. This study showed age between 21 and 60 has good outcome survival than the old age group. The percentage survival was 62.2% in age group of 21-60. Patients <21 year of age also showed good outcome as 75% and patients more than 60 year of age had poor outcome survival of 25%. Pearson chi square test showed **x2=2.4901, p=.4771** which is not significant in this study. Howard et al[3]in their study of acute subdural hematoma reported a good correlation between age and the outcome. They concluded that mortality rate for old patients were as high as 66% compared to young patients, whom mortality rate was 18%. Acute SDH in young patients may be an epiphenomenon whereas in elderly patients the mass itself is probably the most important pathological process. Our explanation for poor outcome in elderly may be aging brain, may be impaired regenerative capacity. Seeling et al[15]did not find any difference in age between survivors and non-survivors. In a series published by Massaro et al[16] patients under the age of 35 yrs had a mortality rate of 45% as compared to mortality of 60% for those above 65 years. Patients aged between 35 and 65 years had a mortality rate of 62%. Though the difference was statistically significant, there was association between age and outcome. This study showed that most of the patients were admitted following road traffic accidents (RTA) 35.5% followed by fall from height 24.5%. Wilberger, et al.[2] (1991) showed that the most common mechanism of injury was automobile accidents 53%followed by falls 37%. In study by BijitGogoi[17]majority of patients 63.63% had road traffic accidents. In the study of Massaro et al [16] most common mechanism of injury was RTA and fall was related with worst outcome.

This study found that Out of those patients who were operated within 6 hours of injury, 71.4% have survived while who were operated after 24 hours of injury only 61.4 had survived. When the time gap and mortality rates were analyzed statistically, a significant difference was not found between the two groups (p>0.05). In other words, our study demonstrates that in patients with PASH, the prognosis is not affected by the timing of the operation which is similar to results shown by study done by Stone and colleagues [18] who reported 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. This is in contrast to study done by Wilberger and colleagues [2] who reported that the time interval between the operation and trauma can affect mortality in PASH. Seelig and colleagues [17] reported a considerable decline in the rates of mortality and morbidity of the patients operated in the first four hours after the trauma compared to those operated upon later (mortality rate of 30% and FR rate of 65%).[18-22]

This study showed there is a strong correlation between the GCS score on admission and prognosis of PASH. Phuenpathom and colleagues reported that the GCS score is one of the most critical factors. In this study, the mortality of patients according to GCS scores on admission were 85.7% in those whom GCS was<8 and those who have GCS >13 100.0% of them have survived. Differences between these results were statistically significant (p<0.001).Similar results were seen by study conducted by Massaro et al (1996) [23]who reported mortality of 70% and functional recovery in 11% cases of acute SDH patients with pt having GCS <8. Similar outcome was reported by Servadei et al [23] and Kotwica[24]This study showed that survival rate was more in individuals having normal pupil reaction 90.9% and mortality was more in patients with abnormal pupil reaction 69.6%.Chi square test showed p value <0.005 which is statistically highly significant. Anisocoria and lack of pupil reaction are indicators of a transtentorial herniation and are associated with a higher mortality. Nevertheless, traumatic mydriasis and oculomotor nerve damage should be distinguished from this condition. These results are similar to other research findings in the literature.[25,26] It is clear that abnormal pupil reaction is a strong determinant of the prognosis in PASH and negatively affects the results.

This study showed that more deaths 85.7% were seen in cases having Midline Shift>10mm. Approximately equal number of cases 68.9% and 66.6% had survived among Midline Shift of 5-10 mm and <5mm. Chi square test showed p value <0.05 which is statistically significant Survival was 76.2% in patients having SDH Thickness on CT scan between 5-10 mm whereas 100.0% mortality in patients having SDH Thickness on CT scan >15mm.

In the acute subdural hematoma guideline published in 2006 by Bullock and colleagues,[27] it is stated that patients with hematomas thicker than 10 mm or who have midline shift greater than 5 mm should be operated without considering the GCS. Craniotomy is strongly suggested as soon as possible if a decline of 2 points occurs in the GCS score, if the intracranial pressure is greater than 20 mmHg, or if an abnormal pupil reaction is detected, despite a thickness of hematoma greater than 10 mm and midline shift less than 5mm. Our clinical experience is similar to this report.

CONCLUSION

ASDH is a frequent neurosurgical condition responsible for significant morbidity and mortality. The core of the decision-making process should be built not only by intrinsic hematoma features but also by prognostic factors that may help predicting the outcome. Abnormal pupils, low GCS at admission, >15mm M.L.S in C.T. and completely effaced basal Cistern on C.T. scan were associated with the worst outcome. Among the various prognostic factors studied, age, gender, time interval between trauma and operation, External Injury, Associated Internal Injury and post-op complications do not bear a strong relationship with outcome as evidenced by statistical tests. So they were not predictive factors in this study. Caution should be taken when considering these factors in the surgical decision.

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