FACTORS PREDICTING EARLY OUTCOME OF ACUTE SUBDURAL HAEMATOMA: OUR EXPERIENCE

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ABSTRACT

Objectives: To investigate the factors determining the postoperative outcome of acute subdural haematoma in our setup.

Methods: A prospective observational case series conducted between January 2015 and June 2016 at department of neurosurgery, Hayatabad Medial Complex Peshawar. Patients presenting with history of head trauma and a diagnosis of acute subdural haematoma, requiring surgical evacuation were included in this study. Data was collected about patient demographics, preoperative clinical and radiological findings, intraoperative observations and postoperative complications. Note was made of the impact each factor had in predicting the outcome of these patients.

Results: 67 patients with mean age of 38.4 years ± 13.1 SD. There were 53 (79.1%) males and 14 (20.9%) females. The most common mode of injury was motor vehicle accidents in 35 (52.2%) cases, 21 (31.3%) cases of fall, 10 (14.9%) cases of physical assault, and one (1.5%) case was due to crush injury. Median GCS at arrival was 7 hours (mean: 7.6 ± 2.1 SD). Mean time between injury and surgery was 7.2 hours ± 3.6 SD (range: 1 hour to 16 hours). The outcome was favourable (GOS: 4, 5) in 38.8% (n = 26) patients while in 61.2% (n = 41) of patients the outcome was unfavourable (GOS: 1, 2, 3). Overall mortality was 38.8% (n = 26). pupillary abnormalities at presentation ($p < 0.001$), midline shift ($p = 0.01$), time since injury to surgery ($p = 0.05$) and GCS at arrival ($p = 0.001$) were strongly associated with final outcome. Outcome was not significantly associated with gender groups ($p = 0.37$), injury mechanism ($p = 0.6$), age groups ($p = 0.95$) and presence of other intracranial/intracerebral traumatic lesions ($p = 0.1$).

Conclusion: Admission GCS, pupillary abnormality, time between injury and surgery and midline shift on CT brain were predictive of early outcome after decompressive surgery. Age, additional intracranial/intracerebral traumatic lesions and mechanism of injury were not significantly associated with postoperative outcome.

Key Words: Acute subdural haematoma, prognostic factors, decompressive craniotomy, outcome.

INTRODUCTION

Head injury has immense impact on the functional outcome and survival of individuals who are victims of trauma. Lifetime healthcare costs reach up to 60 billion dollars due to traumatic brain injury (TBI). More than 10 million people presents with head trauma.[1,2]

Acute subdural haematoma (ASDH) is one of the commonest intracranial traumatic lesion encountered in moderate and severe head injury patients. The primary pathologic mechanism involves rapid acceleration deceleration injury with a rotational component which leads to shearing of the subdural veins over the surface of the brain, leading to rapid haemorrhage. Current evidence based guidelines from Brain Trauma Foundation (BTF) indicate that patients with a thickness of more than 10 mm, midline shift of more than 5 mm, GCS less than 8 or deteriorating rapidly, pupillary abnormalities and intracranial pressure (ICP) over 20 mmHg should be operated with a wide craniotomy with or without bone flap removal and with or without expansion duraplasty.[3,4]

In 1981, Seeling et al[5] proposed that outcome is primarily affected by the time period between occurrence of injury and craniotomy. This four-hour rule indicated that patients who were operated within 4 hours of injury only had a 30% mortality while patients operated later than this had a mortality of 90%. Currently available guidelines are all class-III evidence with no support from randomised controlled trials. The treatment remains primarily surgical evacuation with wide craniotomy despite the ongoing debate of whether to operate in late presenting patients or if there exist a true indication for conservative treatment.[6,7]

ASDH is notoriously associated with a very high mortality despite the neurosurgical and neurointensive care development all over the world.[8] In a developing country like Pakistan, where we have deficient neurointensive care and scant neurosurgical facilities, there is a need for improvement in patients of TBI. Risk factors which affect the outcome of these intracranial lesions, such as ASDH, needs to be studied extensively, so as to identify the preoperative factors which affect the outcome in operated patients.[9]

Our aim is to study these risk factors which have impact on the postoperative outcome of patients with ASDH. Identification of these factors will improve deci-

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sion making for decompressive craniectomy in ASDH both locally as well as internationally.

METHODS

The Study

Prospective case series between January 2015 and June 2016 conducted with the approval of our institute ethical committee approval at the department of neurosurgery, Hayatabad Medical Complex, Peshawar. All patients were included after taking informed consent from the patients or their relatives (guardians).

Patients with a diagnosis of traumatic ASDH, irrespective of gender, with age range of 18 to 65 years were included. Surgical indications were haematoma thickness of more than 1 cm, midline shift of more than 5 mm, GCS of 8 or decreasing rapidly (>2 points in 2 hours). Significant coagulopathy and brain dead patients on arrival were excluded from the study population.

Radiological findings guided the individual surgical approach. Wide craniotomies were performed in all patients. Bone flap was removed and placed subcutaneously in abdominal region, depending on whether there was uncontrollable brain swelling after craniotomy. Duraplasty was dependent considering the presence of brain swelling and underlying contusions. In cases where there was no intraoperative brain swelling or oozing contusions, duraplasty was performed, otherwise not. Data collection was done for patient demographics, arrival GCS, time since injury, blood pressure, pupillary status, CT scan findings, presence of midline shift (MLS), presence or absence of other intracranial lesions such as contusions or extradural haematomas, associated trauma and presence or absence of comorbidities. Postoperative course was recorded with vitals and GCS monitoring, postop complications, length of stay (LOS) and GCS and GOS at discharge. The final clinical outcome was recorded in terms of Glasgow outcome score at 1 month. Complications were treated as required. Outcome was further grouped in favourable or unfavourable groups according to GOS.

Data was entered and analysed with IBM SPSS Statistics version 22.0. Continuous variables were presented as mean ± standard deviation. Categorical variables were presented as frequencies (n) and percentages. Chi-square tests were run for preop factors for final outcome according to GOS. Independent t-test was run for continuous variables and the mean difference with 95% confidence intervals was noted. A p value of ≤0.05 was considered significant.

RESULTS

67 patients with mean age of 38.4 years ± 13.1 SD. There were 53 (79.1%) males and 14 (20.9%) females. The most common mode of injury was motor vehicle accidents in 35 (52.2%) cases, 21 (31.3%) cases of fall, 10 (14.9%) cases of physical assault, and one (1.5%) case was due to crush injury. Table 1

Median GCS at arrival was 7 hours (mean: 7.6 ±

Table 1: Clinical variables for the two outcome groups and their chi-square significance

Clinical variable		Favourable outcome (n=26)		Unfavourable outcome (n=41)		P value
		n	%	n	%	
Gender	Male	22	84.6%	31	75.6%	0.37
	Female	4	15.4%	10	24.4%	
Pupils	Reactive	18	69.2%	7	17.1%	<0.0001
	Non-reactive	8	30.8%	34	82.9%	
Midline shift	Yes	16	61.5%	36	87.8%	0.012
	No	10	38.5%	5	12.2%	
other traumatic lesions	Yes	10	38.5%	24	58.5%	0.10
	No	16	61.5%	17	41.5%	
Age groups	18-30 years	9	34.6%	14	34.1%	0.95
	31-45 years	10	38.5%	15	36.6%	
	46-60 years	6	23.1%	9	22.0%	
	>60 years	1	3.8%	3	7.3%	
Arrival GCS groups	3-8	11	42.3%	34	82.9%	0.001
	>8	15	57.7%	7	17.1%	
Time to Surgery	< 4 hours	10	38.5%	7	17.1%	0.05
	> 4 hours	16	61.5%	34	82.9%	

Table 2: Group wise statistics for continuous variables

	Outcome	n	Mean	Std. Deviation
Patients Age	Favourable	26	38.23	12.513
	Unfavourable	41	38.51	13.722
Time since Injury	Favourable	26	5.85	2.767
	Unfavourable	41	8.07	3.778
Arrival GCS	Favourable	26	8.42	2.335
		41	7.10	1.715

2.1 SD). Mean time between injury and surgery was 7.2 hours ± 3.6 SD (range: 1 hour to 16 hours). Table 2

42 (62.7%) patients presented with pupillary abnormalities, 34 (50.7%) patients had associated intracranial/intraparenchymal lesions (contusions (45%), intracerebral haemorrhage (28.9%), subarachnoid haemorrhage (26.1%). Significant midline shift (>10 mm) was noted in 52 (77.6%) patients. 24% patients presented with associated trauma (skeletal injury 50%, chest trauma: 20%, intraabdominal injuries: 7%, spine fractures: 17% and facial trauma: 6%). Table 1 Postop complications included wound infection in 6 (9.0%) cases, progressive neurologic deterioration in 27 (40.3%), aspiration pneumonia in 30 (44.8%), hospital acquired pneumonia in 24 (35.8%), CSF leak in 1 (1.5%), meningitis in 2 (3.0%) and seizures in 5 (7.5%) of patients. Table 1

The outcome was favourable (GOS: 4, 5) in 38.8% (n = 26) patients while in 61.2% (n = 41) of patients the outcome was unfavourable (GOS: 1, 2, 3). Overall mortality was 38.8% (n = 26). On Chi-square analysis, pupillary abnormalities at presentation ($p < 0.001$), midline shift ($p = 0.01$), time since injury to surgery ($p = 0.05$) and GCS at arrival ($p = 0.001$) were strongly associated with final outcome. Outcome was not significantly associated with gender groups ($p = 0.37$), injury mechanism ($p = 0.6$), age groups ($p = 0.95$) and presence of other intracranial/intracerebral traumatic lesions ($p = 0.1$). Table 1

On independent samples t-test, arrival GCS and time to operation had a significant mean difference between the two outcome groups. Mean time to operation of 5.85 hours ± 2.8 was associated with favourable outcome while mean arrival GCS of 8.4 ± 2.3 was associated with favourable outcome. Table 2

DISCUSSION

Acute subdural haematoma is a major clinical entity, which, despite advancements in diagnosis and treatment of acute traumatic brain injury (TBI) is associated with high rates of mortality and severe neurologic morbidity.[8] The major cerebral traumatic event associated with ASDH is cerebral venous shearing with concomitant injury to the brain parenchyma at macroscopic and microscopic levels. Many studies have tried to investigate the relationship of preoperative and intraoperative clinical and radiological factors which could predict the association of high rates of unfavourable outcomes which ranges from 60% to 90%.[3,4,8,10,11] In addition, most large studies till the present day have been conducted in the economically developed countries where trauma centres are well equipped and neurointensive care is at hand. In our county, such facilities are lacking, which indicate that we in our present situation have to evaluate our trauma care and outcomes in the light of the available resources.[1,2]

Head trauma is very common in the young adult males where the day-to-day activity and highly dynamic lifestyle makes them prone to both accidental injuries as well as injuries due to physical assault. In our study we observed similar trend with regard to the demographic characteristics of the patients. Young adult males in their late twenties and early thirties are frequently involved, most commonly by motorbike accidents. Motorbike accidents are very frequent in our society as these are the chief mode of short to medium distance travel. A majority of these patients are either unaware regarding the use of helmets and seat-belts or they deliberately avoid using it.[12,13] The mean time between injury and surgery is 7.21 hours ± 3.6. This time is too long if the rule of four is to be considered as one of the primary factor in determining mortality. The prime reasons for such late presentations are numerous, including lack of neurotrauma surgical facilities in the periphery of our province, lack of a functional rescue, and pre- or between-hospitals transport mechanism as well as the largely unaware public of the severity of head trauma and the importance of swift neurosurgical care in salvaging patients.[2,8,14,15]

The median arrival GCS in our study was 7 which though in agreement with most of the international and local studies, indicates the severity of primary brain injury which occur concomitantly with ASDH. As apparent from the results, it is important to note that patients who achieved a favourable outcome had a significantly higher median GCS (median GCS: 9.0) at presentation as compared to the patients (median GCS: 7.0) who presented with unfavourable outcome ($p<0.0001$). Like the time to operation, it is also an important prognostic factor. On one hand this indicates the severity of primary brain injury, while on the other hand it indicates the urgency of measures required to be undertaken in order to save the life of the patient. Similar effect was shown by the presence of pupillary abnormalities on the overall outcome in terms of GOS and mortality. 82.9% patients with unfavourable outcome had pupillary abnormalities, including unilateral or bilateral light reaction disturbance or persistent fixed dilation. This is an important clinical parameter besides GCS, as it is very easily reported, can be monitored postoperatively and does not require

special equipment.[5,7,16]

Some studies have shown that age and the presence of other intracranial/intracerebral traumatic lesions such as contusions, extradural haematoma, subarachnoid haemorrhage are important prognostic factors. However, we did not observe in any association of these factors with the final outcome. Moreover, injury mechanism, side of the lesion and comorbidities were also not found to be of significance for predicting outcome.[14,15,17,18]

The overall mortality was very high at 63.4% which indicates the seriousness of the traumatic lesion. Though mortality is affected by the time to surgery, arrival GCS and pupillary abnormalities, it is important to note that these clinical factors are important indicators of the degree of salvage that can be anticipated at the outset. Clinical severity of the injury is important and these factors may be considered to estimate the severity of primary brain injury as well as the effectiveness of surgical intervention.

There is a need for evaluation of these factors to be tested in a randomised controlled trial. In our country it is important to improve the pre- and postoperative care by the provision well equipped neuro-intensive care units as well as trauma centres in the peripheral districts of the province.

CONCLUSION

Acute subdural haematoma is notoriously associated with very high mortality and significant morbidity in the form of prolonged vegetative state and coma. Factors that are important for prognostication after surgical evacuation of ASDH are arrival GCS, pupillary abnormalities, time between injury and surgery and midline shift on CT brain. Further improvement in neurotrauma and prehospital rescue care is the need of the moment.

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