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Research Article

Factors affecting the surgical outcome of patients with cerebral contusions

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ABSTRACT

Background: Study of factors influencing mortality after cerebral contusion is useful for clinicians to predict outcome of such patients. Hence present study was undertaken with the objective to analyse the factors affecting the surgical outcome of patients with cerebral contusions.
Methods: This is a prospective study consisting of 187 cases of cerebral contusions operated in a period from August 2005 to Feb 2008, in the Department of Neurosurgery, Osmania General Hospital, Hyderabad. During the period of study total numbers of head injury admissions were 8163, out of which 964 cases were of cerebral contusions. Among them 187 cases underwent operation. All the patients underwent all necessary investigations. The data was analysed using proportions and appropriate statistical test wherever applicable.
Results: Males were more than females but mortality rate was comparable. Most of the contusions were in 20 -40 years of age. Road traffic accidents were the commonest mode of injury. Most of the cases were moderate of server type of head injuries. The mortality rate in the severe head injury was 33%. Frontal and Temporal locations were the commonest site of contusion and the surgical outcome was better in frontal and temporal than parietal and cerebellar contusions. The overall mortality was 21%. It is seen that age more than 30 years, severe GCS and midline shift of more than 5 mm were the important predictors of mortality after surgery for cerebral contusions.
Conclusions: Age more than 30 years; severe GCS and midline shift of more than 5 mm were the important predictors of mortality after surgery for cerebral contusions.

Keywords: Surgical outcome, Patients, Cerebral contusions

INTRODUCTION

Understanding the mechanism of traumatic brain injury and their clinical consequences is the foundation of the management of head injured patient.[1]

Events are followed from the injury to the head through the mechanisms affecting the whole brain and its component neural and vascular systems traced down to the cellular, sub cellular and molecular processes affecting individual cells and followed into their expression as functional disorders of human consciousness.[2]

Brain Damage in head injury results from either neural or vascular injury and may be caused directly by the forces of injury or indirectly as a result of space occupying effects, ischemia or other secondary complications.[3]

Patterns of brain damage recognized neuro-pathologically, clinically and radiologically can be classified by either pattern or distribution with a major distinction between diffuse injuries (clinically exemplified by concussion) and focal injuries (pathologically characterised by contusion). Although the distinction between primary and secondary damage, depending on the time after injury, is becoming increasingly blurred, it remains a useful clinical concept.[4]

Contusions are bruises of the neural parenchyma and are always traumatic. These are the classic and primary hall mark of brain trauma.[5]

These are most often involves the crown of a gyrus; they tend to be wedge shaped, with the apex extend into the neural parenchyma.[6,7] They represent extravasations of erythrocytes around the small lacerated vessels in the brain parenchyma. In a contusion the plial glial membrane is intact.

Contusions are classified into following types, depending in their spatial relationship to trauma or a specific anatomic structure.[7] These are coup, counter coup, intermediate coup, and Gliding, Herniation and Fracture contusions.

These are discrete area of haemorrhage of variable size, visible on the surface of the brain usually occurring over the frontal pole, sub frontal region, temporal poles, and lateral and inferior surfaces of temporal lobe.

Road traffic Accidents Accounts for Majority of Contusions. The other aetiologies being fall, assault, sports related injuries. These are most commonly seen in male population. The commonest age is 20-40 years. The temporal lobe is the commonest site of contusion. Present study was undertaken with the objective to analyse the factors affecting the surgical outcome of patients with cerebral contusions.

METHODS

This is a prospective study consisting of 187 cases of cerebral contusions operated in a period from August 2005 to Feb 2008, in the Department of Neurosurgery, Osmania General Hospital, Hyderabad.

Institutional Ethics Committee permission was obtained prior to study by submitting the protocol of the study as per the Committee norms of the Institute.

Exclusion criteria

1. Paediatric Head injuries
2. Associated other extra cranial injuries

During the period of study total number of Head injury admissions were 8163 in acute neurosurgical care unit, out which 964 cases were cerebral contusion comprising 12% of total head injury admissions. Out of 964 cases, 187 cases underwent operation for cerebral contusions comprising 19% of cerebral contusions.

All the patients were admitted in acute neurosurgical care unit, and a variety of clinical/ imaging data were collected and analysed with respect to.

1. Incidence among various age groups
2. Sex distribution
3. Mode of injury
4. Post resuscitative Glasgow coma scale
5. Papillary Abnormality
6. Location
7. Findings on CT scan
8. Timing of surgery
9. Associated Intracranial injuries
10. Outcome of the patient at discharge & follow up

The Mortality and morbidity was analysed with respect to Age, Sex, Mode of injury, papillary signs midline shift and associated intra cranial injuries.

Investigations

All the patients underwent following investigations:

Complete blood picture (CBP), Random blood sugar (RBS), Blood urea (BU), Blood grouping and Rh typing, bleeding time and clotting time, serum electrolytes, X-ray Cervical spine, Chest X-ray, electro cardio gram (EGG), CT scan Brain

Statistical analysis

The data was analysed using proportions and appropriate statistical test wherever applicable.

RESULTS

Table 1: Distribution of study subjects according to location of cerebral contusions.

Location	No. of cases	%
Frontal	63	34
Temporal	49	26
Parietal	26	14
Posterior Fossa	5	3
Fronto parietal	3	2
Temporo parietal	19	10
Fronto temporal	14	7
Fronto Temporal Parietal	8	4

As per the CT scan finding the location of various cerebral contusions was as shown in Table 1. It can be observed from the table that, most common site of cerebral contusion was frontal lobe in 34% of cases. Only 3 cases i.e. 2% were having cerebral contusion in fronto parietal region.

Table 2: Distribution of cases according to CT scan findings.

Size of contusion	No. of cases	%
> 25 ml	143	76
< 25 ml	44	24
Midline shift > 5 mm	No of cases	%
Present	157	84
Absent	30	16

Table 3: Distribution of cases according to CT scan findings.

No of cases	No of Deaths	Mortality %
187	40	21

Out of 187 cases, 153 were male constituting 82% of total; whereas only 34 (18%) were female. Maximum study subjects were in the age group of 23 – 30 years (35%) followed by 31 – 40 years (26%). In the age group of 15 – 20 years and age group above 60 years, there were only 6% each. The mean age was found out to be 27 years. The most common mode of injury was road traffic accident (RTA), followed by assault in 21% of cases and 6% of cases were due to fall from a height. The data was also analysed according to post resuscitative Glasgow Coma Scale (GCS). According to this, 51% of patients belonged to moderate GCS, 43% were having severe GCS and only 6% were having mild GCS. On examination, papillary abnormality was found in 79% of patients.

Table 4: Various factors influencing the surgical outcome of cerebral contusions in terms of mortality.

Factors		Deaths (%)*	Alive (%)*	Risk ratio (95% confidence interval)	Chi square	P value
Age (years)	> 30	34 (30.6%)	77 (69.4%)	3.88 (1.7–8.7)	12.5	0.0001982
	< 30	06 (7.9%)	70 (92.1%)			
Sex	Male	34 (22.2%)	119 (77.8%)	1.3 (0.5-2.7)	0.13	0.3604
	Female	06 (17.6%)	28 (82.4%)			
Mode of Injury	Fall & assault	09 (17.6%)	42 (82.4%)	0.7 (0.3-1.6)	0.3184	0.2863
	RTA	31 (22.8%)	105 (77.2%)			
GCS finding	Severe	26 (32.5%)	54 (67.5%)	2.5 (1.3-4.4)	9.1	0.001250
	Mild & moderate	14 I(13.1%)	93 (86.9%)			
Pupillary abnormality	Present	33 (22.3%)	115 (77.7%)	1.2 (0.5-2.5)	0.1367	0.3558
	Absent	07 (17.9%)	32 (82.1%)			
Midline shift > 5 mm	Present	38 (24.2%)	119 (75.8%)	3.6 (0.9-14.3)	3.62	0.02850
	Absent	02 (6.6%)	28 (93.4%)			
Timing of surgery	> 24 hours	12 (29.3%)	29 (70.7%)	1.5 (0.8-2.7)	1.38	0.1200
	< 24 hours	28	108			

*Percentages are row percentages specific for that row.

Table 2 shows distribution of study subjects as per CT scan findings. It is seen that in 76% of cases, the size of contusion was more than 25 ml. 84% of cases were showing midline shift of more than 5 mm.

The incidence of mortality in the present study was found to be 21%.

Table 4 shows various factors influencing the outcome i.e. deaths after surgery for cerebral contusions. It is seen that age more than 30 years, severe GCS and midline shift of more than 5 mm were the important predictors of mortality after surgery for cerebral contusions. The risk of death was 3.8 times more for those who were more than 30 years of age and this was found to be statistically significant ($p < 0.05$). The risk of dying for patients with severe Glasgow coma scale was 2.5 times more as compared to mild and moderate scoring on GCS. This was also found to be statistically significant ($p < 0.05$). The incidence of mortality among patients with midline shift of more than 5 mm was 24.2% as compared to only 6.6% in patients with less than 5 mm. The risk of mortality was 4.4 times more among positive finding of the patients and statistically significant also ($p < 0.05$) as shown in the table.

Whereas other factors like sex, mode of injury, papillary abnormality, and timing of surgery were not found to be predictors of mortality after surgery for cerebral contusion.

Follow up study

All the survived patients were followed up every month for a period of 2 years. The outcome was analysed by Glasgow outcome scale (GOS).

Glasgow outcome scale (Jennet & Bond)[8]

5 – Good recovery
4 – Moderate disability
3 – Severe disability
2 – Persistent vegetative state
1 – Deaths

GOS 4, 5 were classified as favourable outcome and GOS 2, 3, 1, were classified as unfavourable outcome.

Table 5: Distribution of study subjects as per outcome.

No of patients	Good Recovery	Moderate recovery	Severe disability	Vegetative state	Deaths
187	114 (60.9%)	16 (8.5%)	11 (5.8%)	6 (3.2%)	40 (21.6%)

We followed up all survived patients every month for a period of 2 years. The outcome was analysed by Glasgow outcome scale (GOS). We found that 60.9% has good recovery, 8.5% had moderate recovery, 5.8% were with severe disability and 21.6% died.

DISCUSSION

Our study is a prospective study, comprising of 187 cases, studied over a period from Aug. 2005 to Feb. 2008, in the Dept. Of Neurosurgery, Osmania General Hospital, Hyderabad. These were cases of cerebral contusion, which underwent operation.

Out of 187 cases, 153 (82%) were male whereas only 34 (18%) were female. The male to female ratio in our study was 4.5:1. Road traffic accident being the most common aetiology and alcohol consumption as an important risk factor, a Male gender are more predisposed to extensive brain contusion.

Mortality was 22.2% in males and 17.6% in females. Age distribution in our study showed that 65 i.e. 35% of patients were in 3rd decade and 49 (26%) were in 4th decade of life.

Incidence of contusion in 20-50 years of age group was 79% which is comparable to 72.9% by Tandon PN.[9] 15% of patients were beyond 50 years of age and this corresponds to the finding of 15.7 % by Tandon PN.[9] Similarly mean ages was also comparable with Tandon PN study (27 years in the present study vs. 26.5 years in Tandon PN study).[9]

Overall mortality in the present study was 21.6%. Lobato RD et al in their study found a mortality of 28.1%.[10]

In the present study it is seen that age more than 30 years, severe GCS and midline shift of more than 5 mm were the important predictors of mortality after surgery for cerebral contusions. The risk of death was 3.8 times more for those who were more than 30 years of age and this was found to be statistically significant ($p < 0.05$). The risk of dying for patients with severe Glasgow coma scale was 2.5 times more as compared to mild and moderate scoring on GCS. This was also found to be statistically significant ($p < 0.05$). The incidence of mortality among patients with midline shift of more than 5 mm was 24.2% as compared to only 6.6% in patients with less than 5 mm. The risk of mortality was 4.4 times more among positive finding of the patients and statistically significant also ($p < 0.05$) as shown in the table. Whereas other factors like sex, mode of injury, papillary abnormality, and timing of surgery were not found to be predictors of mortality after surgery for cerebral contusion. Lobato RD et al found a significant correlation between the outcome and mechanism of injury, interval between trauma and surgery, hematoma CT density and the hematoma volume.[10] E Jian Lee et al stated that functional outcome showed a significant correlation with preoperative consciousness state, Glasgow Coma Scale score, pupillary sizes, and motor posturing (chi squared test, $p < 0.05$).[11]

We followed up all survived patients every month for a period of 2 years. The outcome was analysed by Glasgow outcome scale (GOS). We found that 60.9% has good recovery, 8.5% had moderate recovery, 5.8% were with severe disability and 21.6% died.

These findings are almost comparable to the findings of Mori K et al who found that 89.4% had good recovery, while 8.4% showed no change.[12]

CONCLUSION

Age more than 30 years, severe GCS and midline shift of more than 5 mm were the important predictors of mortality after surgery for cerebral contusions.

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