



## To determine the outcome of isolated hemorrhagic TBI in a large tertiary care center in Karachi, Pakistan.

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**ABSTRACT... Objective:** To assess the outcome of mild traumatic brain injury patients who have isolated intracranial hemorrhages. **Study Design:** Cross-sectional, **Setting:** Department of Neurosurgery, Abbasi Shaheed Hospital, Karachi. **Period:** 1st January 2018 to 31st January 2020. **Material & Methods:** The inclusion criteria were that all the patients have to be above the age of 18 years, presented to us with mild TBI cases and had observable intracranial hemorrhage on computer tomography (CT) scan. Patient demographics and the various types of interventions were recorded. **Results:** A total of n= 300 patients were included in the study, The average age was 50.5 +/- 20.6 years. There were n= 180 males and n= 120 females. We performed a total of n= 45 (15%) neurosurgical interventions, the most common intervention being craniotomies performed in n= 31 (68.66%) patients. Of all the patients who underwent an intervention 64.44% had immediate intervention 20% had planned intervention as non-emergency cases, and 15.55% had delayed intervention. A one point increment in the GCS score is associated with 50% lower odds of surgical intervention having a p value of <0.001. The mortality rate in our study population was 6%. **Conclusion:** We found that the length of stay and mortality are associated with an increased age and lower GCS score of the patients, care should be taken when evaluating the patients as some cases require delayed intervention hence monitoring is of prime importance.

**Key words:** Mild Traumatic Brain Injury, Subdural Hematoma, Neurosurgical Intervention, Epidural Hematoma.

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## INTRODUCTION

One of the scourges of the field of Neurosurgery are traumatic brain injuries. In the United States every year there are 290,000 hospitalizations.<sup>1</sup> 95% of these patients having what is defined in the literature as mild traumatic brain injury and these patients typically have satisfactory Glasgow coma scale (GCS) scores, between 13 and 15.<sup>2</sup> There is a high cost and burden to the hospital when it comes to the management of these patients.<sup>3,4,5</sup> These burdens also include the need for ICU and often ventilators and long-term care for some of the severely affected cases. Hence the care for patients with TBI is highly variable in nature, and scientists have often proposed models for prognosis of these cases.<sup>6,7,8,9</sup> There is an opportunity to improve upon the criterion for acute management of these patients and to that

end our study is aimed to assess the outcome of mild traumatic brain injury patients who have isolated intracranial hemorrhages. Our goal is to achieve a better understanding of the risks associated with an intervention and the outcomes of the patients.

## MATERIAL & METHODS

The type of study is a cross-sectional, where we looked at cases of mild TBI that presented to our tertiary care center from 1st January 2018 to 31st January 2020. The ethical approval for the study was provided by the Departmental Research Ethics Review Committee, consent was not required as we did not include any identifying information in our data analysis. The inclusion criteria were that all the patients have to be above the age of 18 years, presented to us

with mild TBI cases (according to the GCS score at presentation) and had observable intracranial hemorrhage on computer tomography (CT) scan. The exclusion criteria was all the patients with a previous history of TBI, open wounds, penetrating wounds, fractures, cerebrospinal fluid leakage, and previous history of a debilitating illness such as stroke, dementia, liver failure among others. The various types of interventions were also recorded such as burr hole, external ventricular drain, craniectomy and craniotomy among others. We also measured a wide variety of other demographic variables and clinical history and examination along with various data around the hospital admissions, discharge were also recorded. Convenience sampling was used, Student t-test and Pearson correlation were used to analyze the data where deemed appropriate. Data was analyzed in SPSS version 21.0 for Windows.

## RESULTS

A total of  $n=300$  patients were included in the study, after going through all the cases of intracranial hemorrhage that were admitted to our hospital in that time  $n=1246$  patients. The average age was  $50.5 \pm 20.6$  years. There were  $n=180$  males and  $n=120$  females. The various patient demographics are provided in Table-I. We performed a total of  $n=45$  (15%) neurosurgical interventions, the most common intervention being craniotomies performed in  $n=31$  (68.66%) of the patients. Of all the patients who underwent an intervention 64.44% had immediate intervention 20% had planned intervention as non-emergency cases, and 15.55% had delayed intervention. From all the patients who had a delayed intervention  $n=7$ ,  $n=5$  (71.42%) had a change in the neurological exam and the rest had worsening found on repeat CT scans. The patients who were operated upon were older having a  $p$  value of  $<0.001$ . The odds of intervention increases by 26% with a 10 year increase in age. There were no statistically significant differences between gender and intervention ( $p$  value of 0.65). One point increment in the GCS score is associated with 50% lower odds of surgical intervention having a  $p$  value of  $<0.001$ . From the patients who had interventions the most common

type of hemorrhage was sub dural hemorrhage in  $n=35$  (77.77%) of the patients. Sub and epidural hemorrhages are more likely to require intervention having a  $p$  value of 0.02 respectively. The mortality rate in our study population was 6%, and patients who survived were younger ( $p$  value of 0.009) and had a greater GCS score ( $p$  value of 0.047) as compared to those who died. The mean length of stay in the intensive care unit was  $3.1 \pm 2.5$  days, and those admitted to the ICU were shifted for acute care in the high dependency unit and required monitoring as compared to those who did not ( $p$  value of 0.003). Stable patients with stable CT scans (that is no clinically significant neurological and radiographic worsening) was associated with shorter length of stay as compared to those who had worsening symptoms ( $p$  value of  $<0.001$ ).

## DISCUSSION

In our study we found the overall intervention rate to be 15% and the overall mortality rate to be 2.33%. Delayed intervention which is considered a bane for TBI patients is a feared outcome for neurosurgeons, hence protocols are in place to quickly diagnosis worsening symptoms in patients. In our study 2.33% had a delayed intervention, while studies have reported a delayed intervention rate of 3.8% in non-isolated hemorrhagic mild traumatic brain injury cases.<sup>12</sup> A large meta-analysis of  $n=65,724$  patients showed mortality rate of 1.4% and intervention rate of 3.5% respectively.<sup>13</sup> We had an intervention rate of 15% which is much higher, and this could be attributed to the fact that we conducted our study in a large tertiary care center where patients admitted are in a worse clinical state, as our hospital is publicly funded and the health system in Pakistan is operated in a way that public hospitals often end up with worsening cases as care takers do not wish to spend exorbitant amounts of out of pocket payments. We also looked at isolated hemorrhagic cases, and these patients can benefit for neurosurgical intervention. Studies have reported no differences in outcome of patients at six month mark when patients are admitted at various levels of case in the hospital.<sup>14,15</sup>

Variable	Frequency	Percentage
<b>Gender</b>		
Male	180	60%
Female	120	40%
<b>Glasgow Coma Scale Score</b>		
GCS of 13	18	6%
GCS of 14	54	18%
GCS of 15	228	76%
<b>Type of Hemorrhage</b>		
Extra Dural hemorrhage	4	1.33%
Sub Dural hemorrhage	114	38%
Sub arachnoid hemorrhage	81	27%
Intraparenchymal hemorrhage	30	10%
Intraparenchymal contusion	27	9%
Multiple hemorrhages	44	14.66%
<b>Type of intervention performed</b>		
	Intervention performed in n= 45 patients	
Craniectomy	5	11.11%
Craniotomy	31	68.88%
Burr Hole	8	17.77%
External Ventricular Drain	1	2.22%
<b>Timing of the intervention</b>		
	Intervention performed in n= 45 patients	
Immediate	29	64.44%
Planned	9	20%
Delayed	7	15.55%
<b>Mechanism of Injury</b>		
Fall from low height (ground level fall)	126	42%
Fall from height (more than ground level)	54	18%
Motor vehicle accident	106	35.33%
Assault	12	4%
Other Causes	2	0.66%
<b>Discharge</b>		
Home	203	67.66%
Acute Care	58	19.33%
Rehabilitation	21	7%
Dead	18	6%
<b>Reason for Imaging</b>		
Routine protocol	264	88%
Neurological changes	36	12%
<b>Results of Repeat Imaging</b>		
Improvement	27	9%
Stabilization	240	80%
Worse images	33	11%
<b>Repeat Clinical Examination</b>		
Stabilized	264	88%
Worsened	36	12%

Table-I. Patient demographics and other variables for n= 300 patients.

However, in the literature there are no obvious recommendations for admitting to the various levels of care available, doctors have to make that decision based on the available resources. In our study 11% of the patients had an observable worsening, on CT imaging, worsening clinical examination findings and CT imaging was highly associated with rate of intervention. Other studies have reported that selective imaging for these patients is more beneficial than routine repeat CT scans.<sup>16,17,18,19</sup> However, there are costs associated with repeat radiographic imaging so care should be taken when following international protocols in Pakistan. We also found that advancing age is associated with worse hospital course, and other studies have reported similar results and consider age as being a predictor for clinical deterioration, mortality and higher rates of interventions.<sup>13,18,20</sup> GCS score was also found to be predictive of the outcome for patients, and a single point increase was associated with 23% lower length of stay and 50% lower rates of mortality. Other studies have reported similar results.<sup>13,18,21,22,23, 24,25</sup> There were several limitations to our study, first it was based in a single center in a large urban city, it was retrospective in nature, and we did not do long term follow up of patients, which may have increased further the cases requiring a much more delayed intervention. However, our results still help clinicians in making important decisions regarding the care of these patients with traumatic brain injury.

## CONCLUSION

We found that the length of stay and mortality are associated with an increased age and lower GCS score of the patients, care should be taken when evaluating the patients as some cases require delayed intervention hence monitoring is of prime importance.





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