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POST TRAUMATIC EPILEPSY (PTE);

PREDICTORS AND PREVALENCE IN PATIENTS WITH MODERATE TO SEVERE TRAUMATIC BRAIN INJURY (TBI)

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ABSTRACT... Objectives: To estimate the predictors and frequency of post traumatic epilepsy in patients with moderate to severe traumatic brain injury. **Study Design:** Observational prospective study. **Duration and Place of Study:** Frontier Medical and Dental College, Abbottabad, from January 2015 to December 2015. **Materials and Methods:** Patients between 4-50 years of age, having GCS ≥ 5, with a history of moderate to severe TBI and non-epileptics were enrolled in the study. Patients with history of epilepsy or who were taking anti-epileptic drugs, or those with firearm or penetrating head injuries or with GCS scores < 5 or who were brain dead upon arrival were excluded. Details were recorded regarding age, gender, presence of early and late seizures, diagnosis (hematoma, fracture, intracerebral bleeding, etc.) and cause of injury, GCS scores and plain radiographs and non-contrast enhanced CT scan of head and EEG. Patients were followed up at regular intervals (1, 3, 6, 9 and 12 months) but they were asked to report immediately in case of seizures. SPSS version 21 was used to process and analyze data. **Results:** The study included 120 patients and their mean age was 26.69±12.59 years. As per the gender, there were 90 males and 30 females. Maximum numbers of patients, 41.67% and 30%, were between 11-20 and 21-30 years of ages respectively. Regarding the severity of head injury, 54 (45%) persons had sustained moderate head injury while 66 (55%) patients had suffered severe head injury. Most of the patients, 50%, developed subdural hematoma followed by skull fracture and intracerebral bleed in 25% and 20% patients respectively. Out of 120 patients, 20 patients had developed seizures. Therefore, 16.67% of our patients developed PTE after TBI. Male patients who were between the ages of 11-30 years with severe head injury and with subdural hematoma and skull fracture preferentially developed seizures. **Conclusion:** Post traumatic epilepsy is a major complication of brain injury. There are numerous risk factors associated with the risk of developing PTE after TBI. Male gender, age between 11-20 years, depressed skull fracture, extra parenchymal hemorrhages and severe brain injury are important risk factors that we have found out in our study which when present considerably increases the risk of seizures after head injury.

Key words: Trauma, Epilepsy, Brain Injury.

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INTRODUCTION

Impairment of brain functioning which is caused by a mechanical force i.e. blunt trauma is called traumatic brain injury (TBI). Level of consciousness, as determined by Glasgow coma scale (GCS), helps to define the severity of TBI. Patients with GCS scores of 14-15, 9-13 and 3-8 are categorized as suffering from mild, moderate and severe TBI respectively. TBI can be primary or secondary. Primary brain injury occurs as a result of main injury while secondary brain injury occurs as a consequence of primary or initial injury.[1] It is estimated that more than 1.7 million individuals in America present to emergency department as a result of TBI each year.[2]

Epilepsy is a clinical condition which affects electrical activity of brain and is characterized by repeated, spontaneous seizures which are 24 hours apart.[3] Post traumatic epilepsy (PTE) occurs as a result of traumatic brain injury and it's a long-term complication of TBI.[4] PTE is a different condition from post-traumatic seizures (PTS). PTS occurs within a week of sustaining TBI and

are a direct consequence of head injury. On the other hand, PTE happens after first seven days of TBI.[4,5] The incidence of PTE is estimated to be around 20% among general population.[6] But, the prevalence of PTE is different among general and military people. Prevalence of PTE is as high as 53% in patients with penetrating i.e. bullet injuries to head.[7,8]

Different factors are identified which act as predictors to define the risk of developing PTE after TBI. Most important of these predictors are; i) severity of head injury, the more severe an injury, higher are the chances of developing PTE, ii) intracerebral bleeding, if present increases the risk of PTE by 30%, iii) occurrence of seizures within a week of head injury, iv) presence of subdural hematoma, and v) depression.[4,7,9-11] Presence of more than one risk factors markedly increases the risk of developing PTE. All such patients should be followed up and neuroimaging and EEG should be performed in these patients to identify abnormal brain electrical activity and hence, PTE at an earlier stage.[12]

We have conducted this study to check the rate of development of PTE in patients who had sustained TBI as well as to identify the risk factors which can lead to higher predisposition to PTE in head injured patients.

MATERIALS AND METHODS

This was a longitudinal cohort study which was performedat Frontier Medical & Dental College, Abbottabad. The type of sampling used was non-probability consecutive sampling. Patients between 4-50 years of age, having GCS ≥ 5, with a history of moderate to severe TBI and non-epileptics between January 2015 to December 2015 were enrolled in the study. Patients with history of epilepsy or who were taking anti-epileptic drugs, or those with firearm or penetrating head injuries or with GCS scores < 5 or who were brain dead upon arrival were excluded. Details were recorded regarding age, gender, presence of early and late seizures, diagnosis (hematoma, fracture, intracerebral bleeding, etc.) and cause of injury, GCS scores and findings of plain radiographs and non-contrast enhanced CT scan of head and EEG. Patients were followed up at regular intervals (1,3,6,9 and 12 months) but they were asked to report immediately in case of seizures. Intracranial bleeding lesions were classified either as extra parenchymal hemorrhages e.g. subarachnoid hemorrhage, extra- or subdural hematomas or intra parenchymal hemorrhages. SPSS version 21 was used to process and analyze data. Categorical variables were expressed as frequencies and percentages while numerical variables were expressed as mean with standard deviation.

RESULTS

The study included 120 patients and their mean age was 26.69±12.59 years. As per the gender, there were 90 males and 30 females. Patients were divided into different groups according to their age. Maximum numbers of patients, 41.67%and 30%, were between 11-20 and 21-30 years of ages respectively, as given in Table-I.

Age group (In years)	Number	Percentage
4-10	12	10%
11-20	50	41.67%
21-30	36	30%
31-40	12	10%
41-50	10	8.33%
Total	120	100%

Table-I. Stratification of patients into different age groups, (n=120)

Regarding the severity of head injury, 54(45%) persons had sustained moderate head injury while 66 (55%) patients had suffered severe head injury. The underlying pathology observed in these patients is given in Figure-1. Most of the patients, 50%, developed subdural hematoma, 50%, followed by skull fracture and intracerebral bleed in 25% and 20% patients respectively.

Out of 120 patients, 20patients had developed seizures while 100 patients didn't reportany seizures. Therefore, 16.67% of our patients developed PTE after TBI. Different variables and their association with seizures are given in Table-II. The incidence of seizures was higher among male patients (11.67%) and those patients who were between the ages of 11-12 years (7.5%), in

those patients who had sustained severe brain injury (12.5%) and were diagnosed with subdural hematoma (5.83%) and skull fracture (5%).

Variable	Number, Percentage
Severity of Injury	
Moderate Injury	05, (4.17%)
Severe Injury	15, (12.5%)
Total	20, (16.67%)
Gender	
Males	14, (11.67%)
Females	06, (05%)
Total	20, (16.67%)
Age group	
< 10	02, (1.67%)
11-20	09, (7.5%)
21-30	06, (05%)
31-40	02, (1.67%)
> 40	01, (0.83%)
Total	20, (16.67%)
Type of Injury	
Extra parenchymal hemorrhages	07, (5.83%)
Skull fracture	06, (05%)
Intra parenchymal hemorrhages	05, (4.17%)
Cerebral contusion	02, (1.67%)
Total	20, (16.67%)

Table-II. Association of seizures with various risk factors and variables, (n = 20)

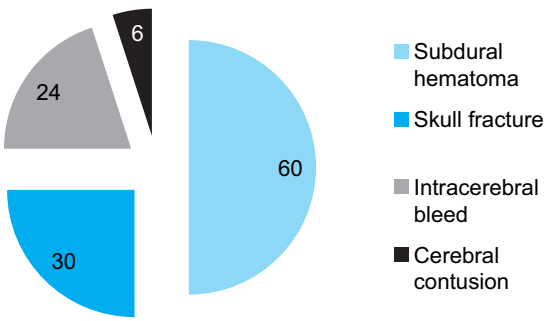

Figure-1. Types of injuries observed in TBI patients, (n=120)

DISCUSSION

TBI is not only a major cause of morbidity and mortality but also an important cause of epilepsy especially in younger people.[13] TBI patients may sustain this injury as an isolated one or it could be squeal to multi-system injury. But, these patients are at a higher risk of developing disability and functional impairment. Trauma lead to epilepsy in 30% of individuals between the ages of 15-34 years.[14] Age distribution in TBI follows a tri-modal pattern with peaks in those who are less than 05 or more than 65 or between the ages of 15-19 years.[1] We have also observed that the peak incidence of TBI was among those patients who were between 11-20 years of age.

PTE places significant burden not only on patients but also their families. The risk of developing PTE after severe TBI is quite high, 40-50% especially in military personnel.[14] The prevalence of PTE in our study was 16.67%. This is comparable to what Thapa et al have reported that the overall risk of developing PTE in their Indian patients was 11.4%.[13] Similarly, the incidence of PTE was found to be 17% by Zhao et al in patients with severe brain injury.[15] Two third of our study population consisted of malepatients while rest of one fourth were female patients. Their mean age was 26.69 years. A similar study was conducted in India by Thapa et al. Their study population consisted of 81% male and 19% female patients. The mean age of their study subjects were also 26.3 years.[13] Similarly, according to Zhao et al, 72.4% of their patients consisted of males while 27.6% were females with a mean age of 36.94±14.62 years.[15]

The most important risk factors that we have identified were male patients who were between 11-30 years of age, presence of subdural hematoma and skull fracture and severe brain injury. This is in agreement with other studies which reported that the risk of acquiring PTE after TBI is proportional to the severity of brain injury; the severe an injury, higher will be the risk.[4,16,17] Xu et al have also concluded that the male gender, severe TBI and presence of skull fracture, subdural hematoma and intracranial hemorrhage are strongly related to development of PTE.[18] Similarly, Temkin NR described that subdural hematoma, intracerebral bleeding and depressed skull fracture increases propensity of acquiring PTE.[10] Zhao et al have also established that the severity of TBI is directly related to the risk of PTE.[15]

PTE is a clinical condition with significantly higher risk of its development after brain trauma. Ours is a single center institution based study with

shorter follow-up period of one year. Hence, large multicenter randomized controlled trials, with longer follow up periods in patients with severe TBI as the risk of seizures remains higher even for > 10 years after the injury, must be conducted to quantify the true risk of development of PTE after TBI especially in people with severe brain injury.[19]

CONCLUSION

Post traumatic epilepsy is a major complication of brain injury. There are numerous risk factors associated with the risk of developing PTE after TBI. Male gender, age between 11-20 years, depressed skull fracture, development of subdural hematoma and severe TBI are few important risk factors that we have found in our study which when present considerably increases the risk of seizures after head injury. All such patients should be closely monitored and followed because of their risk of developing PTE and to decide when to initiate anticonvulsant drug therapy.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
1	Mohammad Mushtaq	Performed study and data collection	
2	Adil Umar Durrani	Data analysis and drafting of manuscript	
3	Syed Irfan Raza Arif	Conceived and supervised the study, proof read and final approval of the manuscript.	