CLINICAL AUDIT OF PATIENTS WITH TRAUMATIC BRAIN INJURY ADMITTED TO NEUROSURGERY UNIT LADY READING HOSPITAL, PESHAWAR

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Abstract

Objectives: The aim of this study is to present data from Lady Reading Hospital (LRH) and describe the most common causes of traumatic brain injury (TBI), presenting symptoms along with severity, methods of management and finally clinical outcomes.

Methods: This observational study was conducted in the Department of Neurosurgery at LRH, Peshawar, Pakistan from 01/08/21 to 31/07/22. After receiving approval from the Institutional Review Board of LRH, information was obtained from the Medical Record Department and data collection was initiated. The following variables were taken into consideration and recorded using a Performa: patient information, type of brain injury, GCS, severity of injury, intervention and clinical outcome. Data was analyzed using Microsoft Excel and expressed using tables.

Results: A total of 1512 patients were included in this study of which 985 (65.14%) were male. Patients' age ranged between 1-80 years. 1028 (68%) patients were from major cities of Khyber Pakhtunkhwa (KPK) and experienced moderate head injury (982, 65%). Surgery was performed on 604 (40%) patients of which 312 (51.65) cases were depressed skull fractures whereas 908 (60%) cases were managed conservatively. The most common finding on imaging was subarachnoid hemorrhage and the leading cause of TBI was road traffic accidents.

Conclusion: TBIs are more common in young adults and middle-aged individuals of which the leading cause was road traffic accidents. Subarachnoid hemorrhage was the most common finding on imaging with depressed skull fractures being a common finding subsequently managed surgically.

Keywords: Traumatic brain injury, road traffic accident, subarachnoid hemorrhage, depressed skull fractures, Glasgow Coma Scale.

Introduction

Traumatic brain injuries (TBI) are a form of injury that occur due to sudden trauma or violence occurring to the brain matter and are said to occur annually in 27 to 69 million people[1,2]. The major causes of TBIs occur from falls, car accidents, violent trauma and sports[3]. Pakistan, a developing country, faces numerous challenges when it comes to road safety and as such a total of over 100 000 road traffic accidents (RTAs) are reported annually with RTAs being the cause of 1.93% of deaths in the country according to data published by the WHO[5,6]. This, in turn, contributes to one of the many reasons trauma centers witness a large number of traumatic brain injuries in Pakistan.

TBIs can occur due to various etiologies some of which include falls; assault and violence including child and elderly abuse for instance shaken baby syndrome; gunshot injuries, road traffic accidents, injuries sustained by athletes during sports or other recreational activities and in laborers for example construction workers[7]. As such, it is not surprising that the incidence of TBIs is so high and a common occurrence in the Emergency Room.

The types of TBIs vary in their severity and form. Typically, TBIs are divided into two categories, that is, closed injuries and open/penetrating injuries[8]. Furthermore, numerous types of injuries can occur and are present within these two categories which include: concussions which can range from mild to severe in their presentation, contusions which can progress to form hematomas, hemorrhages which is defined as an

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uncontrolled bleeding, hematomas which refer to a collection of blood and are further divided into epidural, subdural and intracerebral hematomas; coup-countercoup brain injuries which is a severe type of injury in which the brain collides with the skull, diffuse axonal injuries that are of the more severe forms of injury, penetrating brain injury such as gunshot wounds and finally second impact syndrome otherwise known as a recurrent traumatic brain injury[8].

To assess the severity of a TBI, the Glasgow Coma Scale (GCS) is used. GCS is a scoring system which incorporates the assessment of three different functions, that is, eye opening, verbal response and motor response and gauges the severity of a brain injuries and allows a physician to anticipate the outcome of the patient[9]. A score below 8 indicates severe brain injury, a score of 9-12 indicates moderate injury and finally a score above 13 indicates mild brain injury[10].

Various procedures are used to treat the various types of TBIs patients present with. Treatment aims at reducing physical, mental and cognitive problems that may arise after an injury[11]. These treatments may be in the form of medication, surgery and rehabilitation, for example, surgical treatments used in repairing skull fractures, draining hematomas, relieving intracranial pressure with a burr hole; pharmacological treatment for anxiety, depression, convulsion and coagulation; and finally rehabilitative techniques such as physical therapy, occupational therapy and speech therapy[11].

Our study aims at looking into the different type of TBIs admitted in the Neurosurgery Department at Lady Reading Hospital (LRH) and what their etiologies are, their types, severity, treatments and outcomes in the hopes of better understanding the trends and types of cases and how to counteract them.

Materials and Methods

The study conducted was an observational retrospective study conducted in the Department of Neurosurgery at Lady Reading Hospital, Peshawar from 01/08/21 to 31/07/22. Approval was taken from the Institutional Review Board of Lady Reading Hospital Medical Teaching Institution. Peshawar, Pakistan. Upon taking consent, information from the Medical Record Department was obtained and details of TBIs occurring between the aforementioned time period was collected and organized according to a Performa created by our team which included patient age, gender, address, mechanism and type of injury, and outcome of the patient. We chose to systematically present our data by dividing it into the following categories:

1. Etiology of TBI

2. Type of TBI

3. Severity of TBI

4. Modes of treatment

5. Final outcome

Patients of all age groups were documented, and all patients admitted to the Neurosurgery Department with traumatic brain injury were included in this study whereas patients with cervical spine injuries and minor head injuries treated without admission were excluded. The severity of TBI was scored using the Glasgow Coma Scale and patients were further categorized as having mild, moderate or severe injuries based on a score of ≥13, 9-12 and ≤8 respectively. The different interventions used to treat patients was also documented including medical treatment, surgical treatment and rehabilitative treatment. Modes of treatment were assessed in all patients. Each patient, regardless of severity was managed according to the ABCDE protocol (airway, breathing, circulation, disability limitation and exposure). Patients that presented after road traffic accidents were ensured neck stabilization prior to intubation if necessary to prevent further disability. Patients with severe presentation were immediately stabilized and usually using etomidate as opposed to other anesthetics to ensure cardiovascular stability and avoid complications such as hypotension especially in the case of intracerebral hemorrhage. Saline was used immediately to maintain intravascular volume in the setting of hypotension. On admission patients were taken for imaging and intracranial pressure was monitored using external ventricular drains. 60% of patients with severe presentation were given phenytoin prophylaxis to prevent post-traumatic seizures. Most patients underwent surgery and kept in the intensive care unit. Those patients with moderate TBI were managed similarly to patients with severe presentation when they were on the lower end of the GCS (9-10) especially in the case of hematomas and hemorrhage whereas those on the higher end of the spectrum (11-13) were managed using a more conservative approach with ICP monitoring and repeated CT scans. Patients with mild TBI, on the other hand, underwent imaging, in particular, computated tomography (CT) scans and immediate analgesics were

administered to patients whilst continuously monitoring patient mental status. In the absence of fractures and hemorrhages, patients' wounds were tended to and discharged after complete evaluation. Finally, the final outcome of patients was measured as an increase in GCS or death. Data was analyzed using Microsoft Excel and was presented in the form of tables.

Results

During the study period, we received 1512 patients with TBI, of which, 65.14% (985 cases) were male and 34.86% (527 cases) were female with a male to female ratio of 1.86:1. Patient demographics, cause of injury, type of injury and clinical outcome are summarized in table-1.

Patients ranged in age from 1-80 years of age with a mean age of 40 years. The largest number of patients were in the 1st decade of life (18.52%) followed by patients in their 50s (18.12%) and finally the 3rd decade of life (16.20%)

Table-1

Gender	**No. (%)**
Male	985 (65.14%)
Female	527 (34.86%)
Age Group	**No. of Cases**
1st Decade	280
2nd Decade	200
3rd Decade	245
4th Decade	135
5th Decade	274
6th Decade	115
7th Decade	115
8th Decade	128
Causes of Injury	**Percentage**
Road Traffic Accident (RTA)	45%
Fall from a height	32%
Physical Assault	3%
Firearm Injury	12%
Other	8%
Type of Injury	**No. of Cases (%)**
Depressed Skull Fracture	348 (23.02%)
Epidural Hematoma	192 (12.70%)
Subdural Hematoma	120 (7.93%)
Subarachnoid Hemorrhage	368 (24.34%)
Contusions	276 (18.25%)
Pneumocephalus	124 (8.20%)
Diffuse Axonal Injury	85 (5.56%)
Severity of Injury	**No. of Cases (%)**
Mild	660 (43.65%)
Moderate	472 (31.22%)
Severe	380 (25.13%)

Most patients were from major cities of Khyber Pakhtunkhwa.

According to our first category, that is, etiology of TBI, the most common cause of TBIs in patients in this time period was road traffic accidents (RTAs) taking up 45% of cases. We received a vast array of patients receiving their injuries as restrained passengers, unrestrained passengers, motorcycle accidents, patients impacted by moving vehicles and bus accidents.

In the second category, we looked at the types of TBIs. Of the 1512 patients, 24.33% of cases were of the hemorrhage type and 368 were subarachnoid hemorrhages. On the other hand, 23.02% of cases (348 patients) were skull fractures (depressed skull fractures). Some cases were of the mixed category however, we presented each type as an independent entity.

The third category delved into the severity of injuries using GCS with the classification of mild, moderate and severe injuries scored as ≥13, 9-12 and ≤8 respectively. The majority of cases were mild (43.65%).

The final outcome of patients ranged with the majority of patients (52%) being discharged on the same day, 37% of patients were kept overnight for further observation and some received surgery or other forms of intervention. The remaining 11% of patients either died or went into a coma.

Discussion

Traumatic brain injuries are a common occurrence not only in Pakistan but in the world with an occurrence of 27 to 69 million cases per year[2]. Lady Reading Hospital (LRH) receives an unsurmountable number of cases each year however, clear documentation and statistics on the subject matter do not exist. This study aimed at creating a clear and concise insight into the incidence of various TBIs admitted to LRH with information pertaining to the types, severity, management and outcome so as to allow physicians a better understanding of cases and how to more effectively manage and prepare for them whilst also prompting different government sectors such as those in charge of road safety to ensure a lower number of TBI cases in the future.

Deotale S. et al audited TBIs in a tertiary care hospital in Mumbai and like our study found road traffic accidents to be the leading cause of TBIs with their cases being 79%[12]. This encourages the need for safety measures on the road as a large number of accidents could have been avoided with measures such as seatbelts, stop signs and speed limits that are lacking in developing countries such as ours. Furthermore, the study found that a small number of patients had severe GCS whereas a larger number of patients, that is, 81% of admittees had a score over 8 and as such only 16% received neurosurgical intervention[12]. Not only that but similar to our study the mortality rate was 12%, an avoidable number if further study is done into the topic.

A study conducted in 2004 by Miller L. et al looked into the management of TBIs in the Accident and Emergency (A&E) Department at two hospitals using the National Institute for Clinical Excellence (NICFE) guidelines for early management[13]. The study showed a larger number of TBIs in the male population (61%) similar to our study with the larger number of patients being discharged home after admission to the A&E department however due to the busy nature of the department, a large number of patients were discharged without radiological imaging implicating a necessity for more staff and imaging resources[13]. In contrast, LRH put a large emphasis on imaging for patients with a GCS lower than 13 to ensure no bleeding or lesions were missed.

Another study delved into the topic of preventable deaths after injury. Interestingly, the study found that 11 deaths were avoidable and could have been avoided with on-site neurosurgical staff present in the A&E department[14]. Although not mentioned in the study, it begs the question of whether the presence of more resources or emphasis of CT imaging for patients in the A&E department in the previous study conducted by Miller L. et al would have impacted the patient population that were not provided with this amenity. Luckily, LRH had taken such factors into consideration with neurosurgical staff available in the Trauma Centre to deal with incoming TBI cases and imaging mandatory for all patients presenting with a GCS of 13 or lower. Nevertheless, further investigation into factors that could avoid the death or coma of the 11% of patients in our study is a prospective study that would prove beneficial for the people of Khyber Pakhtunkhwa.

Similarly, a study conducted in Scotland used the Scottish Intercollegiate Guidelines Network (SIGN) recommendations for patient management with TBI and was able to unveil that the new guidelines made a significant difference in CT scanning and discharging[14]. The importance of CT scans and safe discharges are emphasized time and time again and physicians are encouraged to pay heed to this practice.

LRH is one of the busiest tertiary care hospitals in Peshawar, and as such it is fitting to compare this study to other busy tertiary care hospitals such as the regional hospital in South Africa studied by Alexander T. et al. The study found that only a small number of patients required further specialized surgical intervention and those patients that could not tolerate any sort of delay in intervention were effectively managed using non-neurosurgeons[15]. Unfortunately, the study showed that secondary brain injury was not prioritized and was a common occurrence as the etiology and its prevention was not completely understood[15]. Our study shows that the staff at LRH used phenytoin and seizure prophylaxis as an important measure to avoid secondary brain injury, an intervention that

could be studied further to assess if it makes a significant difference in the prevention of secondary brain injury.

Contrary to our practice and beliefs, a study conducted by Horng L. et al concluded that antiepileptic drugs did not make a significant difference in preventing seizures as opposed to patients who were not subjected to the prophylaxis[16]. It is clear that this is a topic that should be revisited as there is conflict on the topic. For example, Schierhout G. et al concluded that, contrary to the previously mentioned study, prophylactic antiepileptic drugs were in fact effective at reducing posttraumatic seizures although its overall effect on death and neurological outcomes remains unclear and without clear evidence inciting a further need for investigation and analysis[17].

As guidelines for management of TBIs vary across the globe, it is difficult to gauge the most effective way of managing patients with TBI effectively. Regardless, it remains clear that although Trauma Centers and the A&E departments are busy units, emphasis on prompt imaging and trained surgical staff availability should be put in place in all facilities. Next steps should focus on evaluating the effectiveness of different treatment modalities being used in LRH on TBI patients and also on avoidable deaths and steps that should be taken to avoid these deaths.

Conclusions

Traumatic brain injuries are most common in young to middle aged people and the leading cause is RTA with subarachnoid hemorrhage being the commonest finding on imaging. Depressed skull fracture is another common finding that is being managed surgically. Most of these patients have moderate type of head injury and are managed conservatively with good GCS on discharge. Further studies should be done on the effectiveness of current practices and avoiding deaths.

Acknowledgments

We would like to acknowledge Lady Reading Hospital for granting us ethical approval and access to their patient data and access to the Medical Record Department.

Author Contribution

SU: Conception of work, final approval, agreeing to be accountable for the work

MS: Design, literature review, methodology, project administration, data acquisition, data collection, analysis and interpretation, drafting, organizing the work and final approval.

MA: Design, literature review, methodology, project administration, data acquisition, data collection, analysis and interpretation, drafting, organizing the work and final approval.

MIK: Conception of work, final approval, agreeing to be accountable for the work.

AM: Acquisition of data, agreeing to be accountable for the work.

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