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Original Research Article

A Hospital-Based Assessment of the Management of Isolated Mild Traumatic Brain Injury (TBI) Patients Managed in the Neurosurgery Department at I.G.I.M.S., Patna

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Abstract

Aim: The aim of the present study was to describe the neurosurgical management of isolated mild traumatic brain injury (TBI) in the Bihar Region.

Methods: This study was conducted at Department of Neurosurgery, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India and consent for participation was obtained from each participant enrolled in this study. The study included all the patients with trauma, having clinical/radiological evidence of head injury alone or in association with other injuries admitted in the Neurosurgery department of Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India for two years. A total of 200 patients of mild head injury attended the emergency services under the Department of Neurosurgery.

Results: There were 148 (74%) males and 52 (26%) females. Most of the patients were healthy 184 (92%) with mild systemic diseases 16 (8%) before the injury happened. Of the patients with mild TBI, predominant mode of TBI was road traffic accidents (RTA) (50%), followed by fall from height (40%), assault and sports-related injury (3%). Of the total, 93% were from blunt injury, and injury at outermost were absent in 7% of patients. Most of the injuries occurred while at home and were accidental (40%) and were directly referred (84%) from the primary center. First aid for pain management was provided by trained personnel (doctors/paramedics) in 25% cases only and no care was provided in the rest of the cases (75%). On radiological examinations, 95% of patients with mild brain injury underwent CT scan, in which 55% were done between 2 to 4 hours after attending the ED room and 45% were performed between 4 to 6 hours.

Conclusion: A high index of suspicion for TBI and an understanding of the risk factors, signs, and symptoms that are most likely to require surgical management or lead to long-term neurocognitive sequelae are the foundation of TBI care in the emergency unit. The care of these patients begins with rapid and appropriate triage, prompt recognition of TBI, and immediate stabilization of the severely brain-injured or otherwise critically ill trauma patient.

Keywords: Traumatic brain injury, trauma, Emergency management, Head injury

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Introduction

Traumatic brain injury (TBI) is a growing international public health problem. In injured persons, TBI results in the most death and disability globally. [1] Approximately 70–90% of traumatic brain injuries (TBIs) that occur worldwide are considered mild, defined as loss of consciousness, 30 minutes, amnesia, 24 hours, or peri-injury confusion/disorientation in a patient with a Glasgow Coma Scale score of 13–15 with clinical symptoms of loss of consciousness (LOC), amnesia or peri-injury disorientation. [2,3] Deriving the incidence of TBI from road traffic incidents results in the much higher global estimate of 55.9 million cases annually. [1] As much as 5% of patients with so-called "mild" TBI depict traumatic abnormalities on initial head CT scan, with 1% requiring neurosurgical intervention in the acute stage of injury. [4] TBI is the leading cause of disability in injured persons younger than 40, leading to significant social and economic impact

due to high costs for treatment, rehabilitation, long-term care, and lost societal contributions. [5] As far as 50% of patients with mild TBI are affected by post concussion symptoms after 1 month of injury and 15 to 20% at 1-year duration. [6,7] The emergency department is the "shop window" of any hospital. It is the most critical and life-saving area, providing urgent care to critically ill patients. In the case of mild TBI care, neurosurgery emergency is an important component of the hospital; albeit, the most overlooked [8]

Currently, there are no mild TBI specific therapies; the diagnostics and line of management administered to the patient have the potential to affect the outcome. [9,10] The clinical management of these patients is variable, and despite the availability of the clinical guidelines, the majority of patients will undergo CT imaging and most of the interpretation is normal. [11]

Moreover, referral of patients with mild TBI directly to the neuropsychological specialists after they are discharged from the neurosurgery emergency has been shown to reduce long term cognitive disability. [12,13] Finally, medications given soon after injury, such as serotonin reuptake inhibitors and benzodiazepines, have been shown to reduce post-concussion symptoms after mild TBI. [14] Thus, the description of neurosurgery emergency care for mild TBI, and the identification of deficiencies and variation in care, would be important first steps toward improving emergency care for this injury. Hence, the main objective of this study is to describe the emergency management plan in the for mild TBI.

Material & Methods

This study was conducted at Department of Neurosurgery, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India and consent for participation was obtained from each participant enrolled in this study. The study included all the patients with trauma, having clinical/radiological evidence of head injury alone or in association with other injuries admitted in the Neurosurgery department of Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India for two years from 2021-2023. A total of 200 patients of mild head injury attended the emergency services under the neurosurgery department.

A questionnaire was administered to each participant by the neurosurgery resident on call in the ED. The form included details like patient demographics, cause of injury, clinical history, Glasgow coma score (GCS) on arrival to the study center, prehospital care, clinical findings, neurological examination, and radiological findings. The severity of TBI was diagnosed according to the GCS score. Early CT scan was done to understand the type of injury to administer the appropriate line of treatment. The progress and outcome in the ED room were recorded by neurology examination. GCS was used for the age group more than 5 years, and the pediatric coma scale (by Simpson and Reilly) was used for pediatric age group less than 5-year cases. Based on GCS, TBI cases were graded as mild (13–15), moderate (9–12) and severe (< 8).

Data Analysis

Statically analysis was performed using statistical software SPSS version 17. The data were presented as no. (%) and median (interquartile ranges). All analysis was performed at the 95% confidence interval.

Results

Table 1: Demographic characteristics of the patients

Demographic characteristics	Frequency (*n*)	Percent (%)
Age (years, median range)	25 (18–38)	
Gender		
Female	52	26
Male	148	74
Preinjury condition		
A normal healthy	184	92
A patient with mildsystemic disease	16	8
Mechanism of injury		
Assault	10	5
Fall from height	84	42
RTA	100	50
Sports-related injury	6	3
Type of injury		
Blunt	186	93
Outermost absent	14	7
Location of incident		
On pedestrian nearhome	80	40
Other, please specifyFall from train	2	1

Public place	4	2
Street	4	2
Street/traffic	109	54.5
Workplace	1	0.5
Referral condition		
Primary referral	168	84
Secondary referral from other hospital	32	16

There were 148 (74%) males and 52 (26%) females. Most of the patients were healthy 184 (92%) with mild systemic diseases 16 (8%) before the injury happened. Of the patients with mild TBI, predominant mode of TBI was road traffic accidents (RTA) (50%), followed by fall from height (40%), assault and sports-related injury (3%). Of the total, 93% were from blunt injury, and injury at outermost were absent in 7% of patients. Most of the injuries occurred while at home and were accidental (40%) and were directly referred (84%) from the primary center.

Table 2: Types of care provided, and treatment given in ER

Care provided to reach hospital	Frequency (*n*)	Percent (%)
Ambulance service	28	14
Medical mobile team	12	6
No professional care	160	80
Emergency care in ED		
No	180	90
Yes	20	10
Pain treatment given in ED		
No	150	75
Yes	50	25
Admission in hospital		
No	140	70
Yes	60	30
Status on discharge		
Dead	2	1
Discharged home	152	76
Refer to other department for other comorbidities	46	23

First aid for pain management was provided by trained personnel (doctors/paramedics) in 25% cases only and no care was provided in the rest of the cases (75%).

Table 3: Clinical history related to injury

Clinical history	Frequency (*n*)	Percent (%)
Sensorium after injury		
LOC	10	5
Vomiting	8	4
LOC, ENT bleed	2	1
LOC, vomiting	40	20
No history	140	70
Pupils		
Both reacting	190	95
Left pupil reacting	2	1
None reacting	4	2
Upper body abnormality		
Brain injury	40	20
Brain injury with face injury	4	2
Face injury	2	1
Head with neck, face injury	6	3
Head and neck injury	3	1.5
Brain injury with neck injury	42	21
No injury	103	51.5
Lower body abnormality		
Abdomen/pelvic girdle pain	14	7
Cervical pain	20	10

External skin lesions	22	11
Wound on lower limbs	4	2
Lower extremities pain	14	7
Lower extremities/ external skin wound	14	7
No abnormality	112	56

The events following the injury included episode of loss of consciousness (LOC) in 5% cases, vomiting in 4% cases, LOC with ear nose throat (ENT) bleed in 1%, and LOC with vomiting in 20 cases. On examination, 5% cases had abnormal pupillary response, but in 95% patients, pupillary responses were found normal. The majority of TBI cases showed some form of upper body injury on head/face and neck region.

Table 4: CT examination for mild TBI

CT procedure	Frequency (*n*)	Percent (%)
Not performed	10	5
Performed	190	95
CT time after attending in ED		
Between 2 to 4 hours	110	55
Between 4 to 6 hours	90	45
CT findings		
Abnormal	72	36
Normal	128	64

On radiological examinations, 95% of patients with mild brain injury underwent CT scan, in which 55% were done between 2 to 4 hours after attending the ED room and 45% were performed between 4 to 6 hours. On CT scan of head, 36% of cases revealed abnormal findings; however, all of these patients were given conservative treatment and discharged later.

Table 5: Clinical examination of the patients

Clinical examination	Median (n = range)
GCS at the time of arrival	14 (13–15)
Systolic blood pressure at arrival (mm Hg)	122 (110–130)
Diastolic blood pressure arrival (mm Hg)	75 (70–80)
Spo2 level at arrival (mm Hg)	100 (98–100)

On the basis of clinical examination, average median GCS score of all attending mild TBI patients were14, while blood pressure and spo2 level at the ED room during clinical assessments were found to be normal.

Discussion

TBI is any injury that disrupts normal brain function and can manifest as any combination of cognitive, behavioural, motor, and sensory symptoms. TBI encompasses a spectrum of disease, subdivided into mild, moderate and severe according to the Glasgow Coma Scale (GCS). Patients are classified as having mild TBI if GCS 13-15, moderate if GCS 9-12, and severe if GCS < 9. [15] Mild TBI is a complex pathophysiologic process caused by direct or indirect traumatic biomechanical forces to the head. The symptoms largely reflect a functional disturbance rather than a structural injury that can be identified on standard neuroimaging. The precise mechanisms responsible for the clinical features of mild TBI remain unclear, but using functional magnetic resonance imaging (MRI), clinical symptoms can be mapped to specific areas of the brain with axonal injury. [16] Current research suggests that blunt forces causing microscopic neuronal shearing lead to a transient hypermetabolic state that, when paired with alterations in cerebral blood flow and autoregulation, result in the clinical symptoms of mild TBI. [17]

There were 148 (74%) males and 52 (26%) females. Most of the patients were healthy 184 (92%) with mild systemic diseases 16 (8%) before the injury happened. Of the patients with mild TBI, predominant mode of TBI was road traffic accidents (RTA) (50%), followed by fall from height (40%), assault and sports-related injury (3%). Of the total, 93% were from blunt injury, and injury at outermost were absent in 7% of patients. Most of the injuries occurred while at home and were accidental (40%) and were directly referred (84%) from the primary center. First aid for pain management was provided by trained personnel (doctors/paramedics) in 25% cases only and no care was provided in the rest of the cases (75%). On radiological examinations, 95% of patients with mild brain injury underwent CT scan, in which 55% were done between 2 to 4 hours after attending the neurosurgical emergency and 45% were performed between 4 to 6 hours. There are many teething problems and lacunae which have been identified in the neurosurgical emergency care for isolated mild traumatic brain insults. These include improper documentation such as that of pain score, less than 44% of patients had pain score

documented in their records. Since headache is thought to be a prime contributing symptom of post-concussion syndrome and considered a primary cause of long-term disability and morbidity after a mild TBI, therefore, accurate pain score documentation is a necessary mandate and is of utmost significance. Since 2000, routine assessment of pain is necessary and required in all the hospitals to be accredited. [18]

Despite the high prevalence of mild TBI globally, there is little known about optimal treatment nor is their consensus regarding how to manage these patients. [19] Neurosurgery emergency care for the mild TBI patient includes symptom control with anti-emetics and analgesics as needed. Management of mild TBI patients with positive neuroimaging should be discussed with neurosurgical consultants and include admission or observation for worsening symptoms and/or change in neurological exam. In general, the disposition of mild TBI patients presenting to the emergency centre depends on two factors: assessment of safety (risk of deterioration); and education regarding post-concussive symptoms and care. The Centres for Disease Control/American College of Emergency Physicians joint practice guideline on mild TBI supports the safe discharge of patients with mild TBI from the emergency department who have negative CT of the head. However, this recommendation excludes patients who are on anticoagulation therapy, patients with an underlying bleeding disorder, and patients who have had a previous neurosurgical procedure. [20,21] The development of guidelines for the management of mild TBI has the potential not only to reduce variation in neurosurgical emergency care and thus disability after mild TBI but also to raise overall awareness of an injury that not infrequently goes undiagnosed in the neurosurgery emergency setting.36 By improving aspects of neurosurgery emergency care such as pain management and follow up recommendations, neurosurgery emergency guidelines for mild TBI have the potential to reduce the tremendous burden of an injury that currently has no treatment. [22]

For younger patients, the frequency of analgesic administration and blood testing is quite less due to the high-tendency of vomiting post concussion and also because of a belief held by parents and healthcare givers that analgesics may cause unwanted effects and mask other specific symptoms. Exploring the barriers to the administration of analgesics in the case of a mild TBI would surely be an important area of future research works.

Conclusion

A high index of suspicion for TBI and an understanding of the risk factors, signs, and symptoms that are most likely to require surgical management or lead to long-term neurocognitive sequelae are the foundation of TBI care in the emergency unit. The care of these patients begins with rapid and appropriate triage, prompt recognition of TBI, and immediate stabilization of the severely brain-injured or otherwise critically ill trauma patient. For the mildly brain-injured patient, clinical decision tools exist to aid in determining which patients require neuroimaging and which can be simply observed or discharged. Appropriate instructions regarding expectant management of long-term symptoms is key at time of patient discharge. Substantial neurosurgery emergency resources are prerequisites for the care of mild TBI in the neurosurgery emergency. However, the current study identified a plethora of deficiencies in the care plan. Many patients were discharged without any specific discharge advice and recommendations. Pain, an important symptom, was unreported and undertreated. Documentation errors were found in many of the neurosurgery emergency records. There were several other parameters such as delayed initial CT scan, incomplete history recording, documentation of a case as medico legal or nonmedicolegal. All these findings suggest that there is a need for the development of guidelines specific for mild TBI care in the neurosurgery emergency.

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