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Original Research Article

A Hospital-Based Study to Assess the Management of Isolated Mild Traumatic Brain Injury (TBI)

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Abstract

Aim: The aim of the present study was to describe the emergency department (ED) management of isolated mild traumatic brain injury (TBI).

Methods: This study was conducted in the Department of Neurosurgery, Medical College Trivandrum Thiruvananthapuram, Kerala, 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 ED of Medical College Trivandrum Thiruvananthapuram, Kerala, India for one year. A total of 100 patients of mild head injury attended the neuro-surgery ED.

Results: There were 75 (75%) males and 25 (25%) females. Most of the patients were healthy 91 (91%) with mild systemic diseases 9 (9%) before the injury happened. Of the patients with mild TBI, predominant mode of TBI was road traffic accidents (RTA), followed by fall from height, assault and sports-related injury. Of the total, 92% were from blunt injury, and injury at outermost were absent in 8% of patients. Most of the injuries occurred while at home and were accidental (42%) and were directly referred (85%) 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%). The events following the injury included episode of loss of consciousness (LOC) in 6% cases, vomiting in 3% cases, LOC with ear nose throat (ENT) bleed in 1%, and LOC with vomiting in 20 cases. On examination, 6% cases had abnormal pupillary response, but in 94% patients, pupillary responses were found normal. The majority of TBI cases showed some form of upper body injury on head/face and neck region.

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

Introduction

Mild traumatic brain injury (mTBI) is a frequent cause of presentation to emergency departments (EDs), accounting for 80% of all head injury cases. [1,2] The majority of people with mTBI will make a full recovery within a couple of weeks or months [3]; however, a proportion (5% to 12%) will suffer from persistent symptoms that can lead to difficulties in returning to routine daily life such as work or school. [4-6] Of those who present to hospital, around 80% are discharged directly from the ED. [7] As the ED is often the only medical contact these people have, the care they receive has the potential to affect their outcome. [8] Several clinical practice guidelines (CPGs) have been developed to assist clinicians in managing mTBI. A study to identify and assess the quality of all CPGs for the management of mTBI in the ED found 18 CPGs and of these, 6 were identified as evidence-based and published in the last 10 years. [9]

Worldwide, between 100 and 300/100,000 adult patients per year are treated in hospital for mild traumatic brain injury (MTBI). [10] There are

numerous definitions of MTBI, a commonly used one was proposed by the American Congress of Rehabilitation Medicine. [11] Most patients with MTBI will recover completely, but some will develop long-term, non-neurosurgical sequelae. [12] A few patients will develop serious intracranial complications requiring neurosurgical intervention in the acute phase. [13] The aim of any acute management strategy must be to identify accurately, and at reasonable cost, those at risk for deterioration requiring neurosurgical intervention. MTBI was commonly defined as patients sustaining a head trauma with "a history of amnesia or loss of consciousness". Annually, approximately 200/100,000 patients were treated as inpatients for MTBI. All emergency departments (EDs) had access to a 24-h computed tomography (CT) scanner service. No clinics reported using CT to triage patients for admission. Subsequent systematic reviews of the literature showed that using CT to decide who required admission was both a safe and a cost-effective acute management strategy for MTBI compared with a strategy based on in-hospital observation. [14] Between 2000 and 2004, a nationwide pragmatic randomized controlled trial (RCT) was also conducted in Sweden to compare the two management strategies. More than half of all Swedish emergency departments participated in the trial. The results provided solid evidence supporting the CT triage strategy. [15,16]

Moreover, referral of patients with mild TBI directly to the neuropsychological specialists after they are discharged from the ED has been shown to reduce long term cognitive disability. [17,18] Finally, medications given soon after injury, such as serotonin reuptake inhibitors and benzodiazepines, have been shown to reduce post-concussion symptoms after mild TBI. [19] Thus, the description of ED 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 for mild TBI.

Material & Methods

This study was conducted in the Department of Neurosurgery, Medical College Trivandrum Thiruvananthapuram, Kerala, 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 ED of Medical College Trivandrum Thiruvananthapuram, Kerala, India for one year. A total of 100 patients of mild head injury attended the neuro-surgery ED.

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, medianrange)	26 (18–38)	
Gender		
Female	25	25
Male	75	75
Preinjury condition		
A normal healthy	91	91
A patient with mildsystemic disease	9	9
Mechanism of injury		
Assault	6	6
Fall from height	41	41
RTA	51	51
Sports-related injury	2	2
Type of injury		
Blunt	92	92

Outermost absent	8	8
Location of incident		
On pedestrian nearhome	42	42
Other, please specifyFall from train	1	1
Public place	2	2
Street	2	2
Street/traffic	52	52
Workplace	1	1
Referral condition		
Primary referral	85	85
Secondary referral from other hospital	15	15

There were 75 (75%) males and 25 (25%) females. Most of the patients were healthy 91 (91%) with mild systemic diseases 9 (9%) before the injury happened. Of the patients with mild TBI, predominant mode of TBI was road traffic accidents (RTA), followed by fall from height, assault and sports-related injury. Of the total, 92% were from blunt injury, and injury at outermost were absent in 8% of patients. Most of the injuries occurred while at home and were accidental (42%) and were directly referred (85%) from the primary center.

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

Care provided to reachhospital	Frequency (*n*)	Percent (%)
Ambulance service	15	15
Medical mobile team	5	5
No professional care	80	80
Emergency care in ED		
No	92	92
Yes	8	8
Pain treatment given in ED		
No	75	75
Yes	25	25
Admission in hospital		
No	72	72
Yes	28	28
Status on discharge		
Dead	1	1
Discharged home	75	75
Refer to other department for other comorbidities	24	24

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	6	6
Vomiting	3	3
LOC, ENT bleed	1	1
LOC, vomiting	20	20
No history	70	70
Pupils		
Both reacting	94	94
Left pupil reacting	2	2
None reacting	2	2

Right pupils'dilatation	2	2
Upper bodyabnormality		
Brain injury	21	21
Brain injury withface injury	1	1
Face injury	1	1
Head with neck, faceinjury	3	3
Head and neckinjury	2	2
Brain injury with neck injury	22	22
No injury	50	50
Lower body abnormality		
Abdomen/pelvic girdle pain	8	8
Cervical pain	9	9
External skin lesions	12	12
Wound on lower limbs	1	1
Lower extremities pain	7	7
Lower extremities/ external skin wound	7	7
No abnormality	56	56

The events following the injury included episode of loss of consciousness (LOC) in 6% cases, vomiting in 3% cases, LOC with ear nose throat (ENT) bleed in 1%, and LOC with vomiting in 20 cases. On examination, 6% cases had abnormal pupillary response, but in 94% 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	6	6
Performed	94	94
CT time after attending in ED		
Between 2 to 4 hours	56	56
Between 4 to 6 hours	44	44
CT findings		
Abnormal	35	35
Normal	65	65

On radiological examinations, 94% of patients with mild brain injury underwent CT scan, in which 56% were done between 2 to 4 hours after attending the ED room and 44% were performed between 4 to 6 hours. On CT scan of head, 35% 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 atarrival (mm Hg)	122 (110–130)
Diastolic blood pressurearrival (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 were 14, 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. [20] 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. [21] 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. [22]

There were 75 (75%) males and 25 (25%) females. Most of the patients were healthy 91 (91%) with mild systemic diseases 9 (9%) before the injury happened. Of the patients with mild TBI, predominant mode of TBI was road traffic accidents (RTA), followed by fall from height, assault and sports-related injury. Of the total, 92% were from blunt injury, and injury at outermost were absent in 8% of patients. Most of the injuries occurred while at home and were accidental (42%) and were directly referred (85%) 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%). The events following the injury included episode of loss of consciousness (LOC) in 6% cases, vomiting in 3% cases, LOC with ear nose throat (ENT) bleed in 1%, and LOC with vomiting in 20 cases. On examination, 6% cases had abnormal pupillary response, but in 94% patients, pupillary responses were found normal. The majority of TBI cases showed some form of upper body injury on head/face and neck region. On radiological examinations, 94% of patients with mild brain injury underwent CT scan, in which 56% were done between 2 to 4 hours after attending the ED room and 44% were performed between 4 to 6 hours. On CT scan of head, 35% of cases revealed abnormal findings; however, all of these patients were given conservative treatment and discharged later. There are many teething problems and lacunae which have been identified in the ED 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. [23]

Despite the high prevalence of mild TBI globally, there is little known about optimal treatment nor is there consensus regarding how to manage these patients. [24] Emergency centre 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. [25,26] The development of guidelines for the management of mild TBI has the potential not only to reduce variation in ED care and thus disability after mild TBI but also to raise overall awareness of an injury that not infrequently goes undiagnosed in the ED setting.36 By improving aspects of ED care such as pain management and follow up recommendations, ED guidelines for mild TBI have the potential to reduce the tremendous burden of an injury that currently has no treatment. [27]

On the basis of clinical examination, average median GCS score of all attending mild TBI patients were 14, while blood pressure and spo2 level at the ED room during clinical assessments were found to be normal. 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 ED resources are prerequisites for the care of mild TBI in the ED.

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 ED records. There were several other parameters such as delayed initial CT scan, incomplete history recording, documentation of a case as medicolegal or nonmedicolegal. All these findings suggest that there is a need for the development of guidelines specific for mild TBI care in the ED.

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