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Research Article

MILD HEAD INJURY: A CLINICO-RADIOLOGICAL STUDY

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ABSTRACT
Objectives behind the study was to determine the most common presentation of patients with Mild Head Injury (MHI) and the most common abnormality on Non-contrast Computed Tomography (NCCT) Head and the incidence of an abnormal NCCT head and neurosurgical intervention in patients with MHI. Between December 2012 and June 2014 we studied 345 patients with MHI (Glasgow coma scale 13, 14, 15) presenting within 12 hours. Pregnant females, children below 16 years of age, patients with penetrating HI and patients who had associated injuries and required surgical intervention for the same were excluded from our study. Detailed history, thorough clinical examination and NCCT head was performed in all patients. Clinically sub- normal patients and patients with an abnormal NCCT head were admitted and the rest were discharged after a minimum observation period of 6 hours with a written instruction sheet. Conservative management or neurosurgical intervention depended on the clinical condition of the patient and the findings of NCCT head. Patients undergoing surgery were followed up weekly for 1 month. Most commonly affected were males of age group 16-30 years. Road traffic accidents were the most common mode of injury (68.13%). 14 patients had GCS of less than 15 on arrival. Most common presenting feature was lacerations and/or abrasions over the face and/or scalp (117). In 34 patients (9.85%) patient a cranio-cerebral abnormality was detectable on NCCT head. Fracture of the cranium was the most common abnormality and was found in 28 patients (82.35%). 5 patients (1.45%) required neurosurgical intervention. All the patients recovered fully after 1 month of follow up. No mortality was encountered. Clinical examination in MHI is necessary but may be misleading. NCCT plays a pivotal role in diagnosing cranio-cerebral abnormalities in such patients. A small percentage of patients require neurosurgical intervention but usually recover within a few weeks.

Keywords: *Mild Head Injury, Non Contrast Computed Tomography Head, Glasgow Coma Scale*

INTRODUCTION
Injury has been defined as any harm whatever illegally caused to any person in body, mind, reputation or property, vide section 44 Indian Penal Code (Mallick). Head Injury (HI) is the lesion or dysfunction of cranium, meninges and/or brain caused by any external mechanical force (Bordignon and Arruda, 2002). In a rapidly developing country – India, due to urbanization and industrialization, road transportation is being increasingly used. This has led to the increased incidence of road traffic accidents (RTA) which is one of the leading causes of HI accounting for upto 60% of the total cases (Amanda *et al.*, 2014). The other causes include fall from height - at work or home, sports injuries, physical assault etc (Amanda *et al.*, 2014). HI imposes a huge socio-economic burden in terms of untimely deaths, injuries and loss of potential income. The negative impact is felt not only by the person suffering from HI but also on the relatives and the economy.
On the basis of Glasgow coma scale (GCS), HI can be further classified as – MILD (GCS 13-15), MODERATE (GCS 9-12), SEVERE: GCS 3-8 (Teasdale and Jennett, 1974; Miller, 1986; Brunicardi *et al.*, 2009). Mild Head Injury (MHI) is one of the most common injuries seen in Emergency Departments (ED), accounting for approximately 70-90% of total cases of HI (Cassidy *et al.*, 2004; David, 2002; Miller, 1986). A very small number of patients with MHI harbour potentially life threatening cranio-cerebral abnormalities (Cassidy *et al.*, 2004; David, 2002; Miller, 1986). Hence, it becomes very important to diagnose any structural damage to the brain, meninges or cranium as early as possible. Detailed history regarding the mechanism of injury and thorough clinical examination and a knowledge regarding the presenting complaints plays an important role in all trauma patients [ATLS]. But many

times the clinical scenario is confusing and unsettling. The value of Non-contrast computed tomography (NCCT) of the head cannot be ignored in these patients (Villasante and Taveras, 1976; Smits *et al.*, 2005). Very few patients will require operative intervention in the form of neurosurgical procedures (Miller, 1986; Villasante and Taveras, 1976; Smits *et al.*, 2005). Hence, it becomes very important to initiating aggressive diagnostic and management modalities to prevent mortality, secondary brain injury and significantly improving the long term prognosis.

Aims and Objectives

The study was conducted to determine the most common presentation of patients with MHI and the most common abnormality on NCCT Head and the incidence of an abnormal NCCT head and neurosurgical intervention in patients with MHI.

MATERIALS AND METHODS

This prospective study was conducted between December 2012 and June 2014 in the Department of general Surgery, NIMS University Hospital, Jaipur, India. Informed consent from the patient or the relatives was taken, explaining the study. The study included patients of MHI (GCS 13-15) who presented to the ED with a history of head trauma within 12 hours. Pregnant females and children below 16 years of age, patients with penetrating HI and patients who had associated injuries and required surgical intervention for the same were excluded from our study. A detailed history of the event, mechanism of trauma and clinical examination was conducted in all the patients and noted in a case file. After resuscitation in the emergency department, the patients were shifted for NCCT head and other investigations (only if required). Haematological investigations were also done. The NCCTs were reported by radiologists of the Department of Radiology, NIMS Hospital. The patients with normal NCCT, GCS 15 and normal clinical examination were discharged home with a written advice sheet after a minimum observation period of 6 hours. The patients with subnormal clinical condition, abnormal NCCT or GCS <15 were admitted for further management i.e. observation or neurosurgical intervention. All the patients were followed up after a week in the out-patient department (OPD), the patients undergoing neurosurgical intervention were followed up for longer duration. The clinical progress and reports were attached in the patient file. The clinical signs and symptoms, the NCCT findings and surgical intervention (if required) were noted. The incidence of abnormal NCCT head and neurosurgical intervention were calculated.

RESULTS AND DISCUSSION

Results

A total of 345 patients were included in our study. The most common presenting clinical feature was Laceration and/or abrasions over the face/or scalp (117 patients), followed by Loss of consciousness (63 patients). Multiple clinical features were present in many patients. 331 patients (95.95%) patients presented with a GCS of 15 and only 5 patients (1.45%) presented with a GCS of 13.

Table 1: Age and Sex distribution in patients with MHI

Age Group (Years)	Male (Percentage)	Female (Percentage)
16-30	175 (87.5%)	25 (12.5%)
31-59	103 (78.6%)	28 (21.4%)
60 or >60	8 (57.2%)	6 (42.8%)
Total	286 (82.89%)	59 (17.11%)

Table 2: Mechanism of MHI

Mechanism of injury	Number of patients (Percentage)
RTA	235 (68.13%)
Fall From height	36 (10.43%)
Physical Assault	65 (18.84%)
Others	9 (2.60%)
Total	345 (100.00%)

Table 3: Frequency of various clinical features present in patients of MHI patients

	Risk factor	Number of patients	Abnormal CT
1	GCS <15 on arrival	14	11
2	Loss of conciousness	63	19
3	Headache	15	3
4	Age > 60	14	2
5	Seizures	1	1
6	Vomiting	32	15
7	Dizziness	17	6
8	Drug/alcohol intoxication	25	2
9	Focal Neurological Deficit	2	2
10	Lacerations over the Scalp or face	117	12
11	Suspected skull Fracture	29	16

Multiple clinical features were present in many patients

Table 4: Incidence of abnormal NCCT head in patients with MHI

	Abnormality on CT scan	Percentage	Normal CT scan	Percentage
Number of patients	34	9.85%	311	90.15%S

Table 5: Incidence of neurosurgical intervention in patients with MHI

	Neurosurgical intervention	Percentage	Conservative management	Percentage
Number of patients	5	1.45%	340	98.55%

Table 6: Frequency Distribution of Various Craniocerebral lesions in 345 patients of mild Traumatic brain injury

	CT Findings	Findings Number of Patients	Percentage
1	Fracture	28	82.35%
2	Extra Axial haemorrhage		
	2.a Epidural hematoma.	10	29.4%
	2.b Subdural hematoma.	6	17.6%
	2.c Subarachnoid hemorrhage.	3	8.8%
3	Intra axial lesions		
	3.a Intracerebral hemorrhage.	1	2.9%
	3.b Intraventricular hemorrhage.	0	0
4	Pneumocephalus	7	20.5%
5	Contusion	18	52.9%
6	Herniation	0	0
7	Diffuse Cerebral Oedema	4	11.8%
8	Midline shift	6	17.6%

Multiple findings were present in many patients.

Discussion

Head Injury is one of the most common presenting complaints in patients presenting to the Emergency Department (Barbosa *et al.,* 2012). Head is a commonly injured body parts. Mild Head Injury (MHI) accounts for a large bulk of HI patients (Barbosa *et al.,* 2012). The clinical picture in such patients varies a lot and may cause diagnostic dilemmas. The most common mode of HI is RTA (Thiruppathy and Muthukumar, 2004) and it accounted for 68.13% of the total cases in our study. Marion *et al.,* (2005) reported RTA as the cause of MHI in 29.7% of the patients. This difference can be attributed to

industrialization and increase in the number of vehicles over time. Unfortunately MHI is very common in males in their 2nd and 3rd decade of life i.e. the economically active age group (Townsend *et al.,* 2004). We studied a total of 345 patients presenting with MHI. The mean age of the patients was 31.60 years and maximum patients were between 16-30 years of age (57.97%). Ian *et al.,* (2001) Stiell *et al.,* (2001) and of Masih *et al.,* (2007) reported a mean age of 38.7 years and 29 years respectively. Males were most commonly affected in our study (82.89%). In a study conducted by Thiruppathy *et al.,* (2004) 63% were males (Thiruppathy and Muthukumar, 2004). Hence we can say that MHI is a burden on the society and the economy because it affects income generating age group. 331 patients (95.95%) of MHI presented to the ED with a GCS of 15, 9 patients (2.60%) with a GCS of 14 and 5 patients (1.45%) with a GCS of 13. Thiruppathy *et al.,* (2004) reported an admission GCS of 15 in 75% of patients.

We noted a total of eleven clinical features, 'Lacerations or abrasions over the scalp or face' was the most common presenting feature and was present in 117 (33.91%) patients, followed by loss of consciousness in 63 (18.26%) patients. Focal neurological deficit was observed in only 2 patients and seizures in 1 patient. 305 patients were observed in the emergency ward for 8-12 hours. This is in agreement with the study conducted by Viola *et al.,* (2000) in which the author has recommended discharging the patients who are clinically normal and have a normal NCCT after a period of observation of minimum 6 hours in the emergency department. We admitted 40 patients for HI. The mean duration of Hospital stay was 4.7 days (range 1day – 12 days). The duration of patients requiring neurosurgical intervention was more (Jonathan *et al.,* 2014).

The NCCT head was abnormal in 34 patients (9.85%). The incidence of a cranio-cerebral abnormality was 98.5 per 1000 patients. Other studies i.e. Haydel *et al.,* (2000) (6.9%), Miller *et al.,* (1996) (6.1%) report a slight lower incidence of intracranial abnormality. This can be attributed to the different population structure being studied. On NCCT head multiple cranio-cerebral abnormalities were present in many patients. Fracture of the cranial vault was the most common abnormality and was present in 28 patients (82.35%), followed by Haemorrhagic contusions in 18 patients (52.9%) and Epidural hematoma in 10 patients (29.4%). Marion *et al.,* (2005) 0.5% (Smits *et al.,* 2005) documented skull fractures in 59.6% patients, followed by Haemorrhagic contusions in 37.8% patients, Subarachnoid haemorrhage in 27.6%. The incidence of Epidural Hematoma in this study was 11.2% which is less as compared to our results. In our study repeat NCCT head when required were done keeping in view the clinical condition of the patient (Bellal *et al.,* 2015).

Neurosurgical intervention was required in 5 patients (1.45%) and the incidence was 14.5 per 1000 patients. Craniotomy was performed in 3 patients for the drainage of an Epidural Hematoma. Two of these patients had an associated linear fracture and one had an isolated Epidural hematoma. Debridement of the scalp wound and excision of the depressed segment was required in 2 patients. Shiomi *et al.,* (2004) reported neurosurgical intervention in 4 out of 29 patients who developed a posttraumatic intra- cranial abnormality. All the 4 cases were acute epidural hematoma with associated skull fracture. This is consistence with our study. Irrespective of the modality of treatment i.e. conservative or surgical, all the patients recovered fully except two patients who developed focal neurological deficit. We encountered no mortality due to MHI in our study.

Conclusion

MHI is a one of the most commonly encountered emergencies in the ED. It has a great socio-economic effect on the society as males in 2nd and 3rd decade of life are the most common victims. Clinical examination in MHI is necessary but may be misleading. NCCT plays a pivotal role in diagnosing cranio-cerebral abnormalities in such patients. Patients with cranio-cerebral abnormality on NCCT head should be admitted and observed as a few of these require neurosurgical intervention but usually recover within a few weeks.

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