Original Article

Role of CT(Computed Tomography) in Head Injury

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Abstract

Background: Head injury is considered as a major health problem that is a frequent cause of death and disability and makes considerable demands on health services. CT remains essential for detecting lesions that require immediate neurosurgical intervention as well as those that require in-hospital observation and medical management.

Objectives: To evaluate the computed tomography findings in patients sustaining head injury and to emphasize the importance of computed tomography scan in head injury.

Methodology: The study was conducted for the period of one year .It comprised a total number of eighty patients presenting to the emergency room(ER) with head injury and were evaluated by CT scan of head using siemens somatom dual slice spiral CT machine.

Results: the study showed overall male to female ratio as 2.6:1. Head injury was most common in 31-50years of age group. Road traffic accidents (RTA) was the commonest mode of injury seen in 65% of patients.Loss of consciousness followed by vomiting and seizures were the common clinical presentations in head trauma patients respectively.According to Glasgow coma scale(GCS) , most of the patients (68.8%)sustained mild head injury(GCS13-15) . Most common abnormal CT findings were skull fractures 39(48.8%), extradural hematoma 31 (38.8%), subdural hematoma 21(26.2%) ,contusions 21(26.2%) , subarachnoid hemorrhage14 (17.5%) and pneumocephalous 13 (16.2%) respectively. Linear skull fracture was the commonest among all other skull fractures.Patients sustaining severe head injury were mostly due to RTA (77%). The highest mortality was seen in patients with severe head injury (GCS 3-8). 5% also had cervical spine injury.

Conclusion:CT is the most comprehensive diagnostic modality for accurate localization of the site of injury in craniocerebral trauma. The early and timely diagnosis of the precise lesion by CT not only had the substantial impact over instituting appropriate treatment and timely surgical intervention but also helped in predicting the ultimate outcome.

Key words: *Head injury, computed tomography (CT), Glasgow coma scale(GCS)*

Introduction

The term head injury is synonymous to traumatic brain injury (TBI) or craniocerebral trauma and is used interchangeably. Head injury is trauma resulting injury to the scalp, skull or brain[1]. It accounts for a large number of hospitalizations and considerable mortality throughout the world. It has been estimated that, each year, over 1.2 million people sustain a head injury in the United States. Of these, approximately 50,000 die, 230,000 are hospitalized and survive and 80,000 to 90,000 develop a long-term disability[2]. In UK, craniocerebral trauma alone is responsible for 150,000 hospital admissions per year[3].

Computed tomography (CT) remains the mainstay for initial diagnostic evaluation of head trauma patients. The fast examination time, wide availability ,lack of contraindications and high accuracy for detecting hemorrhages have made CT the diagnostic study of choice for initial evaluation of head injury[4].

Objectives: To evaluate the role of computed tomography(CT) in patients sustaining head injury and to emphasize its importance in the management and outcome of the patients with head injury.

Materials and methods: Total number of eighty patients presenting with head injury in the emergency department of radiology at College of Medical Sciences(CMS) , Bharatpur and referred cases from other hospitals were examined by CT for duration of one year. All studies were performed with siemen's somatom spirit dual slice spiral CT machine and a protocol of contiguous axial 5-mm sections through the posterior fossa and a contiguous 10 mm axial sequential scans for the rest of the brain. Wherever required, thinner cuts were also taken. Bone algorithms with wide window settings were studied to visualise any fractures of the skull. No contrast material was administered.

For each patient who sustained head injury: A complete clinical history was taken, which included, age, sex, type of injury, principal presenting complaints. The type of trauma was further classified into Road traffic accidents, falls, assaults and miscellaneous. This was followed by general physical examination and detailed examination of the central nervous system. Injuries involving the other systems of the body were also noted. After initial resuscitation, severity of the cranio-cerebral trauma was graded with the help of Glasgow Coma Scale(GCS) into mild head injury (GCS13-15),moderate head injury(GCS 9-12) and severe head injury(GCS 3-8)[5]. **Inclusion criteria:** Patients sustaining head injury presenting in emergency room. **Exclusion criteras**: a)Known hypertensives. b) Patients receiving anti-coagulant drugs. c)Patients with history of previous cerebro-vascular accidents and d)Patients with known bleeding disorders.Data was entered in excel where it was exported into statistical package for social science software (SPSS).

Ethical Clearance:

Prior to the study , ethical approval from the Institutional Review Committee (IRC) was taken at College of Medical Sciences –teaching hospital , Bharatpur . Informed consent was also taken for all the patients involved in the study**.**

Results

A total of eighty patients who sustained head injury presenting in emergency room were analysed . Fifty eight (72.5%) patients were male and 22(27.5 %) were female (Sex ratio M: F = 2.6:1). Ages ranged from one year to seventy year. The highest frequency of head trauma occurred in the 31-50 year group (39%).The most common causes of head injury were RTA (65%), fall injuries (20%) and physical assaults(15%) . Loss of consciousness and vomiting were the commonest clinical features in head injury patients brought to emergency. Clinical picture of patients enrolled in study were as follows **(Table1):**

Table 1: Clinical presentations in study of eighty cases of head injury

Clinical presentations	Frequency	Percentage
LOC	46	57.5
Vomiting	35	43.8
Seizure	15	18.8
Alcohol consumption	15	18.8
Black eyes	13	16.2
Headache	13	16.2
ENT bleeding	8	10
CSF rhinorrhoea	6	7.5

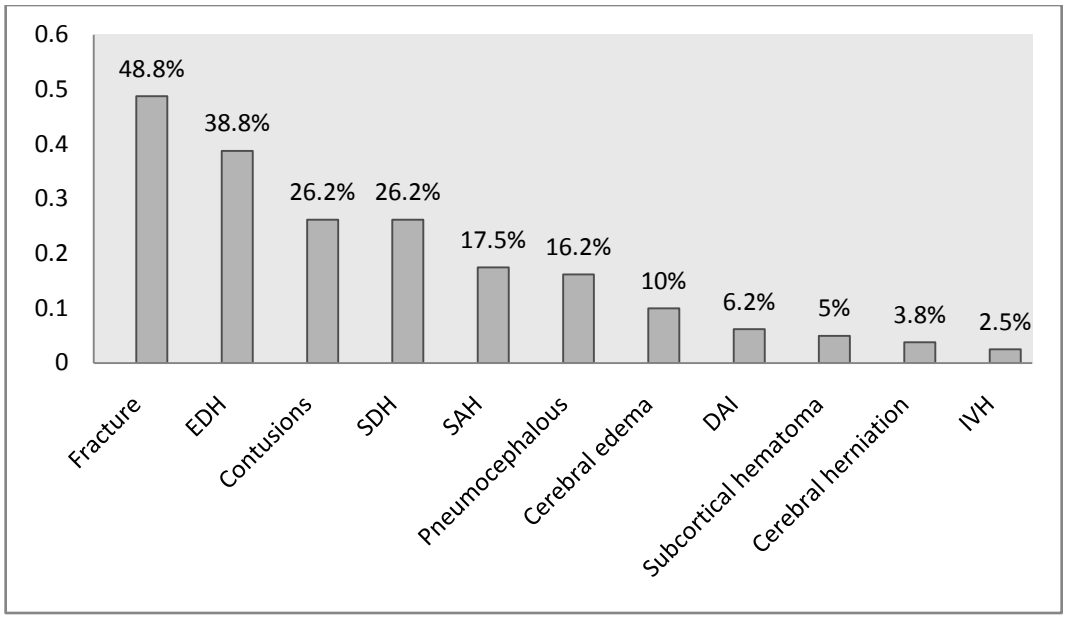
Out of eighty cases, 55 cases (68.8%) sustained mild head injury, 12(15%) cases sustained moderate head injury and 13(16.2%) had severe head injury. RTA was the prime etiological factor in all types of severity of head injury. There were 61.8% patients in mild, 66.6% in moderate and 77% patients in severe head injury who sustained RTA as below **(Table2)**:

Table 2: Severity of head injury (GCS) based on mode of head injury

GCS	Mode of injury			Total
	RTA	Fall	Assault	
Mild (13-15)	34	12	9	55
Moderate (9- 12)	8	3	1	12
Severe (3-8)	10	1	2	13

Twenty five patients (31.2%) had normal CT findings and 55(68.8%) had abnormal CT findings. As shown in figure 1 below, skull fractures were the most common noted in 39 cases (48.8%), followed by EDH 31 cases (38.8%), contusion 22 cases (26.2%), SDH 21 cases (26.2%), SAH 14 cases (17.5%), pneumocephalous 13 cases (16.2%), cerebral edema 8 cases(10%), DAI 5 cases (6.2%), subcortical hematoma 4 cases (5%) cerebral herniations 3 cases (3.8%) and IVH 2 cases (2.5%)**(Figure1).**

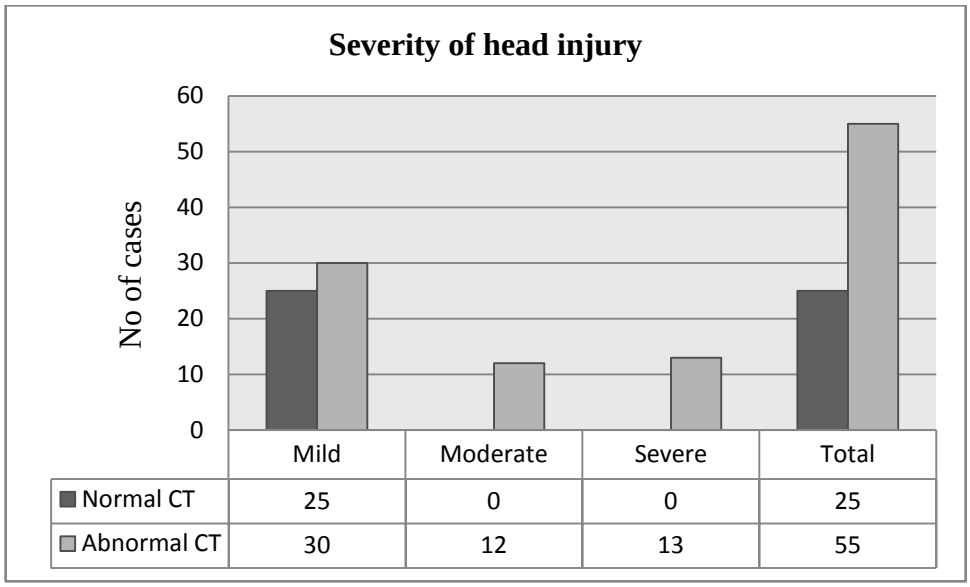
Figure 1: Various lesions in patients with craniocerebral trauma



Linear skull fracture was predominant seen in 30% cases followed by basilar (17.5%), comminuted (8.8%), depressed (6.2%) and diastatic fractures (2.5%).

Abnormal CT findings were seen in 54.5% patients sustaining mild head injury and in all the patients with moderate and severe head injury **(Figure 2).** The p value=0.01 which was stastistically significant.

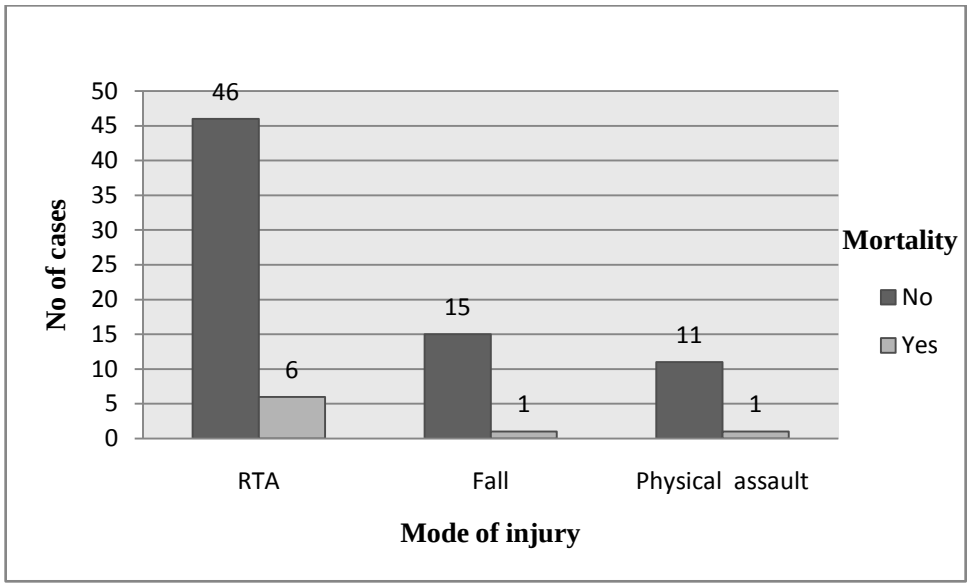
Figure2:Correlation of CT findings with severity of head injury



Eight out of 13 patients with severe head injury had mortality which was statistically highly significant (p

value<0.001).RTA was the most common mode of injury to cause the mortality **(Figure 3)**. Four patients with severe head injury also had cervical spine injury.

Figure 3: Mortality based on mode of injury



Discussion

Head injury is an increasing health problem globally. It is a leading cause of death and disability in children and adults in their most productive years. Precise assessment of the patients presenting with head injury will be very useful in the management of the patients.

In our study the age of patients varied from 1 year to 70 years. Majority of patients found to be in third and fourth decade of life. This age group is the most active groups of society who spend most of their time out of their houses for work and to earn the livelihood are more prone to accidents.The male: female ratio of 2.6:1 observed which is similar with the study conducted in the USA with an incidence ratio of >2:1for males compared to females[6]. The reason for male predominance is that males move out of their homes more frequently and are more actively working outdoors than females. A study in Ghana and another in Nigeria showed road traffic accidents were the commonest causes of head injury[7]. Our findings were thus keeping with the above mentioned literature. Loss of consciousness and vomiting were the most common clinical presentation in patients with head injury which was similar to the study done by Bhandari et al[8] and Agrawal et al[9].

In our series 55 (68.8%) of 80 patients presented abnormal CT findings related to head trauma.There were 54.5% patients sustaining mild head injury and all patients with moderate and severe head injury had abnormal CT findings. Studies in Brazil, presented positive CT findings in a quarter of cases mild head trauma[10] while in Ghana the proportion nearly half of the mild head injury cases with positive CT findings[11]. A study in Nigeria[12], patients with moderate to severe head injury showed abnormal CT findings in 87 % patients.

In this study , skull fracture was the most common finding(48.8%) **(Figure 4)**. A study by Yattoo et al[13] in 547 patients, the CT findings displayed skull fracture only 8.9%, another study done by Zimmerman et al[14] in 286 patients showed hemorrhagic contusions as the most common intracranial lesion . Our finding was thus not in keeping with the above mentioned.

Even though MRI is more sensitive for DAI , it was seen that 6.2% demonstrated DAI **(Figure5).** In this study,most of the patients had more than one CT findings **(Figure 6).**

In our study, 8 patients (10%) expired. All the patients who expired had severe head injury (GCS 3-8). RTA was the commonest mode of injury in the patients who expired. .This findings were similar with the studies done by Yattoo et al [13] in 547 patients, and Agrawal et al[9] showing 6.4%and 7% respectively. Four out of 80 patients (5%) had sustained cervical injury. All the patients sustaining cervical spine injury had severe head injury. Study done by Holly et al[15] in 447 patients of severe head injury , 24(5.4%) suffered cervical spine injury .Thus cervical spine screening is also important especially in severe head injury.

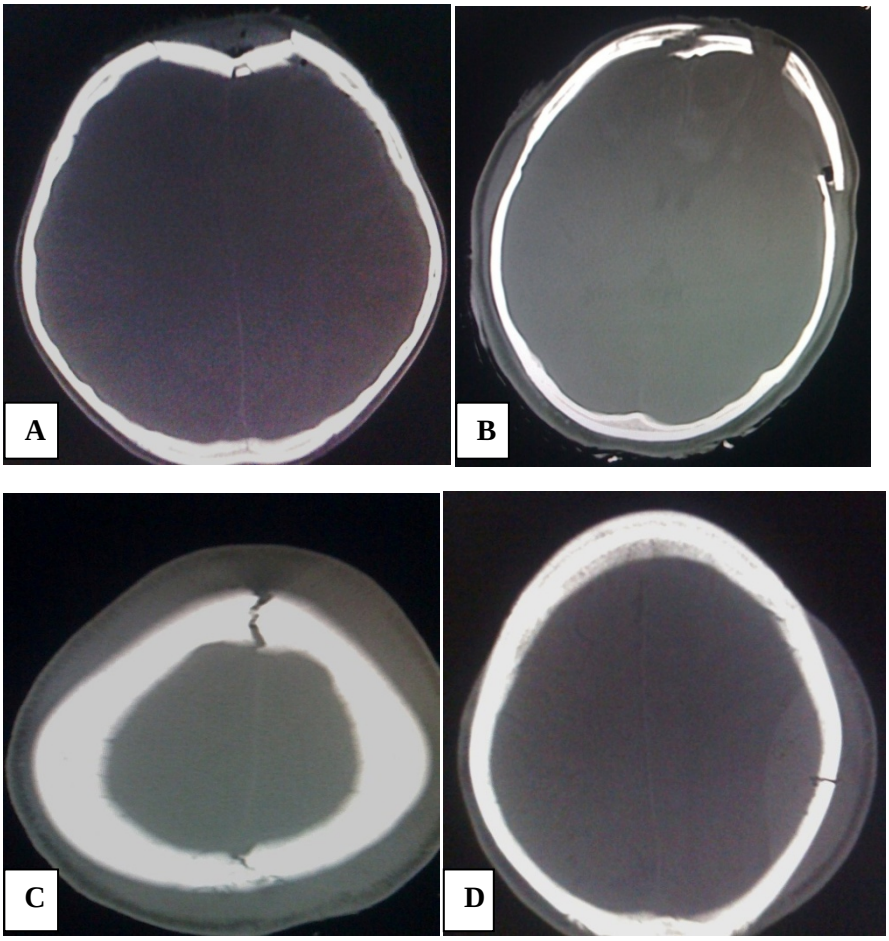


Figure 4 showing different types of skull fracture.(A) Depressed fracture of frontal bone.(B) Comminuted and displaced fracture of frontal bone.(C) Diastasis of sagittal suture (D) Linear fracture of left parietal bone with overlying soft tissue swelling.

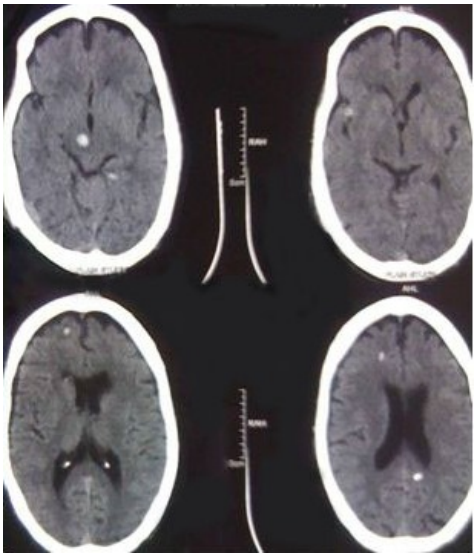


Figure 5: Axial NECT head reveals multiple foci of petechial hemorrhages (DAI) at gray and white matter interface and adjacent to third ventricle.

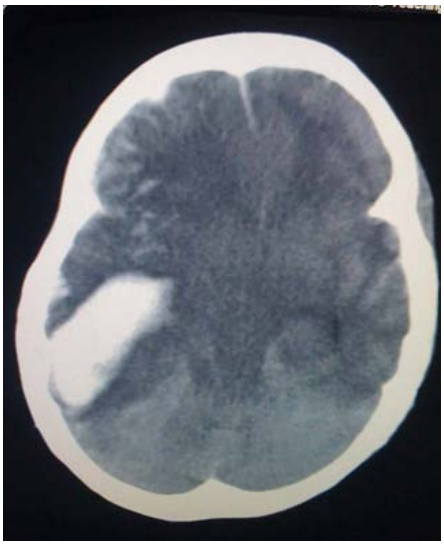


Figure 6: Axial NECT head shows SAH and Hematoma in right fronto-temporal region , diffuse cerebral edema and relatively hyperdense cerebellum called white cerebellum sign.

Conclusion

The high prevalence of head trauma related CT findings justify the use of CT in head trauma. However, it should be performed only when clinically necessary which helps to reduce cost and avoids unnecessary exposure to radiation.

Acknowledgement

We would like to thank Dr Pratyush Shrestha for his immense help in the statistical analysis of the study.

Conflict of interest

None

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