Original Research Paper

Computer Tomographical Evaluation of Traumatic Brain Injury (Tbi); A Cross-Sectional Study

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Abstract

Introduction: Every day, men, women and children suffer head injuries. Head injury causes more deaths and disability than any other neurologic condition and occurs in >70% of accidents, which is the leading cause of death. The aim of present study was to ascertain the CT findings of traumatic brain injury patient.

Material and Methods: Present cross-sectional study conducted in the department of Radiology. Total 150 patients's studied as per inclusion- exclusion criteria and after obtaining IEC permission.

Results: The study revealed that males were commonly affected (89.33%). Most of the patients were in age group of 18-30 years (45.33%). According to Glasgow coma score (GCS) 49.33% patients had severe type of head injury while mild and moderate head injury seen in 28% and 22.67% patients respectively. The highest mortality was seen in patients with severe head injury.

Conclusion: CT is the most comprehensive diagnostic modality for accurate localization of the site of injury in craniocerebral trauma. Precise assessment of the patients presenting with head injury by CT will be very useful in the management of these patients.

Keywords: Computer Tomography, Head injury, Glasgow Coma Scale, Fractures

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Introduction

Every day, men, women and children suffer head injuries. A trip or fall, a car accident, a sports injury; these everyday injuries can range in severity from concussion to coma. A traumatic brain injury (TBI) can be caused by a forceful blow to the head or body, or from an object that pierces the skull and enters the brainNot all blows or jolts to the head result in a TBI. Some types of TBI can cause temporary or short-term problems with normal brain function, including problems with how the person thinks, understands, moves, communicates, and acts. More serious TBI can lead to severe and permanent disability, and even death.[1]

India has the highest incidence of head injuries in the world. In India, more than 100,000 lives are lost and more than 1 million suffer serious head injuries every year. In India, 1 in 6 trauma victims die, compared to 1 in 200 in the United States. Most road accident victims are between the ages of 20 and 40, who are the main breadwinners of the family. These incidences in many cases brought the entire family below the poverty line and deprived the community the important drivers of the economy.

Pedestrians and motorcyclists are the most common victims of road traffic accidents in

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India.[2]

The diagnosis and management of head trauma have been changed significantly with the wide availability of CT scan since its inception in 1970s.[3] The primary goal of imaging the trauma patient is to quickly and accurately identify treatable lesions before secondary injury to the brain occurs. Prompt recognition of treatable injuries is critical to reduce mortality and CT of the head is the cornerstone for rapid diagnosis. CT plays a primary role in the acute setting of head trauma, allowing accurate detection of lesions requiring immediate neurosurgical treatment. CT is also accurate in detecting secondary injuries and is therefore essential in follow-up.[4]

Besides facilitating rapid implementation CT can demonstrate significant primary traumatic injuries including extradural, Subdural, intracerebral haematomas, subarachnoid and intraventricular haemorrhages, skull fractures, cerebral oedema, contusions and cerebral herniations. It is very sensitive in detecting acute hematomas and depressed fractures that require emergency surgery. However Computed Tomography is less sensitive in detecting white matter injuries and posterior fossa lesions due to beam hardening artifacts, from the surrounding bones.[5] With this background present study attempt to ascertain the CT findings of head trauma patients reported to radiology department of tertiary car teaching hospital of western Maharashtra.

Material and Methods

Institutional Ethics Committee (IEC) approval was sought prior to initiation of the study. This was Observational Cross Sectional study carried out in the Department of Radiology of tertiary care medical teaching hospital of Western Maharashtra. The hospital has state-of-the-art infrastructure to provide comprehensive healthcare services to rural and tribal people.

The study was conducted over period of 03 Years from the date of IEC approval. Secondary data mainly used for the analysis in present study. Total 150 patient's records were reviewed retrospectively. All the head trauma patients who referred for CT scan irrespective of their age and gender were included in present study. Incomplete records, lactating and pregnant mothers were excluded from present study. Computer Tomography (CT) Chest was done on SIEMENS SOMATOM EMOTION 6 machine and the findings were re-evaluated using the Picture Archiving and Communication Systems (PACS) as and when required. Parameters like cerebral hemispheres, blood vessels, bone window, type of bleed, contusion, fracture etc. were evaluated. A complete clinical history was recorded, which included, age, sex, type of injury, presenting complaints etc. CT images were reviewed independently by two faculties and the decision of confounding images was made by consensus.

Data Analysis

Data tools were checked for their completeness and data entry and coding was done in Microsoft Excel and statistical analysis was done by using SPSS version 21 (Statistical Package for Social Sciences) software.

The raw data was compiled, classified and presented in a tabulated and graphical manner to bring out important details. Descriptive statistics viz. Mean, standard deviation and frequency, percentage were used for quantitative and qualitative data, respectively. Chi square test was used for categorical data to determine the association between variables. Level of significance ≤ 5% considered significant.

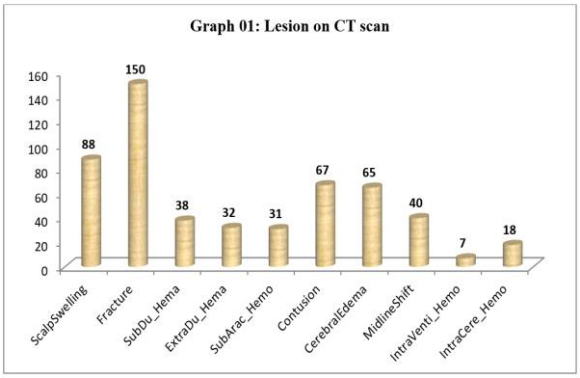
Results

In the present study 150 patients of head injury with positive CT scan finding were studied. The clinical and socio-demographical characteristics of patients depicted in table 01. Males (89.33%) are more likely to suffer from traumatic brain injury (TBI) than females (10.67%). The most common age group of patients was 18-30 years. (45.33%) and 31 to 50 years (34.0%) followed by ≥ 51 (20.67%) years age group. The age and gender of the patients of found to be non-significantly associated (P: 0.67; Table 02). The most common type mode for head injury in this study was road traffic accidents (63.33%) while falls (34%) and assault (2.67%) were less common respectively. (Table 01)

Table 01 Clinico-sociodemographical distribution of head injury patients (n=150)		
A] Age wise distribution		
Sr. No	**Age groups**	**Frequency (%)**
1.	18 Yrs. to 30 Yrs.	68 (45.33%)
2.	31 Yrs. to 50 Yrs.	51 (34.00%)
3.	≥ 51 Yrs.	31 (20.67%)
B] Gender wise distribution		
Sr. No	**Gender**	**Frequency (%)**
1.	Male	134 (89.33%)
2.	Female	16 (10.67 %)
C] Mode of injury		
Sr. No	**Mode of injury**	**Frequency (%)**
1.	Road Traffic Accidents (RTA)	95 (63.33%)
2.	Fall	51 (34.0%)
3.	Assault	04 (02.67%)
D] Type of fracture		
Sr. No	**Fracture type**	**Frequency (%)**
1.	Linear	96 (64.0%)
2.	Depressed	41 (27.33%)
3.	Skull base	13 (08.67%)
E] Grading of head injury based on GCS score		
Sr. No	**Head injury type**	**Frequency (%)**
1.	Mild (13-15)	42 (28.0%)
2.	Moderate (09-12)	34 (22.67%)
3.	Severe (≤ 08)	74 (49.33%)
F] Type of Contusion		
Sr. No	**Contusion type**	**Frequency (%)**
1.	Hemorrhagic	58 (86.57%)
2.	Non-Hemorrhagic	09 (13.43%)

The majority of patients had linear type of fracture while 27.33% and 08.67% had depressed and skull base fracture respectively.
According to Glasgow coma score (GCS) 49.33% patients had severe type of head injury while mild and moderate head injury seen in 28% and 22.67% patients respectively. In this study 44.66% (67) patients had contusion out of that hemorrhagic contusion seen in 86.57% (58) patients while 13.43% (09) had non-hemorrhagic contusion. (Table 01)

Table no 02: Distribution of Age and gender of patients			
Age groups	**Gender**		**Total**
	Male	**Female**	
18 to 30 yrs.	62	06	68
31 -50 yrs.	44	07	51
≥ 51 yrs.	28	03	31
Total	**134 (89.33%)**	**16 (10.66%)**	**150 (100%)**
Chi-square (χ2):0.77 df:02 P:0.67 Non significant			



In the present study, fractures were noted in all 150 patients (100%). Other lesions which detected on CT scan were scalp swelling [88; 58.66%], contusions [67, (44.66%)], cerebral edema [65, 43.33%], midline shift [40; 26.66%], subdural hematoma [38; 25.33%], extradural hematoma [32; 21.33%], subarachnoid hemorrhage [31 20.66%], intra-cerebral hemorrhage [18; 12.00%] and intra-ventricular hemorrhage [07; 4.66%].

Table no 03: Distribution of type of fracture and gender of patients			
Fracture Type	**Gender**		**Total**
	Male	**Female**	
Linear Fracture	86	10	96 (64.0%)
Depressed fracture	37	04	41 (27.33%)
Skull base Fracture	11	02	13 (08.67%)
Total	**134 (89.33%)**	**16 (10.66%)**	**150 (100%)**
Chi-square (χ2):0.34 df:02 P:0.84 Non significant			

Association between type of fractures with gender and age of the patients found to be non-statistically significant [Table 02 and 03].

Table no 04: Distribution of type of factor and Age of patients				
Fracture Type	**Age groups (yrs.)**			**Total**
	18-30	**31-50**	**≥ 51**	
Linear Fracture	46	32	18	96 (64.0%)
Depressed fracture	17	14	10	41 (27.33%)
Skull base Fracture	05	05	03	13 (08.67%)
Total	**68 (45.33%)**	**51 (34.0%)**	**31 (20.67%)**	**150**
Chi-square (χ2):0.98 df:03 P:0.91 Non significant				

In present study out of 32 patients of extradural hemorrhage 78.94% (30) patients had an overlying fracture while on other hand all 38 (100%) patients of subdural hemorrhage had overlying fracture. The commonest fracture among SDH patients was linear type fracture (27, 71.05%) followed by depressed (09, 23.69%) and skull base fracture (02, 05.26%).

Discussion

In present study head injury seen in predominantly in males (89.33%) as compared to females (10.67%). Rathi AR et al reported more males than females (Sex ratio M:F = 2.3:1) who were affected in head injury [5] The reason for male predominance for head injury is may be because men go outside their homes more often and work outside the home more actively than women. Patients betwee ages of 18 to 30 years are more likely to suffer head injuries than other age groups. Rathi AR et al reported somewhat similar age (21 to 30 years) to be more affected in head injury. Olabinari EO et al.[6] al reported a male predominance (male to female ratio 3.8:1) of head injury in his study. In this study population head injury (HI) occurred most frequently in the first four decades of life and were least common beyond the seventh. Most common mode of injury in present study was road traffic accidents (63.3%) followed by fall (34.0% and assault (02.67%). Olabinari EO et al.[6] reported the most common cause of head injury was motor bike road traffic accidents (MBRTA) accounting for more than two-fifths (40.8%) of the injuries (25.4%); motor vehicular traffic accident (MVRTA) (29.2%), and fall from height (20.8%) while assault, gunshot, and occupational hazard were the other infrequent causes of head injury.

In present study liner type fracture (64%) found to be more frequent than other fracture type. Khadka B et al[7] too reported that linear skull fracture was the commonest among all other skull fractures. Olabinari EO et al[6] reported that the most common basal skull fracture site was the petrous temporal bone (45.8%) in his study and temporal bone fractures were longitudinal in 55.6% cases and 18.5%, and 14.8% cases were of transverse and mixed type respectively. According Glasgow coma scale 49.33% (22.67%) had severe type of head injury and 28.0% and 22.67% had mild and moderate type of head injury respectively in this study. Rathi AR at al[5] reported 40.90% as sever type of head injury 19.23% and 03.33% moderate and mild type of head injury respectively in his study. According to Glasgow coma scale (GCS) most of the patients (68.8%) of Khadka et al[7] had sustained mild head injury. This finding contrasts with the findings of our study.

In this study 44.66% (67) patients had contusion out of that hemorrhagic contusion seen in 86.57% (58) patients while 13.43% (09) had non-hemorrhagic contusion. In Khadka B et al study[7] 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. In Rathi AR et al.[5] study contusion and cerebral oedema was found to be the commonest intracranial lesion detected on CT accounting for 43% and 45%, respectively. A study by Yattoo et al[8] in 547 patients, the CT findings displayed skull fracture only 8.9%, another study done by Zimmerman et al[9] in 286 patients showed hemorrhagic contusions as the most common intracranial lesion. Mortality seen in more in patient with severe type of head injury in present study; similar findings reported by Rathi AR et al.[5] The highest mortality was also reported by Khadka B et al[7] study in patients with severe head injury.

Conclusion

Head injury is an increasing health problem globally. Precise assessment of the patients presenting with head injury will be very useful in the management of the patients. Computed tomography is one of the comprehensive diagnostic modality for accurate localization of the site of injury in acute Cranio – cerebral trauma; However, it should be performed only when clinically necessary which helps to reduce cost and avoids unnecessary exposure to radiation.

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