

# A study of various CT findings in the patients of head injury at tertiary health care center

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## Abstract

**Background:** Computed Tomography (CT) is considered the imaging modality of choice in head injury. It has not only made localization accurate, but helped to learn the pathophysiology of injury, the classification of lesion into operable and non-operable. **Aim:** To study the various CT findings of brain injury which in turn may help in optimizing medical management which can be lifesaving in most of the cases. **Material and Methods:** A total of 150 cases of head injuries were evaluated clinically on presentation. Computerized tomography was obtained in all these patients. **Results:** The commonest mode of injury in both adults and children was road traffic accidents (56.67%). 88 patients (58.67%) had a relevant positive scan finding. Patients with GCS scores of 13 to 14 had abnormal scans in 87.5% and 80% cases respectively. Patients in moderate grade (GCS score 9–12) and severe grade (GCS score 3–8) had a relevant positive scans in 96.55% and 100% respectively. **Conclusion:** CT could accurately depict and differentiate the various lesions resulting from trauma to the brain. The high prevalence of head trauma related CT findings justify the use of CT in acute-head trauma.

**Key Words:** Head injury, road traffic accidents, CT scan, Glasgow Coma Scale.

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## INTRODUCTION

Head injury, a worldwide serious health problem today, has been a cause of concern since the Neolithic age. It has been a significant factor of death related to trauma, especially in industrialized and developing countries.<sup>1</sup> Cranial trauma is consequently a source of major disability and a huge financial and psychological burden upon society. Computed Tomography (CT) is considered the imaging modality of choice in head injury. CT, though less sensitive in minor areas of contusion, is more easily performed and less time consuming, is particularly useful when the patient is unconscious or uncooperative

and is extremely reliable for showing lesions which require urgent treatment.<sup>2</sup> Advent of CT scan has made an important landmark in the management of head injury patients. It has not only made localization accurate, but helped to learn the pathophysiology of injury, the classification of lesion into operable and non-operable. Considering the magnitude of the problem of head trauma and the fact that CT is the best imaging modality to assess acute cranio-cerebral trauma, the present study has been undertaken to assess the CT manifestations of brain injury which in turn may help in optimizing medical management which can be lifesaving in most of the cases.

## MATERIAL AND METHODS

The present work comprised of a study of 150 cases of head injuries referred to the Department of Radio Diagnosis, Assam Medical College and Hospital, Dibrugarh, over a period of one year.

**Selection of Cases:** Cases with antecedent history of recent, head trauma were included in this prospective study. Both sexes and all age groups were included in the study. Only those patients who presented within 48 hours of sustaining the head injury were included in the study. All patients were evaluated clinically on presentation and

patient's history and relevant clinical information were recorded on a predefined Performa. At the time of initial presentation, patient was assigned a Glasgow Coma Score by responses to graded stimulation of three simple, standardized, neurological function test. Computerized tomography was obtained in all these patients. Patients too restless to produce scans of suitable quality were adequately sedated with appropriate intravenous sedation. Accurate positioning of all patients was ensured to produce good quality scans and to avoid a false impression of midline shift in the scans. CT imaging was done with the patient supine on the scanner gantry and the gantry angled 15°–20° to the canthomeatal line parallel to the skull base. To reduce the beam hardening artifacts and to increase the conspicuity of small lesions, the posterior fossa was studied with 5 mm slices from CI arch, through the level of posterior clinoids, followed by 10 mm slices from the sella through the vertex. Most adult heads were covered in 15–20 sections. The equipment used for computerized tomography was Model SOMATOM AR TX SCANNER (SIEMENS), a third generation scanner. The parameters used were a 512 x 512 matrix, 130 KV, 70 mA, and an acquisition time of 3 seconds. The images were viewed in both soft tissue and bone algorithm Pictures were obtained with use of centers and windows that were optimal for ensuring brain and bone details. Diagnosis were made according to standardized radiological criteria. The scans were reviewed by two senior Radiologists to prevent interpretive errors.

## RESULTS

In the present study 18.67% (28 out of 150) were children (< 17 years) and the remaining 81.34% (122 out of 150) were adults (> 17 years). Among children 32.14% (9 out of 28) were below 10 years of age. 136 patients (90.67%) in the present study were male and the remaining 14(9.33%) females giving a ratio of 9.7:1. The commonest mode of injury in the present study in both adults and children was road traffic accidents (56.67%). Fall from height accounted for 28.57% of cases in children and 23.77% cases in adults.

**Table 1: Mode of head injury in relation to age**

Mode of injury	Age in years		Total	Percentage
	<17	>17		
RTA				
Fall from height	16	69	85	56.67
Assault	08	29	37	24.67
Fall of heavy object	03	19	22	14.67
Sports injury	01	02	03	2.00
	00	03	03	2.00
<b>Total</b>	<b>28</b> <b>(18.67%)</b>	<b>122</b> <b>(81.34%)</b>	<b>150</b>	<b>100</b>

The CT findings were categorized as normal or relevant positive. The normal scans included negative scans and insignificant positive scans. A CT scan was considered relevant positive only if an intracranial injury was noted. A CT scan demonstrating only an extracranial injury was considered negative. An insignificant positive was one that demonstrated only basilar or skull fracture without brain injury that was unlikely to have led to any untoward sequel. Of the 150 patients subjected to CT scanning, 88 patients (58.67%) had a relevant positive scan and the remaining 62 patients (41.33%) had normal CT scan finding. 10 of the 62 patients (16.13%) had a positive scan but no acute injury to the brain and was considered normal. The various abnormal findings in the 88 abnormal scans observed in patients were divided into three categories as primary, secondary and others. The distribution of various abnormal findings according to Glasgow Coma Scale is shown in Table 2.

**Table 2: Distribution of abnormal CT scan findings according to Glasgow Coma Scale**

Lesions on CT	3-8	9-12	13-15	Total	Percentage of total patients
Primary					
Skull fractures	11	15	35	61	40.67
Extracerebral hemorrhage					
Epidural	02	08	13	23	15.00
Subdural	05	07	03	15	10.00
Subarachnoid	08	12	04	24	16.00
Intraaxial lesion					
Hemorrhagic contusion	18	21	20	59	39.33
Intracerebral hematoma	06	05	02	13	8.60
DAI	07	01	01	09	6.00
Brainstem haemorrhage	03	--	--	03	2.00
IVH	03	--	--	03	2.00
Secondary					
Diffuse brain swelling	07	05	09	21	14.00
Cerebral infarction	01	--	--	01	0.60
Others					
Pneumocephalus	04	05	08	17	11.33
<b>Total</b>	<b>75</b>	<b>79</b>	<b>95</b>	<b>249</b>	<b>100</b>

## DISCUSSION

The constant increase in high velocity accidents and violence over the past decade has made the matter of acute head trauma one of the prime importance in today's medical practice. Cranial CT scan has been established as an accurate diagnostic modality in neuroradiology. CT provides a more accurate picture of intracranial lesion secondary to head trauma than any other diagnostic procedure. No intravenous contrast was used in the present study. The highest incidence of cases in the present study was found in the third decade (34%). The patients in this age groups are the most active groups of society who spend most of their time out of their houses

to earn the livelihood are more prone to accidents. Mebrahtu-Ghebrehiwet *et al*<sup>3</sup> also observed the similar findings. 136 patients (90.67%) in the present study were male and the remaining 14(9.33%) females giving a ratio of 9.7:1. The increased incidence of head injuries in male is probably due to greater exposure of males to all kinds of trauma because of their nature of job and mental temperament. The commonest mode of injury in the present study in both adults and children was road traffic accidents (56.67%). Fall from height accounted for 28.57% of cases in children and 23.77% cases in adults. Other investigators like HsiaoM *et al*<sup>4</sup> also reported RTA as the commonest cause of head injury. Abnormal CT scan findings were seen in 88 out of 150 (58.67%) patients. The result of Talwar *et al*<sup>5</sup> who found 49.8% normal scans in their studies varied with the results obtained in the present study. Harrop SN<sup>6</sup> had observed that incidence of abnormal scans is higher in patients scanned immediately after trauma as compared to patients who have CT scans at a longer interval after sustaining head injury. The variation in the results obtained by Talwar *et al*<sup>5</sup> as compared to the present study is well explained by the observations made by Harrop SN<sup>6</sup> as the above authors scanned patients even 4-6 weeks after sustaining head injury, which was in contrast to the present study where all patients were scanned within 48 hours of sustaining head trauma. To conclude, there was a good correlation between the

clinical manifestations and gross lesions identified on CT scan. The number and intensity of tissue abnormalities on CT scans increased proportionately with the severity of clinical signs and symptoms. However, no variable either alone or in combination could predict the severity of head trauma on CT. The GCS score correlated well with the CT findings, lower the GCS score higher the frequency of abnormal entities on CT scan.

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