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Clinical Picture and Management of Head Injury- A Prospective Study

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Abstract
CT scan is an indispensable diagnostic modality and GCS as a clinically vital entity in evaluating the head injured patients and predicting their outcome. CT and GCS are also found complimentary to each other. CT most reliably demonstrates trauma related intracranial lesions and thus aid in prompt and effective management. GCS is a relevant prerequisite for further evaluation by CT and in a developing nation like India with highest incidence of head injury affecting people of all economic groups, it can cut short necessity of CT, particularly in the mild injury group as assessed by Glasgow coma scale.

Introduction

Head injury or traumatic brain injury, also known as intracranial injury occurs when there is an external blow to the brain, which is commonly caused by vehicular accidents, falls from height and violence. Intracranial injuries are associated with high rates of mortality and morbidity.(1) Even at the time of Hippocrates (460 – 370 BC) different types of fractures were recognized and trephination was advocated. According to Hippocrates "No head injury was so slight that it could be neglected or so severe that life should be despaired of" stands true till today with all new gadgets and state of the art management. Today traumatic brain injury has emerged as one of the leading causes of morbidity and mortality all over the world. It has reached epidemic proportions in India contributing to approximately 1.6 million people seeking medical help and greater than 2 lakhs deaths per year.(2) Worldwide it is a major public health problem and is predicted to surpass many diseases as a major cause of death and disability by the year 2020.(3) Head Injury is frequently seen in the young age group and is caused mainly by road traffic accident (RTA) in 60%, followed by fall (30%) which is common in children, assault (5%) and miscellaneous (5%).(4) Young males are commonly affected population in traumatic brain injury, around 69% cases of injury are from age group 15-35 years.(5)

In the clinical evaluation and management of head injuries along with the vital parameters and valuable tests, conventional radiological tests like X-rays, the newer CT scan and MRI of brain has changed the outlook by revealing trauma related abnormalities accurately and promptly; thus,

resulting in an appropriate and timely intervention.[6] The newer life saving facilities are still confined to the major cities and selected towns in our country contributing to a much higher head injury related morbidity and mortality in the rural and semi-urban areas.

The Glasgow coma scale (GCS) is a simple and worldwide-accepted method of assessing the severity and prognosticating head injury patients based on the bedside functional assessment relating to degree of structural damage. Neurological assessment for assessing severity of traumatic brain injury is commonly done by Glasgow Coma Scale (GCS) but low score of GCS do not necessarily predict bad outcome.[7] CT scan of brain remains as the most reliable method of demonstrating the extent of structural damages like acute haemorrhages, skull fractures, intracranial masses, though MRI of brain is more sensitive than CT scan in the detection of diffuse axonal injuries, non-haemorrhagic contusions and small subdural haematomas.[8]

Aims and Objectives

The study was aimed:

1. To observe the different presentations of head injury patients.
2. To observe the prognosis of head injury patients according to Glasgow Coma Scale (GCS).
3. To observe the medical or surgical management of head injury patients based on CT scan of brain and co-relating the outcome with the initial Glasgow Coma Scale score.

Materials and Methods

The present prospective study was carried out on consecutive 240 head injury patients between the age group 15-65 years admitted in the Department of Neurosurgery and Department of General Surgery of V.S.S. Institute of Medical Sciences and Research, Burla, Sambalpur, Odisha during the time period from November 2015 to October 2017.

Type of Study: Prospective study.

Duration of Study: November 2015 – October 2017

Place of Study: VSS Institute of Medical Sciences and Research, Burla, Sambalpur, Odisha.

In all patients history, mode of injury, clinical examination including vital parameters, pulse, B.P., respiratory rate and pupillary reflexes were noted. The initial GCS and the plain X-ray skull and CT scan brain findings were recorded in all cases. Patients were then managed conservatively or surgically based on CT scan of brain findings. At the time of discharge and at follow up varying up to three months, outcome as assessed by Glasgow outcome scale (GOS) were recorded.

Selection Criteria

Inclusion Criteria

Patients presenting with head injury between age group 15-65 years to the emergency and out-patient department of General Surgery and Neuro-Surgery of V.S.S Institute Of Medical Sciences and Research, Burla, Sambalpur, Odisha.

Exclusion Criteria

1) Patients with history of alcohol intake or any substance abuse or any form of intoxication are excluded from the study.
2) Patients having other systemic injuries such as long bone fractures, chest injuries and abdominal injuries are excluded from this study.

For the convenience of comparison, good recovery (GR) and moderate disability (MD) were considered as favourable outcome, whereas severe disability (SD), persistent vegetative state (PVS) and death (D) were considered as unfavourable outcome.

The summary and conclusion were drawn about the correlation between clinical presentations, X-rays, modality of managements based on CT scan findings, analyzing the outcome and comparing it to initial Glasgow Coma Scale score.CT scan of brain could not be done in 17 patients due to early death of the patients or due to economic issues.

Observation

Table – I Mode Wise Distribution of 240 Head Injures

Mode of injury	No of cases	Percentage
RTA	138	57.5
Fall	79	32.9
Assault	23	9.6

It is observed that, majority of cases i.e. 138 (57.5%) are due to RTA followed by fall in 32.9% and assault in 9.6% cases.

Table – II Sex Wise Distribution

Mode of injury	No. of cases	Male	Female
RTA	138	104	34
Fall	79	54	25
Assault	23	23	0
Total	240	181 (75.4%)	59 (24.6%)

Affected in 75.4% cases of head injuries due to different causes while females are affected in 24.6% cases. The ratio of male : female is 3:1.

Table – III Age Distribution of Head Injury Cases

Age in year	RTA	Fall	Assault	Total (%)
15-25	26	35	4	65 (27.08%)
26-35	42	21	9	72 (30%)
36-45	31	8	5	44 (18.33%)
46-55	19	6	2	27 (11.25%)
56-65	20	9	3	32 (13.33%)
Total	138	79	23	240 (100%)

Maximum number of head injuries was found in the age group of 26-35 years (30%) followed by the age group 15-25 (27.08%) and age group 36-45 years (18.33%).

Table – IV GCS Wise Distribution of Head Injury Cases

GCS	No. of cases	Percentage
Mild (GCS 13-15)	95	39.6
Moderate (GCS 9-12)	86	35.8
Severe (GCS 3-8)	59	24.6

Majority of head injury patients were in the mild GCS (13-15) group.

Table – V Mode of Injury Wise Distribution of 94 Skull Fractures

Type	No. of cases	Linear fracture	Depressed fracture	Comminuted fracture
RTA	138	38	14	5
Fall	79	12	05	8
Assault	23	06	03	3
Total	240	06	03	3

Out of the 240 patients under study, skull fractures were seen in 94 cases (40%) of which most common is the linear fracture (59-6%). Maximum number of skull fractures were associated with assault (52.2%) followed by those due to fall (41.3%) and RTA (31.6%) respectively.

Table – VI GCS Wise Distribution of 94 Skull Fractures

GCS	No. of cases	Skull fracture	
		Present	Absent
Mild (13-15)	95	25 (26.3%)	70 (23.7%)
Moderate (9-12)	86	46 (53.5%)	40 (46.5%)
Severe (3-8)	59	23 (39.0%)	36 (59.0%)
Total	240	94	146

Out of 240 cases, skull fracture were seen in 94 cases (39.2%). Fractures were seen in all GCS severity group patients with higher frequency in the moderate and severe GCS groups.

Table – VII Correlation of intracranial lesion with skull fracture

CT finding	No. of cases	Skull fracture	
		Present	Absent
No intracranial lesion	74	7(9.5%)	67(90.5%)
Intracranial lesion	149	87(58.4%)	62(51.6%)

It is observed that fractures can occur even without any intracranial injury as is seen in 9.5% cases of patients with normal CT scan picture in this study.

Table – VIII Association of fracture with different CT finding

CT finding	No. of cases	Fracture	% of fracture
Normal	74	19	25.7
EDH	31	17	54.8
SDH	24	13	54.2
ICH	39	16	41.0
Cerebral oedema	25	10	40.0
Difuse cerebral swelling	23	09	39.1
Contusion	93	48	51.6
Laceration	09	00	00
Pneumocephalus	23	14	60.8

EDH was found to be the commonest lesion on CT with associated skull fracture (54.8%) followed by SDH in 54.2% and conclusion in

51.6% cases respectively. Pneumo-cephalus was found in 60% of fracture cases.

Table – IX CT finding wise distribution of 223 patients

CT finding	No. of cases	Percentage
Normal	74	33.2
intracranial lesion	194	66.8

Out of the 240 patients under study, CT could not be done in 17 cases, and of the 223 CTs done, Normal CT found in 74 pts. (33.2%) and various intracranial lesions were found in rest 66.8% cases. CT scan of brain could not be done in 17 patients due to early death of the patients or due to economic issues.

Table – X GCS wise distribution of CT findings in 223 pts.

GCS	Total No. of cases	No. of CT done	CT finding	
			Normal	Intra-cranial lesion
Mild	95	92	49(53.2%)	43(46.8%)
Moderate	86	80	20(25.0%)	60(75.0%)
severe	59	51	05(9.8%)	46(90.2%)
Total	240	223	74	149

Different intracranial lesions were found with the incidence of 46.8%, 75% and 90.2% cases of mild, moderate and severe GCS groups respectively. It shows proportionate increase in the number of intracranial lesions with the increasing GCS severity.

Table – XI Correlation of initial GCS with GOS

GCS	Total No. of cases	Outcome (GOS)	
		Fafourable (GR & MD)	Unfavourable (SD, PVS & D)
Mild	95	93(97.8%)	02(2.2%)
Moderate	86	72(83.7%)	14(16.3%)
Severe	59	28(47.5%)	31(52.5%)
Total	240	193(80.4%)	47(19.6%)

Of the total 47 unfavorable outcomes that includes severely disabled (SD), persistent vegetative state (PVS) and death (D), 31 cases (52.5%) were in the severe injury group (GCS 3-8). Only 2 cases (2.2%) of the mild GCS group died. In the severe injury group of the 31 unfavorable outcome patients, 3 patients (5%) progressed to PVS.

Table – XII Correlation between management and outcome

Management	No. of cases	Out come	
		Favourable	Unfavourable
Conservative	214(89.2%)	171 (80.0%)	43(20.0%)
Surgery	26(10.8%)	22(84.6%)	04(15.3%)
Total	240	153	47

It is observed that 10.8% of cases necessitated surgery and rest 89.2% cases were managed conservatively. Unfavourable outcome was found in 15.3% cases of surgery group and 20% in the conservatively managed group.

Table – XIII Correlation between GCS Groups and CT Lesions

GCS group	CT lesion									
	Normal	EDH	SDH	ICH	Cerebral Oedema	Diffuse brain swelling	Contusion	Laceration	Diffuse axonal injury	Pneumo-cephalus
Mild	53	11	07	07	08	03	28	0	0	06
Moderate	16	12	11	13	10	07	35	2	0	12
Severe	05	08	06	19	07	13	30	2	3	05
Total	74	31	24	39	25	23	93	4	3	23

It is observed that contusions were the predominant CT lesion in all GCS groups. Out of the 74 normal CT scans, only in 5 cases (6.7%) were in the severe GCS group while the majority i.e. 53 cases. (71.6%) belonged to mild GCS group. 13 (56.5%), out of 23 cases of diffuse brain swelling and all the 3 cases of diffuse axonal injury were in the severe GCS group.

Table – XIV CT Scan Brain Findings and Outcome

CT finding	No. of CT finding	Out come	
		Favourable	unfavourable
Normal	74(33.2%)	71(96%)	03(4%)
EDH	31(12.0%)	25(80.6%)	06(19.4%)
SDH	24(9.0%)	17(71%)	07(29.0%)
ICH	39(15.0%)	24(61.5%)	15(38.5%)
Cerebral oedema	25(9.7%)	17(68.0%)	08(32.0%)
Diffuse cerebral swelling	23(8.9%)	05(21.7%)	18(78.3%)
Contusion	93(36%)	77(82.8%)	16.(17.2)
Laceration	04(1.5%)	03(75%)	01(25%)
Pneumo-cephalus	23(8.9%)	20(87%)	03(13%)

It is observed that out of the 223 CT scans done, 74 patients (33.2%) were without any demonstrable intracranial lesion on CT while rest 149 patients (66.8%) had evidence of intracranial lesion on CT. favourable outcome was seen in 71 patients with normal CT, while rest 3 patients (4%) with normal CT developed persistent vegetative state (PVS). In 149 patients with intracranial lesions on CT mortality was seen in 47 patients (31.5%). Unfavourable outcome seen with 78.3% cases of Diffuse cerebral swelling followed by 38.5% cases of ICH, 32% cases of cerebral oedema and 29% cases of SDH respectively indicating the severity of these intracranial lesions.

Summary & Conclusion

Following important information were obtained from this study:

Out of the various modes of head injury, road traffic accident (RTA) is the cause for maximum number of head injuries. ‘

Males are more prone to head injury due to their increased outdoor activities.

Highest incidence of head injury occurs in the 26 to 35 yrs age group, though no age is exempt to head injury.

GCS, to a great extent reflects the severity of injury to the brain in most cases. However falsely low GCS in few cases eludes the assessment because of initial hypo-perfusion, hypoxia or intoxication where CT scan of brain helps by demonstrating the absence of significant parenchymal lesion. In contrast cases with GCS score of 15 may show intracranial lesion on CT where hospitalization and conservative management becomes a necessity.

Plain X-ray skull has little role in evaluating extent of injury to the brain. Presence or absence of fracture on plain x-ray neither confirms nor rules out presence of parcenchymatous brain damage, as skull fractures often occur without significant brain injury and also many patients with severe brain injury do not show skull fracture. There is no significant correlation between presence of fracture with the severity on the Glasgow coma scale as shown by a marginal increase in frequency of fractures in the moderate and severe GCS groups.

Linear fractures of the vault forms the commonest skull lesion in head injured patients. EDH is the commonest CT lesion associated with linear fracture of skull.

The important CT scan of brain abnormalities in head injured patients are haemorrhagic contusion, ICH, EDH, SDH, diffuse cerebral swelling, diffuse axonal injury. These CT scan of brain lesions can occur singly or in association. Contusion is the most common trauma related abnormality seen on CT scan of brain.

A significant correlation is found between severity assessed by GCS and CT scan of brain findings. Most of the cases in mild injury group have minimal or no intracranial lesion on CT scan of brain, whereas most of the cases in severe GCS group have findings on CT. However it is difficult to predict the specific lesion likely to be encountered in a particular GCS group. Large, multiple lesions, associated mass effect by oedema are usually seen in the severe GCS group while single lesion is encountered in mild GCS group.

Some cases of diffuse axonal injury despite having grave prognosis may show normal CT scan of brain due to multiple minute lesion not demonstrable on CT. GCS plays an important role in evaluations of such cases.

CT scan of brain finding predicts the trend of outcome in almost all cases. Patients with normal CT scan of brain usually have a good outcome. CT of brain indicators of poor outcome are diffuse cerebral swelling, SDH, diffuse axonal injury, sub-arachnoid and intra-ventricular haemorrhages and obliteration of peri-mesencephalic cistern and mid-line shift. Mid-line shift of more than 5mm carries high mortality.

CT scan of brain has proven to be most helpful in demonstrating lesions like acute SDH and EDH and large intra-cerebral haematomas (particularly the peripheral ones) and life saving as early

detection and emergent surgical intervention is the only hope for the patient.

In concluding the study, it can be mentioned that, CT scan is an indispensable diagnostic modality and GCS as a clinically vital entity in evaluating the head injured patients and predicting their outcome. CT and GCS are also found complimentary to each other. CT most reliably demonstrates trauma related intracranial lesions and thus aid in prompt and effective management. GCS is a relevant prerequisite for further evaluation by CT and in a developing nation like India with highest incidence of head injury affecting people of all economic groups, it can cut short necessity of CT, particularly in the mild injury group as assessed by Glasgow coma scale.

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