ORIGINAL RESEARCH PAPER
Volume - 10 | Issue - 02 | February - 2021 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

GLASGOW COMA SCALE AND COMPUTED TOMOGRAPHY CORRELATION IN TRAUMATIC BRAIN INJURY PATIENTS

Radiodiagnosis

Dr. (Prof.) Alka Agrawal Professor & HOD, Department Of Radiodiagnosis, M.G.M. Medical College & M.Y. Hospital, Indore.

Dr. Saurabh Atram* Professor, Department Of Radiodiagnosis, M.G.M. Medical College & M.Y. Hospital, Indore. *Corresponding Author

Dr. Vivek Yonati Associate Professor, Department Of Radiodiagnosis, M.G.M. Medical College & M.Y. Hospital, Indore.

Dr. Manoj Kumar Soni Post Graduate Resident, Department Of Radiodiagnosis, M.G.M. Medical College & M.Y. Hospital, Indore.

Dr. Prakhar Nigam Post Graduate Resident, Department Of Radiodiagnosis, M.G.M. Medical College & M.Y. Hospital, Indore.

ABSTRACT

Background: Traumatic Brain Injury (TBI) is one of the leading causes of disability, morbidity and mortality around the world in all age groups. Besides clinical evaluation by Glasgow Coma Score (GCS), intracranial lesions in these patients can be detected early by Computed Tomography (CT) which remains the primary investigation of choice in most of the cases of TBI. **Aims & Objectives:** To assess the correlation of glasgow coma scale and CT findings in patients with head trauma. **Material and methods:** 77 patients with head trauma taken for CT scan were studied and their CT findings were correlated with GCS score. **Results:** Most common age group with head trauma was 26-35 years (27.2%). The mean age and standard deviation was 40.97 ± 14.09 years. Majority of the patients were males (83.1%). Most common mode of head injury was Road traffic accidents (84.4%). According to GCS scoring, half of the studied patients (50.6%) had severe head injury, followed by moderate (33.7%) and mild (15.5%) head injury. Intracranial hemorrhages were found in 55 (71.42%) CT scans, being the most common finding as a single lesion or part of multiple lesions. Skull fractures were found in 45 (61%) patients. 25 cases showed midline shift, out of which 18 cases with severe head injury had ≥ 5mm midline shift. Patients with poor GCS had more CT findings as compared to that with good GCS. The mean GCS score in patients with single lesion (11.3 ± 1.99) was significantly different than the mean GCS in those with multiple lesions (8.92 ± 2.45). **Conclusion:** Our study showed positive correlation between severity of head injury assessed using glasgow coma scale and CT findings in patients with head trauma.

KEYWORDS

glasgow coma score, traumatic brain injury, computed tomography

INTRODUCTION

Traumatic brain injury (TBI) is an alteration in brain function or anatomic structure due to blunt or penetrating trauma to the head with associated confusion, altered level of consciousness or focal sensory, motor or other neurologic deficits. Traumatic brain injury is one of the major causes of mortality in all age groups particularly in the younger population (below 40 years). Road traffic injury is the leading cause (60%) of head injuries followed by falls (20-25%) and violence (10%) [1,2,3]. Alcohol involvement is known to be present among 15-20% of head injuries patients [4].

The initial evaluation of a patient with head trauma includes the Glasgow Coma Scale (GCS). The GCS tool has been widely used since 1974, after its development by Teasdale and Jennet, as triage tool and also as a prognostic indicator in cases with head injuries [5]. GCS comprises a set of very simple and easy to perform physical evaluation. Based on GCS scoring system, head injuries are categorized as Mild (with score 13-15), moderate (9-12) and severe (≤ 8).

The invention of computer tomography (CT) has revolutionized the management of patients with acute cranio-cerebral trauma [6,7]. The primary goal of imaging the trauma patient is to identify treatable lesions by surgery, before secondary injury to the brain occurs. CT is ideally suited to evaluate patients immediately after trauma due to its wide availability and rapid scan time. Our study aims to provide a correlation between the GCS and CT findings in patients of head trauma.

MATERIAL AND METHODS

A total of 77 patients with head trauma referred for Non-Contrast Computed Tomography (NCCT) in the Department of Radiodiagnosis of M.Y. hospital, Indore from June 2019 to September 2020 were studied after getting approval from Institutional Scientific Review Board and Institutional Ethical Committee.

RESULTS

Most common age group with head trauma was 26-35 years (27.2%) followed by 36-45 years (24.6%). The mean age and standard deviation was 40.97± 14.09 years. Majority of the patients were males (83.1%). The most common presentation was headache (64.9%) followed by loss of consciousness (33.7%). Most common mode of head injury was road traffic accidents with 65 patients involved (84.4%). About 28 (36.36%) patients out of these were found to be under the influence of alcohol.

Half of the total studied patients (50.6%) had severe head injury according to GCS, followed by moderate (33.7%) head injury and mild (15.5%) head injury. Out of total 77 patients, 71 had abnormal findings. 6 CT scans did not reveal any abnormality.

Table 1. DISTRIBUTION OF CT FINDINGS WITH REGARDS TO SEVERITY OF HEAD INJURY BASED ON GCS

CT findings	Severity based on GCS		
	Mild	Moderate	Severe
Skull fracture	03 (6.3%)	16 (34.0%)	28 (59.5%)
Epidural hemorrhage			
MFA*	00	00	01 (20.0%)
FA*	00	01 (20.0%)	03 (60.0%)
Subdural hemorrhage			
MFA*	00	01 (11.1%)	03 (33.3%)
FA*	00	02 (22.2%)	03 (33.3%)
Subarachnoid hemorrhage	00	00	02
Intracerebral hemorrhage			
MFA*	01 (2.2%)	07 (15.5%)	18 (40.0%)
FA*	01 (2.2%)	06 (13.3%)	12 (26.6%)
Intra-ventricular hemorrhage	00	02 (28.5%)	05 (71.4%)
Brain herniation	00	00	05 (100%)
Cerebral edema	01 (1.92%)	16 (30.76%)	35 (67.30%)
Cerebral contusion	01 (7.6%)	05 (38.4%)	07 (53.8%)
Mid-line shift	00	05 (20.0%)	20 (80.0%)

*MFA- multi focal areas, FA -focal area

Skull fractures were found in 47(61%) patients. Out of these,

depressed fracture was seen in 27.6% patients and fracture was non-depressed in 53.1% patients. Skull fractures showed positive correlation with severity of head injury (P = 0.031) in our study. Intracranial hemorrhages were found in 55 (71.42%) CT scans being the most common finding as a single lesion or part of multiple lesions. Of the intracranial hemorrhage group, intracerebral hemorrhage was the most frequent (66.1%) finding followed by subdural hemorrhage (13.2%).

We found that greater percentage of multi-focal areas of intracerebral hemorrhage (ICH) 18(40.0%) (P value -0.007), epidural hemorrhage (EDH) 1 (20.0%) (P value -0.05), subdural hemorrhage (SDH) 3 (33.3%) (P value -0.05) and intra-ventricular hemorrhage (IVH) 5(71.4%) (P value - <0.001) were found in severe head injury and showed positive correlation with severity of head injury.

In our study 25 cases showed midline shift, out of which 18 cases showed ≥ 5mm midline shift in severe head injury patients. The mean GCS score in patients with single lesion (11.3 ± 1.99) was significantly different than the mean GCS in those with multiple lesions (8.92 ± 2.45).

Scalp edema was the most common ancillary finding seen in 50 out of 77 studied patients, more commonly in patients with severe head injury.

DISCUSSION

Traumatic brain injury is one of the major public problems which has gained wide importance. Traumatic brain injury accounts for 3% to 10% of deaths. These deaths occur mostly in young adults which is of real concern [8].

The predominant age group with head injury in our study was 26-35 years. Male patients outnumbered female patients. Men are more exposed to outdoor work and violence activities than females which are risk factors for TBI. The most common presentation in patients of head trauma was headache (64.9%) followed by loss of consciousness (33.7%). Road traffic accident (84.4 %) was the most common cause of the head injury followed by assault (9.0%) and fall from height (5.1%). Out of 77 patients, 12 patients had good GCS (≥13) with no or minimal clinical complains but due to suspected injury on clinical examination, were referred for CT imaging. On imaging, we found that three patients had skull fractures out of which two patients had concomitant intracerebral hemorrhages. 1 out of 3 patients with fractures had depressed fracture and was surgically treated for it. Remaining patients received medical treatment in emergency room and were closely monitored. All patients were discharged upon complete recovery. Hence, CT imaging is equally important in cases with good GCS and NCCT should be considered in patients even with mild symptoms.

26 patients with moderate head injury (GCS between 9 to 12) underwent CT imaging. Out of these, 16 CT scans had skull fracture, 1 had EDH, 3 had SDH, 13 had intracerebral hemorrhages and 2 had intraventricular hemorrhages as single or concomitant findings. Five patients with depressed fractures and two with subdural hemorrhages were taken for surgery. One patient died intraoperatively and rest six were discharged with partial recovery.

Out of total 77 patients, 39 had severe brain injury (GCS ≤ 8). 13 patients with poor GCS had depressed fracture. Out of these 11 patients with concomitant intracerebral as well as subdural hemorrhages, were taken for surgical interventions. Remaining two patients of depressed fracture died preoperatively. 35 patients had intracranial hemorrhages. Two patients out of four with EDH had poor GCS and midline shift ≥ 5mm and were taken for decompression surgery (burr hole surgery/craniotomy). 3 out of 6 patients with SDH had thickness of hematoma more than 1 cm. 1 out of 6 patients with SDH of thickness less than 1 cm had dilated fixed pupils and raised intracranial pressure. All these 4 patients were taken for decompression surgery. A total of 33 out of 35 patients received appropriate surgical and medical intervention due to rapid assessment with GCS and accurate diagnosis with the help of CT imaging.

In our study, 25 cases showed midline shift. 18 cases with severe head injury showed ≥ 5mm midline shift. Midline shift showed positive correlation (r=0.690, P < 0.001) with severity of head injury. Chiewvit P et al [9] also reported a significant finding of midline shift in 96 patients out of 216.

The mean GCS score in patients with single lesion (11.3± 1.99) was significantly different than the mean GCS in those with multiple lesions (8.92± 2.45) and P value of 0.018 represents positive correlation between the multiple lesions and low GCS value. This is in conformity with the study by Basudev Agrawal et al [10] where mean GCS with multiple lesions was 10.3±1.85.

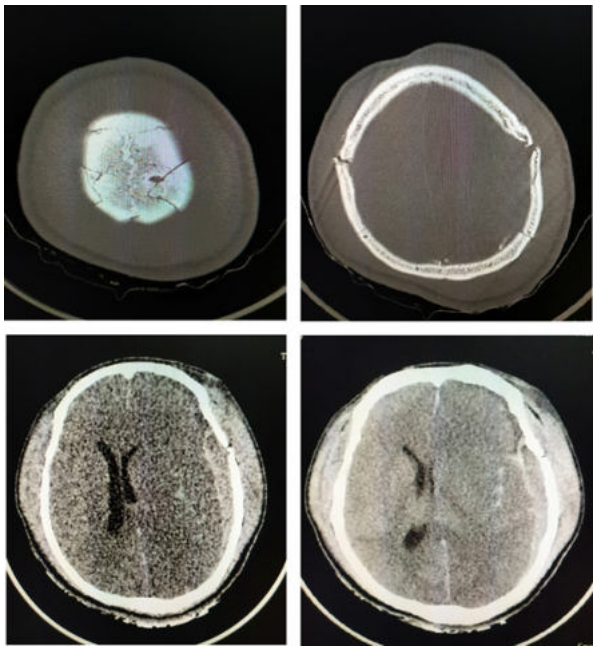

Image 1 - Axial NCCT images of skull show fracture of bilateral parieto-temporal bone and extradural hemorrhage overlying left cerebral hemisphere causing compression of adjacent brain parenchyma and effacement of ipsilateral lateral ventricle leading to mild dilation of contralateral ventricle and midline shift of approximately 9 mm towards the right side. Subarachnoid hemorrhage is seen in left cerebral hemisphere with generalized cerebral edema.

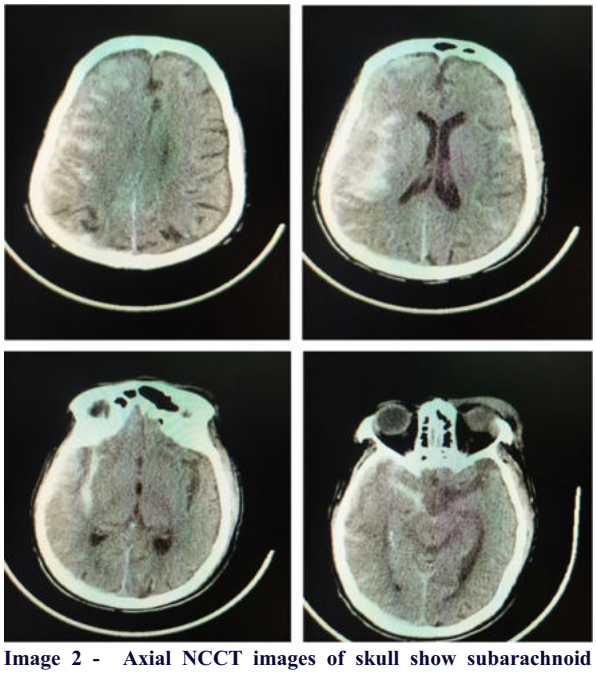

Image 2 - Axial NCCT images of skull show subarachnoid hemorrhage in right cerebral hemisphere with adjacent subdural hemorrhage causing compression of underlying brain parenchyma and mild effacement of ipsilateral lateral ventricle with midline shift of approximately 2.5 mm towards the left side. Mild right generalized cerebral edema and hemorrhagic contusion with surrounding edema is seen in right parieto-temporal lobe.

CONCLUSION

Our study showed that most of the abnormal CT findings were in severe and moderate head injury patients. However, mild head injury cases with good GCS scores also revealed CT findings which required surgical intervention, urgent medical attention and supervision. So it is advisable to go for CT head imaging even in cases of mild head injuries, in order to detect any small yet significant abnormality.

Our study has showed that there is positive correlation between severity of head injury assessed using glasgow coma scale and CT findings in patients with head trauma. We conclude that lower the GCS (severe the head injury), more will be the number and severity of lesions detected on NCCT.

REFERENCES

1. Hryshko FG, Deeb ZL. Computed tomography in acute head injuries. J Computed Tomography. 1983;7(4):331-44.
2. Gentry LR. Imaging of closed head injury. Radio. 1994;191(1):1-7.
3. Kalsbeek WD, McLaurin RL, Miller JD. The national head and spinal cord injury survey: major findings. J Neurosurg. 1980:S19-31.
4. G. Gururaj. Epidemiology of traumatie brain injuries: Indian scenario, Neurological Research, 2002. 24:1, 24-28.
5. Teasdale G, Jennett B. Assessment of coma and impaired consciousness: a practical scale. Lancet. 1974;304(7872):81-4.
6. Ambrose J. Computerised transverse axial scanning (Tomography): clinical approach. Brit J Radio. 1974;46:679-95.
7. Hounsfield GN. Computerized transverse axial scanning (tomography): Part 1. Description of system. Bri J Radio. 1973;46(552):1016-22.
8. Ravi M Godavarthi, Gayatri Manam, Ramakrishna Baru, Sunitha, Naveen Kumar B. A comparison of glasgow coma score with computed tomographic findings in cases of traumatic brain injury. International Journal of Contemporary Medicine Surgery and Radiology. 2018;3(2):B111-B115.
9. Chiewvit P, Tritakarn SO, Nanta-aree S, Sulhipangchai S. Degree of midline shift from CT scan predicted out come in patients with head injuries. J Med Assoc Thai. 2010; 99-107.
10. Basudev Agrawal, Rupesh Verma Correlation of Glasgow Coma Scale with Non-Contrast Computed Tomography findings in immediate post traumatic brain injury , International Journal of Research in Medical Sciences Agrawal B et al. Int J Res Med Sci. 2019 Apr;7(4):1059-1062