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RESEARCH ARTICLE

ANALYSIS OF TRAUMATIC BRAIN INJURY: AND CORRELATION BETWEEN NCCT FINDINGS AND GCS ASSESSMENT

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Abstract

Introduction: TBI is one of the primary causes of disability, illness, and death in people of all ages all over the world. In addition to clinical evaluation by the Glasgow Coma Score (GCS), cerebral abnormalities in these individuals can be found early by computed tomography (CT), which is still the primary study of choice in the majority of TBI cases.

Aims and Objectives: The purpose of this study was to see if the Glasgow coma scale and CT findings in individuals with head trauma correlated.

Material and Methods: After receiving ethical committee clearance, prospective research was undertaken for a period of one year in a tertiary care hospital in North India. The Glasgow coma score was applied to 77 TBI cases, and computed tomography was conducted on all of them, with the results recorded. IBM Corp.'s SPSS statistics for Windows, was used to analyse the data.

Results: Head trauma was most prevalent in people aged 26 to 35. (27.2 percent). The average age was 40.97 14.09 years, with a standard deviation of 14.09 years. Males made up the majority of the patients (83.1 percent). Road traffic accidents were the most prevalent cause of head injuries (84.4 percent). Half of the patients evaluated (50.6 percent) had severe head damage, followed by moderate (33.7 percent) and mild (15.5 percent) brain injury, according to GCS score. Intracranial haemorrhages were observed in 55 (71.42 percent) CT images, making them the most prevalent single or multiple lesions finding. In 45 (61%) of the patients, skull fractures were discovered. Midline shift was seen in 25 instances, with 18 individuals with serious head injuries having a midline displacement of less than 5mm. Patients with a low GCS had more CT results than those with a high GCS. The mean GCS score of individuals with a single lesion (11.3 1.99) differed significantly from the mean GCS of patients with multiple lesions (8.92 2.45).

Conclusions: The degree of head damages as measured by the Glasgow coma scale and CT findings in individuals with head trauma were shown to be positively correlated in our study.

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Introduction:-

Traumatic brain injury (TBI) is a disruption in brain function or anatomic structure caused by severe blunt or penetrating head trauma, with symptoms such as disorientation, altered state of consciousness, and localised sensory, motor, and other neurologic deficits. Traumatic brain injury is one of the leading causes of death in people of all ages, but especially in children and teenagers (below 40 years). Road traffic accidents are the primary cause of head injuries (60 percent), followed by falls (20-25 percent) and violence (10 percent) (1,2,3). Alcohol is reported to be present in 15-20% of individuals who have suffered a head injury (4).

The Glasgow Coma Scale is used to assess a patient who has suffered a brain injury (GCS). Since 1974, when Teasdale and Jennet developed the GCS instrument, it has been widely used as a triage tool and a prognostic predictor in cases of head trauma (5). GCS consists of a collection of extremely simple and straightforward physical tests. Head traumas are classified as mild (with a score of 13-15), moderate (9-12), or severe (with a score of 8).

The development of computer tomography (CT) has changed the way patients with acute cranio-cerebral injuries are treated (6,7). The primary purpose of imaging a trauma patient is to identify surgically curable lesions before further brain damage develops. Because of its wide availability and quick scan duration, CT is suitable for evaluating patients right after a trauma. According to the majority of the research, CT scans are required soon after a head injury and also during follow-up after therapy measures. As a result, discovering alternate methods to minimise unneeded CT scans and radiation risks is critical in TBI cases (8). The goal of our research is to find a link between the GCS and CT findings in head trauma patients.

Material and Methods:-

Study Place:
A tertiary care centre in North India

Study Period:
September 2018 to October 2020

Data Collection & Analysis:-
SPSS (version 15.0, SPSS Inc., Chicago, IL, USA) software.

Study Population:-
A total of 77 patients with head trauma referred for Non-Contrast Computed Tomography (NCCT) were included in the study

Inclusion criteria
Patients >18 years of age, with a h/o TBI not less than 12hours to exclude any delayed effects of development after injury.

Exclusion criteria
History of coagulation disorders, seizures, previous history of neurosurgery.

Known hypertensives
Patients with known history of Cerebrovascular accidents

After a complete clinical evaluation, the severity of the patient's head injury was classified as light if the Glasgow coma score (GCS) was 13-15, moderate if the GCS was 9-12, and severe if the GCS was 3-8.5.

CT scanning Procedure
All the patients included in the study irrespective of GCS score were subjected to Cranial CT scans without intravenous administration of contrast agent. CT scans were performed with patients in dorsal decubitus position, with single slice helical CT

Results:-

The most prevalent age group for head trauma was 26-35 years old (27.2%), followed by 36-45 years old (36.4%). (24.6 percent). The average age was 40.97 14.09 years, with a standard deviation of 14.09. Males made up the majority of the patients (83.1 percent). Headache was the most prevalent symptom (64.9 percent), followed by loss of consciousness (33.7 percent). Road traffic accidents were the most prevalent cause of head injury, with 65 patients involved (84.4 percent). A total of 28 patients (36.36 percent) were determined to be under the influence of alcohol.

According to GCS, half of the total study participants (50.6 percent) had severe head damage, followed by moderate (33.7 percent) and mild (15.5 percent) head injuries. 71 individuals out of a total of 77 had abnormal results. Six CT scans revealed no abnormalities. Skull fractures were discovered in 47 of the 61 individuals. Depressed fracture was found in 27.6% of these individuals, whereas non-depressed fracture was reported in 53.1 percent. In our study, skull fractures had a positive link with the degree of head injury (P = 0.031). Intracranial haemorrhages were discovered as a single lesion or as part of several lesions in 55 (71.42 percent) CT images. Intracerebral haemorrhage was the most common kind of intracranial haemorrhage (66.1%), followed by subdural haemorrhage (13.2 percent).

NCCT findings	**Glasgow Coma Scale Severity**		
	Mild	**Moderate**	**Severe**
Skull fracture	03 (6.3%)	16 (34.0%)	28 (59.5%)
Epidural haemorrhage			
Multi focal areas	00	00	01 (20.0%)
Focal areas	00	01 (20.0%)	03 (60.0%)
Subdural haemorrhage			
Multi focal areas	00	01 (11.1%)	03 (33.3%)
Focal areas	00	02 (22.2%)	03 (33.3%)
Subarachnoid haemorrhage	00	00	02
Intracerebral haemorrhage			
Multi focal areas	01 (2.2%)	07 (15.5%)	18 (40.0%)
Focal areas	01 (2.2%)	06 (13.3%)	12 (26.6%)
Intra-ventricular haemorrhage	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%)

We discovered that severe head injury patients had a higher percentage of multi-focal areas of intracerebral haemorrhage (ICH) 18 (40.0%) (P value -0.007), epidural haemorrhage (EDH) 1 (20.0%) (P value -0.05), subdural haemorrhage (SDH) 3 (33.3%) (P value -0.05), and intraventricular haemorrhage (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 instances had a midline shift, with 18 cases having a midline displacement of less than 5mm in severe head injury patients. The mean GCS score in patients with a single lesion (11.3 1.99) differed substantially from the mean GCS in patients with multiple lesions (8.92 2.45).

Scalp oedema was the most prevalent ancillary finding in 50 of the 77 individuals evaluated, and it was more common in those who had had a serious head injury

Discussion:-

Traumatic brain injury is a serious health concern that has attracted a lot of attention. Traumatic brain injury is responsible for 3% to 10% of all fatalities. The majority of these deaths occur in young adults, which is a serious issue (9).

In our analysis, the most common age group with a head injury was 26-35 years old. Patients who were male outweighed those who were female. Men are more likely than women to be exposed to outdoor employment and violent behaviours, both of which are risk factors for TBI. Headache was the most prevalent symptom in individuals with head trauma (64.9 percent), followed by loss of consciousness (33.7 percent). Prasad et al in their study reported nausea and vomiting, headache and Loss of consciousness as the prime clinical presentations which correlate with our study (10). The most prevalent cause of head injury was a car accident (84.4 percent), followed by assault (9.0 percent) and a fall from a height (9.0 percent) (5.1 percent). Out of 77 patients, 12 had an excellent GCS (13), had no or minor clinical complaints, but were referred for CT imaging owing to a suspected injury on clinical assessment. On imaging, we discovered three individuals with skull fractures, two of whom had concurrent intracerebral haemorrhages. One of every three patients with fractures had a depressed fracture, which required surgical treatment. The remaining patients were treated in the emergency room and closely watched. All of the patients were released when they had fully recovered. As a result, even in situations when the GCS is good, CT imaging is necessary, and NCCT should be investigated in patients with moderate symptoms.

CT imaging was performed on 26 individuals with a mild head injury (GCS of 9 to 12). The CT scans revealed 16 skull fractures, 1 EDH, 3 SDH, 13 intracerebral haemorrhages, and 2 intraventricular haemorrhages as single or concurrent findings. Surgery was performed on five patients with depressed fractures and two patients with subdural haemorrhages. One patient died during surgery, while the other six were discharged after a partial recovery.

There were 39 individuals with serious brain damage (GCS 8) out of a total of 77. Depressed fracture was found in 13 individuals with a low GCS. The 11 patients who had both intracerebral and subdural haemorrhages were selected for surgical surgery. Two more individuals with depressed fractures died before surgery. Intracranial haemorrhages affected 35 people. Two of the four EDH patients had a low GCS and a midline shift of less than 5mm, thus they were sent for decompression surgery. Three of the six individuals with SDH had a hematoma thickness of more than one centimetre. Dilated fixed pupils and increased intracranial pressure were found in one out of every six individuals with SDH of less than one centimetre thickness. These four patients were all scheduled for decompression surgery. Because of the quick assessment with GCS and precise diagnosis with CT imaging, 33 out of 35 patients got appropriate surgical and medicinal treatments.

Twenty-five of the instances in our analysis had a midline displacement. In 18 cases with severe head injury, the midline displacement was less than 5mm. The degree of head damage had a positive connection (r=0.690, P 0.001) with midline displacement. A significant finding of midline displacement was also observed by Chiewvit P et al (11) in 96 individuals out of 216.

The mean GCS score in patients with a single lesion (11.3 1.99) was substantially different from the mean GCS in patients with many lesions (8.92 2.45), with a P value of 0.018 indicating a positive link between numerous lesions and low GCS. This is consistent with the findings of Basudev Agrawal et al (12) who found a mean GCS of 10.31.855 in patients with numerous lesions.

Conclusion:-

The majority of abnormal CT findings were seen in individuals with severe and moderate head injuries, according to our research. Mild brain injury cases with good GCS scores, on the other hand, revealed CT findings that needed surgical intervention, as well as immediate medical treatment and supervision. As a result, even in situations of minor head traumas, CT head imaging is recommended to identify any little but significant abnormalities.

Our research found a link between the degree of head damage as measured by the Glasgow coma scale and CT findings in individuals with head trauma. We infer that the lower the GCS (the more serious the head injury), the more lesions will be seen on NCCT.

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