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Clinical Patterns and Computed Tomography Findings in Patients with Cranio-Cerebral Trauma in Tertiary Hospital in Eastern Nepal

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ABSTRACT

Background: Head injury is a common problem encountered in emergency department. Among various neurological diseases, cranio-cerebral trauma ranks high in order of frequency and gravity. In acute setting, computed tomography is modality of choice because of its high accuracy in detecting intracranial lesions. The study was done to analyze computed tomography findings in cerebral trauma in regards to sociodemographic characteristics and find out associations of Computed tomography findings with mechanism of injury and clinical manifestations.

Methods: The study was carried in Department of Radiology, BPKIHS, over a period of one year from Aug. 2015 to Aug. 2016. 450 patients were included in our study and findings noted on structured pro forma. Analysis was done using SPSS version 20 applying simple descriptive statistical methods.

Results: Among 450 patients, 220 patients (48.9%) had various cranio-cerebral injuries. Most were in age group of 20-29 years (49.5%) and most common mode was road traffic accident (44.6%).Most patients presented with altered sensorium (39.2%) and Glasgow Coma Scale score of ≥13 (70.9%). Scalp lesion was the most common finding (24%) followed by bone fractures (19.8 %). Patients with road traffic accident (59.7%) and fall from height (46.7%) had more positive computed tomography findings than from physical assault (28.2%). Glasgow Coma Scale showed significant statistical association with computed tomography findings ($p<0.001$).

Conclusions: Road traffic accident is the most common mode of head injury in young adults patients presenting in our hospital. Glasgow Coma Scale can be considered as an important clinical marker for predicting positive computed tomography findings. Also computed tomography is an important initial investigation to evaluate the various craniocerebral injury in trauma patients.

Keywords: Computed tomography; Cranio-cerebral trauma; road traffic accident.

INTRODUCTION

Cranio-cerebral injuries are common cause of emergency visits to hospital following trauma and are associated with significant long-term morbidity and mortality.[1] In developing countries, the incidence of traumatic brain injury (TBI) is rapidly increasing. Road traffic injuries are the most common cause (60%) of TBIs followed by falls (20% to 25%) and assault (10%).[2]

In acute setting, early clinical and radiological diagnosis and aggressive management may prevent secondary complications due to head trauma. Computed tomography (CT) is the primary modality of choice in initial assessment of head injury patients as it is easily available, faster and highly accurate in detecting various brain lesions.[3]

The study of role of CT in early diagnosis of brain lesions can have significant impact on providing appropriate treatment and timely surgical intervention. This study analyses various CT findings in patients with head injury and discuss association of CT findings with mechanism of injury and clinical manifestation.

METHODS

A cross sectional descriptive study was carried out in the Department of Radiodiagnosis and Imaging, B P Koirala Institute of Health Sciences, Dharan, Nepal over a period

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of one year from August 2015 to August 2016 after taking ethical approval from local institutional review committee. All cases of head injuries irrespective of age group were included in the study. However, cases of cranial trauma after child birth and follow up cases of previous head injury were excluded from the study. A total of 450 cases referred for CT scan of head for suspected head injury were included in the study. Clinical examination including Glasgow Coma Scale (GCS) was recorded by senior resident of radiology after initial resuscitation and stabilization of the patient in ER. Informed consent was taken from stable conscious adult patients in radiology department prior to CT scan. However, if patient is a child or is not stable or unconscious, then patient was immediately shifted for CT scan and consent was taken from close relatives. CT scan was recommended for all patients with moderate and severe head injury (GCS 3-12). CT scan of the head was done as per the standard protocol of the hospital. Findings were noted on structured pro forma. Data was entered into Microsoft Office Excel Spread Sheet and then exported into IBM SPSS version 20.0 for analysis. Descriptive statistics (mean, median, mode, standard deviation, proportion and percentages) were calculated for appropriate variables. Pearson's chi-square was used to assess relationships and statistical significance of GCS, mechanism of injury and clinical presentation with CT findings. P-value less than 0.05 was considered to be statistically significant (confidence level=95%).Sample size was calculated using the formula $n=Z^2P(1-P)/d^2$ Where n is the sample size, Z (=1.96) is the statistic corresponding to 95% level of confidence, P (=52%, i.e. 0.52) is expected prevalence that was obtained from similar study done[14] and d(=0.05) is precision (corresponding to effect size). Desired sample size obtained for our study was 384.

RESULTS

A total of 450 patients who underwent CT scan for head injury were analyzed, out of which 307(68.2%) patients were male while 143(31.8%) were female, with a male to female ratio of 2.1:1. Their age ranged from 1 to 84 years, with a mean age of 34.6± 19.75 years. Maximum numbers of the patients (109, 24.2%) were in age group of 21 to 30 years and the most common mode of head injury was road traffic accidents (201, 44.6%) as shown in Figure 1.

Among 450 patients with head trauma, the most common clinical presentation was history of altered sensorium (284, 39.2%) followed by external injury (147,20.3%) and vomiting (146, 20.1%) as shown in Table 1.

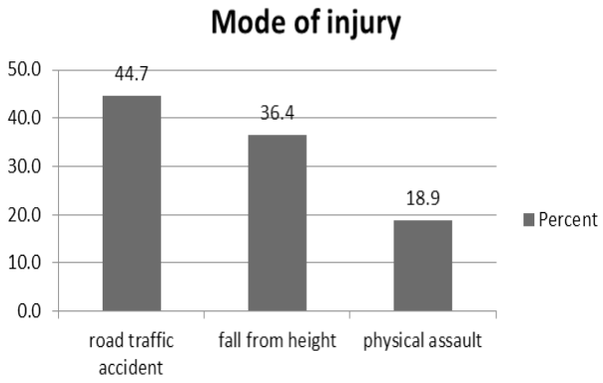

Figure 1. Bar Diagram showing mode of injuries in patients with head trauma.

Table 1. showing the common clinical presentation of patients with head trauma (n=450).

Clinical features	Percentage	Frequency
Altered sensorium	39.2%	284
External injury	20.3%	147
Vomiting	20.1%	146
Headache	11.1%	80
Nasal/Aural discharge	6.6%	48
Convulsions	2%	15
Shock /Unconscious	0.2%	2
Respiratory distress	0.2%	2

Among 450 head injuries patient who underwent CT scan of head, 230 patients (51.1%) had normal CT finding while 220 patients (48.9%) had various pattern of intracranial injuries. Among the patients who had positive CT finding, scalp lesion was the most common finding in 24% of cases(106) followed by fractures 19.8 %(104). The spectrum of cranio-cerebral injuries present in patients with head trauma is summarized in Table 2.

Table 2. Spectrum of injuries in patients with head trauma (n=220).

CT Findings	Frequency	Percentage
Scalp lesions	126	24
Skull fracture	104	19.8
Cerebral contusions	90	17.1
Subarachnoid hemorrhage	53	10.1
Extradural hematoma	38	7.5
Subdural hematoma	38	7.5
Intraparenchymal hematoma	27	5.1
Pneumocephalus	27	5.1
Diffuse cerebral edema	10	1.9

Intraventricular haemorrhage	6	1.1
Diffuse axonal injury	5	0.9

GCS was recorded in ER in all patients who came for head CT, out of which 72 % of cases had GCS of 15 (minor TBI) while only 4.9% had GCS score of 8 or less (severe TBI) as shown in Figure 2. Of the 450 patients whose GCS was recorded, a clear association was found between presence of positive CT scan findings and GCS score (P<0.001), showing an increase in the percentage of positive findings as the GCS score decreased.

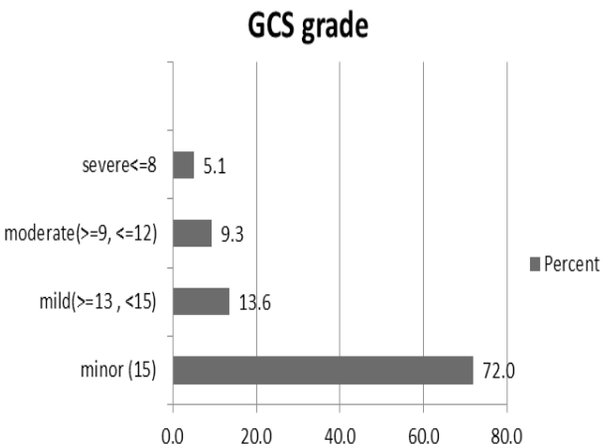

Figure 2. Bar diagram showing grades of GCS in patients with head trauma.

Patients were more likely to have a positive CT finding, if the injury was sustained from RTA (59.7%) and fall from height (46.7%), while there was less likelihood of a positive finding if the cause of injury was from physical assault (28.2%). Significant statistical association with positive CT finding was noted in RTA and physical assault (p<0.001) but not in case of fall from height (p=0.533).

In our study, CT findings of intracranial injury were commonly seen in patients who presented with clinical features of shock/unconsciousness (two out of two patients, 100% positive CT findings) and external injury (97 out of 147, 65.9 %) while positive CT findings were least in patients with headache (33 out of 80 patients, 41.2% positive CT findings). However statistically significant association with abnormal CT findings was only noted in patients who presented with altered sensorium (p=0.047) and with external injury (p<0.001).

DISCUSSION

Cranio-cerebral trauma is one of the major causes of morbidity and mortality and has high incidence in developing countries due to increase number of road traffic accidents and other factors such as falls and physical assault. [4-6] With the advent of CT, the diagnosis of head injury has significantly improved which aids in early intervention and subsequent management.

Head injury is a common occurrence in patients of all age groups from children to elderly.[7] Similar finding was also noted in our study where the age of the patients ranged from 1 to 85 years. The peak incidence of head injury was in the third decade (24.2%), similar to findings from previous studies by Ohaegbulam et al. (33.9%), Adeolu et al. (23.3%) and Bordignon and Arruda (25.1%).[6,8,9] Since the third and fourth decade age group are income generating working class people who work outdoors, making them more susceptible to accidents and assault. Lesser number of cases are seen in elderly population as they are less involved in outdoor activity making them less prone to accident and assault.

Most of our patients were male in their thirties (34.6+-19.7, M:f 2.1:1). Findings are consistent with the observed pattern in other studies done by Bordignon and Arruda(30.8 ± 19 years; M:F 2:1) and Obajimi et al.(M:F 5:3).[9,10] The higher number of male patients is likely due to be males being involved more in outdoor works and morenumber of male drivers compared to female.

Road traffic accident was the most common cause of head injury in reports by Obajimi et al.(43.9%) and Adeolu et al.(73.4%).[10,8] The present study matches these findings as RTA was the most common cause of head injury in 44.6% of cases in our study. The large number of head injury caused by RTA is due to use of large number of old unmaintained vehicles, poor road conditions in hilly areas, drinking while driving and speeding.[11,12]

Most of our patients presented with alterered sensorium (39.2%), external injury (20.3%) and vomiting (20.1%). Our findings are consistent with study by Ahmad et al. and Bhandari et al. where they reported altered sensorium (54.75% & 66.7%) as most common clinical presentations followed by vomiting (49.5% & 46.3%).[13,14]

Most of our patients had minor head injury (70.9%) with high GCS (13 or more). Similar findings were observed in study carried out by Bhandari et al. where mild GCS score was noted in 77% of cases of head injury.[14]

In our study, scalp injury (24%), skull fractures (19.8%) and cerebral contusions (17.1%) were among the common CT findings while diffuse cerebral edema (1.9%), diffuse axonal injury(0.9%) and intraventricular hemorrhage (1.1%) were relatively uncommon. In study

done by Ahmad et al. in patient with head trauma in Eastern part of Nepal, skull fracture (42%) was the most common injury followed by cerebral contusion (32.8%) while subdural hematoma was the least common (14%).[13] In another study done by Akanji et al. in Nigeria and Bhandari et al. in Eastern region of Nepal , contusion was the most common injury (53%) followed by skull fracture (52%) while least common injury was diffuse axonal injury(5%).[14,15] Lesser number of cases of diffuse axonal injury in our case and other studies is likely due to poor sensitivity of CT in detecting non hemorrhagic lesion of axonal injury.

The likelihood of injury on CT correlated inversely with the GCS in studies done by Komolafe et al. and Sanei Taheri et al. which was also seen in our study in which we found negative CT scan findings in 67.6% patients who presented with minor GCS score, while positive findings were seen in 100% of cases with severe GCS score.[16,17] In a study by Morgado et al. and Akanji et al., there was a clear association between incidence of positive CT scan findings and GCS ($p<0.01$).[18] Similar finding was also noted in our study with p value <0.01

In our study, patients were more likely to have a positive CT finding, if the injury was sustained from RTA (59.7%) and fall from height (46.7%), while there was less likelihood of a positive finding if the cause of injury was from physical assault (28.2%). Similar finding was noted by Akanji et al whose study showed more positive CT findings in cases of RTA (73.6%) followed by assault (50%) and fall (47.8%).[15]Significant statistical association of RTA ($P<0.001$) and physical assault ($p<0.001$) with positive CT finding was noted in our study but no association was noted in case of fall from height ($p=0.533$). In a study conducted by Alharthy et al., no statistically significant association was noted between different mechanism of injury and CT findings.[19]

There were few limitations in our study. The time interval between trauma and clinical evaluation as well as time of CT scan after trauma were not taken into account which can have significant bearing on CT findings. Similarly all cases of head trauma were included in our study not excluding patients with normal CT findings and patients with high GCS. There by many normal cases were included in our study which can alter our results and statistical analysis.

CONCLUSIONS

In conclusion, road traffic accident is the most common mode of head injury in young adults patients presenting in our hospital and GCS can be considered as an important clinical marker for predicting positive CT findings. Also CT is an important initial investigation to evaluate the various cranio cerebral injury in trauma patients.

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