ORIGINAL RESEARCH ARTICLE

Role of CT in Head Trauma

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DOI: http://dx.doi.org/10.21276/ijcmsr.2020.5.1.52

How to cite this article: Ameya Radheshyam Rathi, Pramod Shaha, Amol Bhoite, Namita Narkhede, Sandeep Immadisetty. Role of CT in head trauma. International Journal of Contemporary Medicine Surgery and Radiology. 2020;5(1):A239-A242.

A B S T R A C T

Introduction: Head injury causes more deaths and disability than any other neurologic condition and occurs in >70% of accidents, which is the leading cause of death. The aim of the present study was to evaluate and assess the role of computedtomography in patients with head trauma and to study the various cranio-cerebral changes that occur in trauma to head with aid of CT.

Material and methods: The study comprised of a prospective analysis of 100 patients with Cranio –cerebral trauma using computed tomography who were treated at our institution from November 2017 To April 2019. Findings of the computed tomography using Helical CT scanner, Siemens Machine were computed and compiled.

Results: The study revealed that males were commonly affected (70%). Most of the patients were in age group of 21-30 years (29%).Patients with severe head injury on GCS scoring formed the bulk of the study (44%). Cerebral edema was the most common intracranial lesion observed (45%). Subdural hemorrhage was more common of all intracranial hemorrhages noted (39%). Patients with a Glasgow coma scale of <8 had the highest mortality (40.90%).

Conclusion: Computed tomography is one of the comprehensive diagnostic modality for accurate localization of the site of injury in acute Cranio – cerebral trauma. The early and timely diagnosis of the precise lesion by CT not only had substantial impact over instituting appropriate treatment and timely surgical intervention but also helped in predicting the ultimate outcome.

Keywords: Head Trauma, Computed Tomography, Fractures, Epidural Hematomas, Subdural Hematomas, Contusions, Glasgow Coma Scale

INTRODUCTION

Head injuries due to road traffic accidents (RTA) have become a daily occurrence taking an increased toll on human lives and limbs. Most of these patients are in their prime (third & fourth decade of life) and therefore have a direct social and economic effect besides the emotional burden of suffering a lifelong debilitating loss of function.

Immediate and instantaneous death following cranial trauma occurs due to unpreventable primary brain injuries. However, death occurring within 24hrs of craniocerebral trauma can be averted by timely institution of diagnostic and therapeutic measures that could prevent secondary braininsults.

Previously, the mainstay of diagnosis of intracranial traumatic lesions was at best clinical evaluation, plain roentgenograms of skull and cerebral angiography. An accurate diagnosis cannot be made on the basis of physical examination alone except on rare occasion. In addition a detailed examination cannot be performed when patients condition is rapidly deteriorating Plain roentgenograms and angiography suffer from lack of sensitivity and specificity. Angiography in addition is hazardous invasive procedure on a patient already having potential brain damage.

Sir Godfrey Housfield described CT in 1973 and thereby spawned an imaging revolution[1]

Prompt recognition of treatable injuries is critical to reduce mortality and CT of the head is the cornerstone for rapid diagnosis.[2] Follow up assessment using CT is frequently necessary to detect progression and stability of lesions and evidence of delayed complications and sequelae of cerebral injury, which can determine whether surgical intervention is necessary.

CT is the single most informative diagnostic modality in the evaluation of a patient with a head injury. Besides facilitating rapid implementation it can demonstrate significant primary traumatic injuries including extradural, Subdural, intracerebral haematomas, subarachnoid and intraventricular haemorrhages, skull fractures, cerebral oedema, contusions and cerebral herniations. The present day scanners, due to refined technology, can further help in diagnosing diffuse axonal injuries which were never thought before.

Computed Tomography is widely available, rapid, permits close monitoring of unstable patients, compatible with

ISSN (Online): 2565-4810; (Print): 2565-4802 | ICV 2018: 86.41 |

respirators and other mechanical support devices and can be used with patients whose medical and occupational histories are not available. It is very sensitive in detecting acute hematomas and depressed fractures that require emergency surgery. However Computed Tomography is less sensitive in detecting white matter injuries and posterior fossa lesions due to beam hardening artifacts, from the surrounding bones. Moreover CT aids in surgical planning, prognosticating outcome and recovery time.

This study attempts to assess the utility of CT in the diagnosis, management and prognosis of patients with cerebral trauma with the objectives to evaluate the role of computed tomography in patients with head trauma, to describe various spectrums of hemorrhages those occur in head trauma with aid to CT and to evaluate the value of early CT imaging with GCS values & the patient prognosis.

MATERIAL AND METHODS

The present study was carried out in patients with head trauma, referred to Krishna hospital, Krishna institute of medical sciences, Karad, in the Department of Radio-diagnosis during a period from November 2017 To April 2019.

Sample Size

The study comprised a total of one hundred patients with head injury referred to Krishna hospital,Karad.

Inclusion Criteria

1. Patients of all age groups with head trauma.
2. Head trauma that has occurred within 24 hours.
3. Patients with head trauma treated as in-patients.

Exclusion Criteria

1. Cranial trauma during childbirth.
2. Patients with non traumatic intracranial bleed.

Plan of study

A complete clinical history of the patients was noted on proforma, which included, age sex, type of injury. The type of trauma was further classified into Road traffic accidents, Falls, Assaults, industrial accidents and miscellaneous. Follow up of Patients during their hospital stay was performed.

After initial resuscitation, severity of the craniocerebral injury was graded with the help of "Glasgow Coma Scale" (GCS).

CT protocol

Patients were examined with CT scanner in the supine position. Proper immobilization and positioning of head was achieved in all patients. Bone algorithms & wide window settings were studied to visualise the various craniocerebral changes (fig-1,2).

STATISTICAL ANALYSIS

Rates, ratios and percentages of different diagnosis and outcome made by Computed tomography will be computed and compiled with the help of SPSS (version 20) software. Chi square test will be used for comparison of CT findings of different variables and P value will be calculated.

RESULTS

A total of hundred patients of sustained head trauma with positive findings on CT scan were included in the present study.

Out of 100, 70 patients were male and 30 were female.Male population dominated the study with 70% of patients being male and 30% being female.(Sex ratio M:F = 2.3:1) (table 1)

In the present study, the peak incidence of head injury in males occurred in the age group of 21-30 i.e. 21 patients. Incidence in males in other age groups being 9 patients in 0-10, 11 in 11-20, 17 in 31-40, 5 in 41-50, 3 in 51-60 and 04in patients aged above 61 years of age (table 1)

In females also the peak incidence occurred in 21-30 age group i.e. 8 patients. The other age groups being 04 in 0-10, 04 in 11-20, 04 in 31-40,02 in 41-50, 05 in 51-60 and 03 in patients above 61 years (table 1)

In the present study contusions of brain were the commonest intracranial lesion noted in 43% patients and fractures were the commonest of all lesions accounting for 65% cases. Other lesions which were seen on CT scan are Cerebral edema (45%), Midline shift (37%), Subdural hematoma (39%), Extradural hematoma (32%), Intracerebral hematoma (21%), Subarachnoid hemorrhage (20%), Intraventricular hemorrhage (3%) and pneumocephalus

Age group (years)	Male	Female	Total
0 – 10	9	4	13
11 – 20	11	4	15
21 – 30	21	8	29
31 – 40	17	4	21
41 – 50	5	2	7
51 – 60	3	5	8
>61	4	3	7
Total	70	30	100

Table-1: Sex wise and age wise Distribution in head trauma

Lesions	Cases / Percentage
Contusions	43
Cerebral Edema	45
Midline Shift	37
Subdural Hematoma	39
Extradural Hematoma	32
Intra Cerebral Hematoma	21
Subarachnoid Hemorrhage	20
Intraventricular Hemorrhage	03
SDH+EDH	15
SDH+Contusion	20
SDH+Contusion+SAH	16
Pneumocephalus	12

Table-2: Incidence of Various Lesions as Observed on CT Scan

Glasgow Coma Score	No. of cases	Death	Percent
<8	44	18	40.90
9 – 12	26	5	19.23
13 – 14	30	1	3.33
X^2=25.49 and p<0.001, which shows that the relationship is significant.			

Table-3: Mortality on basis of GCS

Figure-1: Axial CT Section in 26 year old man with history of RTA showing Hemorrhagic contusion in left temporal lobe

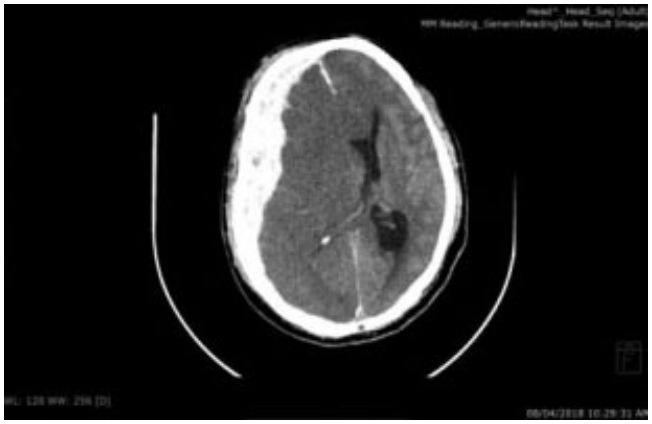

Figure-2: Axial CT Section in 40 year old man with history of RTA showing Subdural hemorrhage along right frontoparietal convexity with midline shift to left (~12.7mm).

(12%) & fractures(65%). SDH+EDH accounted for 15%, SDH+Contusion-20%, SDH+Contusion+SAH-16%. (table 2)

According to the study, cases with severe head injury with GCS score of <8 were the commonest accounting for 44% of all cases followed by cases with mild head injury with GCS score of 13-14 accounting for 30% cases and with moderate head injury were least common accounting for 26% (table 3).

According to the study, poor outcome was noted with a GCS score of <8.Patients with GCS score of <8 had a mortality of 40.90% followed by 19.23% in patients with GCS of 9-12 and 3.33% in patients with 13-14 GCS score. Only 1 case out of 30 with GCS 13-14 category expired likely due to patient suffered other body parts injuries. Outcome is therefore poor with low GCS score (table 3).

DISCUSSION

Males were found to be more predominant than females in the present study. Incidence reported in other studies were Kalsbeck[3] 59%, Zimmermann et al[4] 79%, James F Holmes et al[5] 65%, Masih Saboori et al[6] 78.2%. This male predominance is because males move out of their homes more frequently and are more actively working outdoors than females.

In the present study patients in the age group of 21-30 years formed the bulk of the study. Study by Ogunseyinde AO et al[7] also stated that head injury was common in patients younger than 35 yrs. Fary Khan et al[8] (2003) in their study mentioned that peak incidence of traumatic brain injuries were between 15-35 years age group and Masih Saboori et al[6] (2007) reported a mean age of 29yrs for patients of head injury. By the studies it is noted that head injury is seen commonly in socially and economically productive age group of the population and hence has an impact on the financial aspect of the family.

In the present study, patients classified as severe head injury with a GCS score of <8 formed the bulk of the study accounting for 44% followed by 30% of patients with mild head injury with GCS score of 13-14. This increase in incidence of severe head injury seen is probably due to exclusion of patients with normal CT findings in the present study conducted.

Contusion and cerebral oedema was found to be the commonest intracranial lesion detected on CT accounting for 43% and 45%, respectively in the present study. Dublin[9] also reported similar observation (40%).

Subdural hematoma was found to the commonest type of hemorrhage noted accounting for 39% in the present study. Incidence reported in other studies were Masih Saboori et al[6] (34.7%), Ogunseyinde AO et al[4](28.7%).

Intracerebral bleed accounted for 21% of lesions in the present study, whereas a slightly higher incidence of 26.3% was noted in the study conducted by Ogunseyinde AO et al.[7]

Intraventricular hemorrhage was the least common lesion noted with an incidence of 3% in the present study. Le Roux PD et al[10](1992) and Lee J.P et al[11] (1991) in their studies had stated that IVH is noted in 1% to 5% of all patients with head injury. Traumatic IVH is thus relatively uncommon and usually reflects severeinjury.

In the present study, poor outcome was noted with a GCS score of <8 with a mortality of 40.9% followed by 19.23% in patients with GCS of 9-12 and 3.33% in patients with 13-14 GCS score. Study conducted by Gordon Stuart et al[12] reported an incidence of 34.50% mortality with a GCS score of <8.

CONCLUSION

Head injury causes more deaths and disability than any other neurologic condition before age 40 and is most commonly caused by road traffic accidents. Males are worst affected due to head injuries.

Management of brain injury can be done by neuroimaging techniques which can provide some of the most important diagnostic, prognostic, and pathophysiological information. Imaging modalities can help assess intracranial hemorrhage, fractures, and other structural lesions. Beside the correct diagnosis itself the time to establish a diagnosis above all has a crucial impact on successful management and good outcome of these patients.

Computed tomography is a simple, inexpensive, highly effective and safe imaging modality and provides the ability to rapidly evaluate patients with acute head injuries.

CT aids in surgical planning, prognosticating outcome and recovery time. It can demonstrate significant primary traumatic injuries including extradural, subdural,

ISSN (Online): 2565-4810; (Print): 2565-4802 | ICV 2018: 86.41 |

intracerebral haematomas, subarachnoid and intraventricular haemorrhages, skull fractures, cerebral oedema, contusions and cerebral herniations. CT is one of the most comprehensive diagnostic modality for accurate localization of the site of injury in trauma tohead.

Thus it is justifiable to conclude that CT is and should be considered the first imaging of choice in acute head injury as it forms the cornerstone for rapid and effective diagnosis.

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Source of Support: Nil; **Conflict of Interest:** None

Submitted: 14-01-2020; **Accepted:** 16-02-2020; **Published online**: 21-03-2020