Assessments of Role of CT scan in Patients with Cranio- Cerebral Trauma

Tilak Chandrapal[1*], Eranna R. Palled[2#]

[1]Associate professor, Department of Radio diagnosis, Srinivas Institute of Medical Sciences and Research Centre, Srinivasnagar, Suratkal, Mangalore, Karnataka, INDIA.

[2]Assistant Professor, Department of Radio diagnosis, Belgaum Institute of Medical Sciences Belgaum 590001 Karnataka, INDIA.

Corresponding Addresses:

[*] tilakcp@yahoo.co.uk, [#]drpalled_eranna@yahoo.com

Research Article

Abstract: **Introduction:** Head injuries caused or contributed to death in most trauma fatalities. The primary goal of imaging the trauma patient is to quickly and accurately identify treatable lesions before secondary injury to the brain occurs. Computed Tomography (CT) is ideally suited to evaluate patients immediately after trauma. **Materials and methods:** 100 patients of cranio cerebral trauma were selected and various factors associated with cranio-cerebral trauma were recorded. CT scan findings of these patients were recorded. Types of skull fractures were recorded. **Results:** 92% patients showed abnormal findings on CT scan. Contusion (57.6%) was the most common finding observed on CT scan. Linear fracture was observed in 60.8%. **Conclusion:** CT scan is one of the most comprehensive diagnostic modality for accurate localization of the site of injury in cranio-cerebral trauma.

Keywords: cranio cerebral trauma, CT scan, contusion, linear fracture.

Introduction

The invention of Computed Tomography by G. N. Hounsfield in 1973, revolutionized the management of patients with acute cranio-cerebral trauma.[1, 2] Trauma is a major health problem and is a leading cause of death in the age group 1 - 45 years. Head injuries caused or contributed to death in most trauma fatalities.[3] Head trauma causes a spectrum of brain injuries ranging from transient physiological dysfunction, manifested by short periods of confusion and amnesia to severe immediate irrerversible neuronal damage and death. The primary goal of imaging the trauma patient is to quickly and accurately identify treatable lesions before secondary injury to the brain occurs. Computed Tomography (CT) is ideally suited to evaluate patients immediately after trauma. Since its advent, Computed Tomography has made significant contributions to the care and survival of trauma patients. Magnetic Resource Imaging is useful to assess patients who are stable but neurologically impaired in the days to months after trauma. Computed Tomography is widely available, and rapid, permits close monitoring of unstable patients, is compatible with 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. Thus the present study was undertaken to assess the role of CT scan findings in patients of Cranio cerebral trauma (head injury).

Objectives

To evaluate and assess the role of computed tomography in patients with Cranio-cerebral trauma.

Material and Methods

Study design

Present cross-sectional study was conducted at K.L.E. Society's Hospital and Medical Research Centre, Belgaum. Patients with craniocerebral trauma hospitalized in surgical wards of this hospital were selected for the study. Following inclusion and exclusion criterion was used to select the study population.

Inclusion Criteria

All cases referred for C. T. scan with cranio-cerebral trauma amongst the admitted patients at K.L.E.S. Hospital and M.R.C., Belgaum

Exclusion Criteria

1. Known hypertensive and diabetic patients receiving anti-coagulant drugs
2. Patients with known bleeding disorders
3. Patients with history of previous cerebro-vascular accidents.
4. Patients having major injuries like liver and splenic rupture and flail chest.

With reference to above inclusion and exclusion criterion total hundred patients were selected for the study. A complete clinical history of the patients was taken on pretested and pre-structured proforma, which included, age sex, type of injury, principal presenting complaints. The type of trauma was further classified into Road traffic accidents, fall, Assaults, industrial accidents and miscellaneous. This was followed by general physical examination and detailed examination of the central

nervous system. Injuries involving the other systems of the body were also noted.

CT protocol:

After the examination of the cervical spine for any evidence of injury, the patients were examined with CT scanner in the supine position. The Gantry tilt was given in the range of ± 0-25 degrees, so as to parallel the scan plane to the orbito-meatal line. Contiguous axial sections of slice thickness 4 mm and 8 mm in the early part of the study and 5 mm and 10 mm in the later part of the study were taken in the posterior fossa and the supratentorial region respectively. Thinner sections were also obtained in the region of interest. Whenever indicated, contrast enhanced CT scans were performed using 50-60 ml. of iodinated, ionic water soluble contrast media. In cases of allergic reactions to contrast media, intravenous antihistamines and steroids were administered.Bone algorithms with wide window settings were studied to visualise any fractures of the skull. The Computed Tomography findings in patients with cranio-cerebral trauma were noted.

Results

Table 1: Age-wise and Sex-wise distribution in cranio-cerebral injuries

Age (in years)	Male		Female		Total no of Cases
	Cases	%	Cases	%	
0-20	13	15.29	05	33.34	18
21-30	28	32.94	06	40.00	34
31-40	18	21.17	02	13.33	20
41-50	15	17.64	02	13.33	17
51-60	06	07.08	00	00	06
> 61	05	05.88	00	00	05
TOTAL	85	100.00	15	100.00	100

In the present study it was observed that 85% of craniocerebral trauma occurred in male population. It was observed that younger age group i.e. up to 40 years (72%) was suffering more commonly from craniocerebral trauma as compared to older patients (28%). Similar pattern was observed in male and female also.

Table 2: Incidence of different modes of injury

Type of injury	No. of cases	Percentage
Road traffic accident	63	63.00
Fall	33	33.00
Assault	01	01.00
Others	03	03.00
Total	100	100.00

While studying various causes for craniocerebral trauma it was observed that road traffic accidents (63%) was the most common cause.

Table 3: Frequency of abnormal and normal CT scans in cranio-cerebral injuries

Normal CT scans		Abnormal CT scans		Total no. of Cases
Cases	Percentage	Cases	Percentage	
08	08.00	92	92.00	100

In the present study 08 patients showed normal CT scans whereas 92 patients showed abnormality in CT scan.

Table 4: CT scan finding in patients of cranio cerebral injury

Lesions	Cases	Percentage
Contusions	53	57.60
Cerebral Edema	45	48.90
Mass Effect	26	28.20
Subdural Hematoma	20	21.70
Extradural Hematoma	19	20.60
Intra cerebral Hematoma	17	17.00
Subarachnoid Hemorrhage	12	13.00
Intraventricular Hemorrhage	10	10.80
Pneumocephalus	06	06.52
Fractures	51	55.40

* Multiple responses were obtained.

It was observed that contusion (57.6%) was the most common finding on CT scan of craniocerebral trauma patients in the study. It was followed by fractures (55.40%), cerebral edema (48.9%).

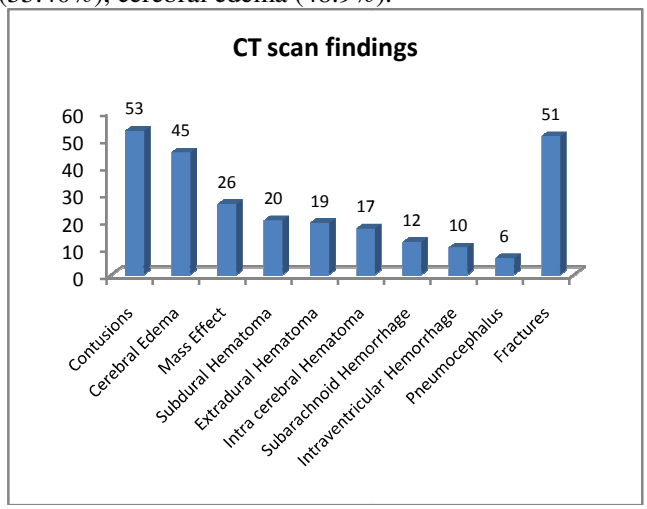

Table 5: Incidence of the types of fractures as observed on CT scan

Type of fracture	No. of cases	Percentage
Linear	31	60.80%
Depressed	10	19.60%
Skull Base	10	19.60%
TOTAL	51	100.00

Out of total 51 patients showing fractures on CT scan 31 has linear type of fracture followed by depressed fracture and fracture at skull base (10 each).

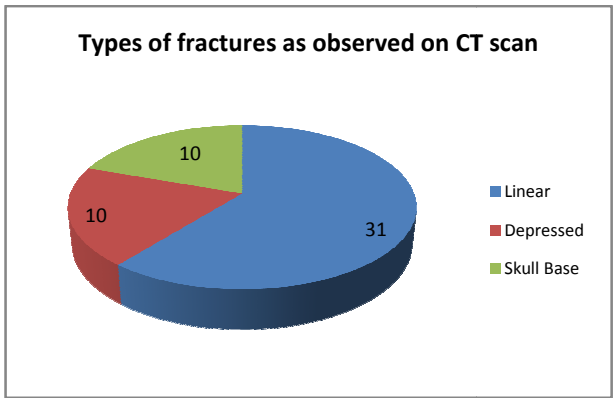

Table 5: Lesions percentages in the patients who expired

Lesion	Percentage
Subdural Hematoma	40%
Mass Effect	38%
Cerebral Edema	27%
Contusions	24%
Fracture	18%
Extradural Hematoma	10%

In the present study amongst the 100 patients 21 patients expired. The commonest lesion in the patients who expired was subdural hematoma in (40.00%) followed by mass effect (38.00%), cerebral edema (27.00%), contusion (24.00%) fractures (18.00%) and extradural hematoma (10.00%).

Discussion

The present cross-sectional study was conducted at K.L.E. Society's Hospital and Medical Research Centre, Belgaum. It was observed that majority of the patients of cranio cerebral trauma were young male. Similar findings were reported by Kerr *et al* in England and by Kalsbeek and associates in the United States.[4] In a study conducted by Zimmerman R. A. (1978) showed that 79% male incidence as the males were exposed to more of outdoor work and led a more active life.[5] In the present study it was found that the incidence of RTA was high i.e., 63%. Whereas Lindell (1994) found the incidence of RTA was 20-50%.[6] This can be attributed to the reason that Belgaum is in close proximity to the National Highway and with rapid urbanization there is increase in the number of vehicles and population with more movement of people. It was observed that 92% patients with cranio- cerebral trauma showed abnormal findings on CT scan. Whereas only 8% showed normal CT scan reports. Similar findings were observed by Genarelli *et al*.[7] All patients in the study were undergone CT scan and their findings were studied. It was observed that contusion was the one of the most commonly seen lesion (57.6%) followed by fractures (55.4%) and cerebral edema (48.9%). Dublin also reported similar phenomenon in his study.[8] On CT scan various fractures of skull were observed. It was seen that linear fracture was the most common type followed by depressed fracture (60.8%) and fracture at skull base (19.6% each). Linear fractures of the skull vault can be appreciated on plain X-ray of skull. But basal fractures are difficult to appreciate. In a study conducted by Zimmerman and associates, the plain X-ray failed to appreciate fracture in 4 patients, 3 of which had basal fractures.[5] In the present study plain X-ray skull did not show basal fractures in 9 patients. However in one patient petrous temporal bone fracture extending as hairline fracture in to the parietal bone was seen. Thus Computed Tomography was found to be more sensitive in detecting basal skull fracture which were not detected on routine plain X-ray skull. In the present study the common lesion in the patients who expired was subdural hematoma seen in 40% of them. This is consistent with the results of Cooper PR, who showed the mortality due to subdural hematoma being 35% to 50%[9]. Zimmerman R (1997) concluded that, significant predictors of outcome on CT scan are intra cerebral hemorrhage, extradural hematoma, intraventricular hemorrhage, subdural hematoma and presence of subarachonoid hemorrhage. Site of intracerebral hemorrhage, volume of extradural hematoma, subdural hematoma, midline shift of more than 3 mm, compressed or absent perimesencephalic cisterns. [10]

Conclusion

We can conclude that incidence of cranio cerebral trauma was more in male and in younger age group. The major mode of injury for cranio cerebral trauma was road traffic accidents. Most of the patients with cranio-cerebral trauma shows abnormal CT findings and Contusion was the most common lesions. Linear fractures were found to be the common type of skull fractures. Computed Tomography was found to be more sensitive in detecting basal skull fracture which were not detected on routine plain X-ray skull. . Subdural hematoma was the commonest cause of morbidity and mortality in cranio-cerebral trauma.

Figure 1: Axial NECT in a patient with trauma shows HEMORRHAGIC CONTUSION (Arrow) in the right Frontal region with minimal SAH

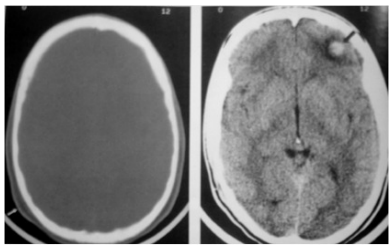

Figure 2: Axial NECT in a patient with trauma shows minimal soft tissue contusion in the right occipital region and CONTRECOUP injury in the left frontal region

References

1. Ambrose J. Computerised transverse axial scanning (Tomography): Clinical Approach. Brit. J. Radiol. 1974; 46: 679-95.
2. Hounsfield. GN. Computerised transverse axial scanning (Tomography): Description of System. Brit. J. Radiol 1973; 16: 1016-22.
3. Hryshko FG, Deeb ZL. Computerized tomography in acute head injuries. J. Comput. Assist. Tomogr. 1983; 7: 331-44.
4. Kalsbeek WD, McLaurin RL, Harris BSH, Miller JD. The national head and spinal cord injury survey: Major findings. J. of Neuro. Surg. 1980; 53: 519-31.
5. Zimmerman RA, Bilaniuk LT, Genneralli T, Bruce D, Dolinskas C, Uzzell B. Cranial C.T. in the diagnosis and management of acute head trauma. A. J. R. 1978; 131: 27-34
6. Gentry LR. Imaging of closed head injury. R.S.N.A. 1994; 191: 1-17.
7. Genarelli TA, Spielman GM, Langfitt TW. Influence of the type of intracranial region on outcome from severe head injury. J. Neuro Surg. 1982; 56: 26-36.
8. French AN, Limitations and pitfalls of computed tomography in the evaluation of craniocerebral injury. Surg. Neurol. 1978; 10: 395-401.
9. Cooper PR. Head Injury: Post traumatic intra cranial mass lesions. 2nd Ed. Baltimore MD: Williams and Wilkins; 1987.
10. Zimmerman R, Gibby WA, Carmody RF. Neuroimaging clinical and physical principles: Cranio-cerebral trauma. New York: Springer Verlag. 1999.