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Original Research Article

A study on various spectrum of hemorrhages that occur in patients with craniocerebral trauma with Aid to CT

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Abstract

Computed Tomography is widely available, rapid, permits close monitoring of unstable patients, 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. The study comprised a total of one hundred and fifty patients (150) with head injury admitted to Teaching and General Hospital. According to the present study, intracerebral haematoma (58%) was the most common lesion noted in patients who expired followed by subdural haemorrhage 46%. Extradural haemorrhage 7.50% was the least common lesion noted in these patients.

Keywords: Hemorrhages, craniocerebral trauma, CT

Introduction

The knowledge of pathophysiology and mechanisms involved in trauma provides an insight to the response of body to injury and this knowledge in turn forms a framework for logical therapy. Head injury as a term is used to encompass all injuries to the scalp calvarium and brain. Understanding the mechanisms underlying brain trauma, their basic pathology, and their imaging manifestations is therefore essential for the practicing radiologist [1].
The magnitude and distribution of a traumatic brain lesion depends on the shape of the object causing trauma, the force of impact and whether the head is in motion at the time of injury. Finally the total injury produced by impact depends not only on the mechanical damage but also on the complex interaction of pathophysiological events that follow [2].
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 hemorrhages, 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. Contribution of CT is crucial to complete injury assessment and forms the basis of patient management [3].

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

MRI is not well suited to assess acutely injured patients. MRI requires more time to perform than Computed Tomography and is more susceptible to patient motion artifacts. The lack of signal from the bone and the relative inability to differentiate fresh haemorrhage from normal brain, impairs MRI's ability to detect fractures and acute haematomas, thereby limits its usefulness in acute head trauma. However MRI is more sensitive in detecting white matter injuries as well as imaging brainstem and posterior fossa lesions [4].

Methodology

Source of data

The present study was carried out in patients with craniocerebral injury, referred to Teaching and General Hospital, in the Department of Radio-diagnosis.

Sample size

The study comprised a total of one hundred and fifty patients (150) with head injury admitted to Teaching and General Hospital.

Inclusion criteria

1. Patients of all age groups with craniocerebral injury.
2. Craniocerebral injury that has occurred within 24 hours.
3. Glasgow coma scale < 14.
4. Patients with craniocerebral injury treated as in-patients.

Exclusion criteria

1. Patients with craniocerebral trauma with no positive CT findings
2. Cranial trauma during childbirth.
3. Glasgow coma scale >14.
4. Patients with non-traumatic intracranial bleed.
5. Patients who cannot be followed up.

Plan of study

A complete clinical history of the patients was noted on 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. 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).

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 ± 0-20 degrees, so as to parallel the scan plane to the orbitomeatal line.
Contiguous axial sections of slice thickness 5 mm were taken for the posterior fossa study and l0 mm in the supratentorial region respectively. Thinner sections were also obtained in the region of interest.
Bone algorithms & wide window settings were studied to visualise the various craniocerebral changes.

Results

Table 1: Incidence of Various Lesions as Observed on CT scan

Lesions	Cases	Percentage
Contusions	66	44.00
Cerebral Edema	65	43.30
Midline Shift	59	39.9
Subdural Hematoma	58	38.6
Extradural Hematoma	43	29.0
Intra Cerebral Hematoma	28	19.3
Subarachnoid Hemorrhage	36	24.0
Intraventricular Hemorrhage	06	4.0
Pneumocephalus	27	18.0
Fractures	93	61.0

In the present study contusions of brain were the commonest intracranial lesion noted in 66 patients (44.00%) and fractures were the commonest of all lesions accounting for 93 cases (61%). Other lesions which were seen ORI CT scan are Cerebral edema 65 (43.30%), Midline shift 59 (39.9%), Subdural hematoma 58 (38.6%), Extradural hematoma 43 (29%), Intracerebral hematoma 28 (19.3%), Subarachnoid hemorrhage 36 (24%) and Intraventricular hemorrhage 06 (4%) and pneumocephalus 27 (18%).

Table 2: Association of overlying fracture with extradural haemorrhage

EDH	Number of Patients	Percentage
EDH with fracture	40	93.02
EDH without fracture	3	6.98
Total	43	100.00

According to the study, out of 43 patients with extradural haemorrhage, 40 patients had an overlying fracture associated.

Table 3: Incidence of various hemorrhages in patients who expired

Hematomas	Percentage
EDH	7.50
SDH	46.0
ICH	58.0

According to the present study, intracerebral haematoma (58%) was the most common lesion noted in patients who expired followed by subdural haemorrhage 46%. Extradural haemorrhage 7.50% was the least common lesion noted in these patients.

Table 4: Mortality on basis of GCS

Glasgow Coma Score	No. of cases	Death	Percent
<8	62	30	48.38
9 - 12	40	9	22.5
13- 14	48	1	2.08

According to the study, poor outcome was noted with a GCS score of <8. Patients with GCS score of <8 had a mortality of 48.38% followed by 22.5% in patients with GCS of 9-12 and 2.08% in patients with 13-14 GCS score. Outcome is therefore poor with low GCS score. x; 2=25.49 and p<0.001, which shows that the relationship is significant.

Discussion

In the present study, out of 93 fractures totally detected on CT, 24 (25.8%) were missed on plain radiograph. CT was a better imaging modality for detection of fractures including the detection of skull base fractures.

In the present study, patients classified as severe head injury with a GCS score of <8 formed the bulk of the study accounting for 41.3 followed by 32% 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.

Many studies were conducted to predict the usefu1ness of CT scan in a patient with minor head injury. In this respect Dr Proflan G Steill *et al.* [5] came up with the Canadian CT head rule which consists of five high risk factors which are

1. Failure to reach GCS of 15 within 2 hours,
2. Suspected open skull fracture,
3. Any sign of basal skull fracture,
4. Vomiting episodes,
5. Age equal/more than 65 years and two additional medium-risk factors (amnesia before impact >30 min and dangerous mechanism of injury).

The high-risk factors were 100% sensitive and medium-risk factors were 98.4% sensitive for predicting clinically important brain injury.

Contusion was found to be the commonest intracranial lesion detected on CT accounting for 44% in the present study. Dublin also reported similar observation (40%).

Subdural hematoma was found to the commonest type of hemorrhage noted accounting for 38.6% in the present study. Incidence reported in other studies were Masih Saboori *et al.* [6] (34.7%), and Ogunseyinde AO *et al.* [7] (28.7%).

Intracerebral bleed accounted for 14.3% 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]

Intraventricu1ar hemorrhage was the least common lesion noted with an incidence of 4% in the present study. Le Roux PD *et al.* [8] (1992) and Lee J.P *et al.* [9] (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 reflect s severe injury.

Extradural hematoma was found to be associated with an overlying fracture in 93.02% of cases in the present study. Gun reported 100% association of EDH with an overlying fracture. A blow to the calvarium resulting in fracture of the adjacent bone causes displacement of dura away from the inner table of skull result ING in damage to underlying vessel thus causing extradural hematoma.

The commonest hemorrhage found in patients who expired was intracranial hemorrhage with an incidence of 58%. This can be attributed to the more severe impact of trauma to cause the hemorrhage and also the significant midline shift noted in these patients leading to a grave prognosis.

Subdural hematoma was seen in 46% of patients who expired. Cooper *et al.* [10] in his study stated that mortality due to subdural hematoma was 35% to 50%. SDH is also associated with worse outcome because it generally is caused by high velocity injuries resulting in more primary brain injury.

EDH was seen in only 7.5% of patients who expired. Bricolo A.P *et al.* [11] and Smith HK *et al.* [12] in their studies stated that mortality with EDH is approximately 5%. Since EDH is usually associated with low velocity injury, it results in little primary injury to brain and causes poor outcome only if the expanding hematoma is allowed to compress the brain.

In the present study, poor outcome was noted with a GCS score of <8 with a mortality of 48.38% followed by 22.5% in patients with GCS of 9-12 and 2.08% in patients with 13-14 GCS score. Study conducted by Gordon Stuart *et al.* [13] reported an incidence of 34.50% mortality with a GCS score of <8. This increased mortality in a patient with a reduced GCS score is prob4bly due to more severe primary brain insult associated.

Preoperative decompression was carried out in 6 patients with extradural hematoma. All operated patients had good recovery. Traumatic extradural hematoma is a neurosurgical emergency and timely surgical intervention for significant extradural hematoma is gold standard as stated by Phoebe S.Y *et al.* [14] (2007) in their study. Liu JT *et al.* [15] (2006) also mentioned in their study that burr hole evacuation followed by drainage under negative pressure is a safe and effective method or emergency management of a pure traumatic epidural hematoma [16].

Conclusion

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, intracerebral haematomas, subarachnoid and intraventricular hemorrhages, 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 to head.

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