ROLE OF CT SCAN IN ORBITAL INJURY- A COMPARATIVE STUDY WITH X-RAY FILM OF SKULL IN SOUTHERN PART OF ODISHA

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ABSTRACT

BACKGROUND

CT scan imaging is an important tool in the assessment of orbital injury and detecting the orbital bony fracture. To achieve the best possible result, diagnosis and treatment of orbital bone injury must be accurate, thorough and prompt.

MATERIALS AND METHODS

Retrospective study of 50 patients of head injuries were studied for 2 years who had admitted to M.K.C.G Medical College, Berhampur, Odisha. CT scan film was studied who had earlier done x-ray film for head injury. In our study, penetrative injury to eyeball was excluded.

RESULTS

Study of 50 head injury patient showed males are 78% and females 22% having male and female ratio 3.5:1. 30 patients were in between 20-40 years on CT scan report says there is 21 number of fracture skull, intracerebral haematoma in 20 patients, brain contusion in 18 patients, 11 patients had cerebral oedema, subdural haematoma present in 9 patients and 5 patients had extradural haematoma.

CONCLUSION

CT scan is an effective method of imaging to detect head injury pathologies and deciding for the early treatment and preventing any complication.

KEYWORDS

Computed Tomography, X-Ray Skull, Orbital Fracture.


BACKGROUND

Multiple trauma due to Road Traffic Accident (RTA) is main cause of head injury in young adults. Head injury causes sudden death in 25% of RTA. Orbital injuries are most commonly seen in skull fracture in road traffic accidents. However, the patients coming to casualty present as multiple injuries following RTA. Approximately, 20% of the patients with severe facial trauma injuries may have orbital injury. Skull fracture in the form of Lefort II and III leads to eyeball injury. Further orbital floor fracture commonly give rise to injury to the eyeball in the form of massive lid oedema and laceration, conjunctival tear, corneal rupture, scleral rupture, hyphaema in anterior chamber, lens dislocation or subluxation, vitreous haemorrhages and retinal detachment.¹ All these conditions finally may give rise to blindness if not treated at its earliest point of time.

As orbit is composed of seven facial bones- frontal, zygomatic, maxilla, lacrimal, ethmoid, sphenoid and palatine to protect the eyeball. The superior orbital ridge and upper medial orbital ridge are part of the frontal bone. The lateral orbital rim is part of zygomatic bone. The inferior and lower medial rims are part of the maxilla and the floor of orbit is made up the upper border of maxillary sinus. The medial rim separating the orbit from nares is the lacrimal bone. The medial wall and part of the posterior wall of the orbit are formed by the ethmoid bone. The remainder of the posterior of the orbit is formed by the 2 wings of the sphenoid bone, the continuation of the lacrimal bone from the medial wall and the orbital process of the palatine bone.

The optic nerve exits the optic foramen in the lesser wing of the sphenoid bone. The globe of the eye sits within the orbit surrounded by periorbital fat and the extraocular muscles that control its movement. The inferior orbital nerve courses through the maxilla in the orbital floor. The weakest
portion of the orbit is the thin orbital floor (maxilla) and the lamina papyracea (ethmoid bone) medial and inferiorly.

A study by Coon et al identified 4 indications for surgical indications for surgical intervention in paediatric patients with orbital fractures, it is only the direct blunt trauma damages the eye. However, the fracture of bony part commonly occurs to the medial and inferior wall, which are the thinnest of all. The direct blow may give rise to ‘sink’in or retraction of the globe. Orbital fractures causing entrapment of extraocular muscle giving rise to diplopia and entophthalmos, pain with chewing (trismus) or facial instability give rise a sufficient ground for surgical intervention. Floor fracture further may cause entrapment of V2 nerve giving rise to ‘white-eye.’

Most floor fracture patients need intervention within the first two weeks of injury, but some other surgeons wait for 4 to 6 months for repair. Before CT scan, one always go for x-ray skull or computed tomography is still recommended. Before CT scan, one always go for x-ray skull or computed tomography is still recommended.6

But, we must follow the National Institute for Health and Clinical Excellence (NICE) published guideline in CG 65- Head injury, triage assessment, investigation and early management for head injury.

**Ophthalmic evaluation**

1. 11-15% of orbital fractures are associated with ophthalmic emergencies, majority of which presented with loss of visual acuity or visual changes.
2. Sudden introduction of large volume of air into the orbit from the sinuses and nose with orbital fat acting as ball valve leading one way traffic for air entry causes increase in orbital pressure- a compartmental syndrome with optic nerve stroke.
3. Again traumatic optic neuropathy is seen in 0.5-5% of orbital trauma.

**Objective**

To detect orbital injury in head injury patients in road traffic accident, CT scan is better option than x-ray skull to prevent from inevitable blindness. The management of orbital trauma and fracture is essential to minimise and prevent early and late sequelae and complication. Early and effective intervention is required to prevent vision loss and to minimise late problems like diplopia and disfiguring globe malposition.

**MATERIALS AND METHODS**

Retrospective analysis of CT scan report was studied in 50 patients who were advised for x-ray film of skull admitted to the emergency department of our hospital, M.K.C.G. Medical College, Berhampur, Ganjam, Odisha. The study was conducted for two years from October 2015 to September 2017. We present the results of CT scan and x-ray film on the nature and location of the indemnified lesion.

**Inclusive Criteria**

1. Head injuries due to RTA.
2. Direct blunt trauma/blow to the face.

**Exclusive Criteria**

1. Any penetrating injury to eyeball.
3. Infants and children.

**RESULTS**

39 patients (78%) were males and 11 (22%) were females with M:F ratio 3.5:1. 30 patients were in age group 20-40 years and 15 patients are in age group 41-60 years and 5 patients were more than 60 years.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-40</td>
<td>21</td>
<td>9</td>
<td>30</td>
</tr>
<tr>
<td>41-60</td>
<td>14</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>&gt;60</td>
<td>4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>39</td>
<td>11</td>
<td>50</td>
</tr>
</tbody>
</table>

**Table 1. Age and Sex Distribution**

Patients of RTA having head injury, periorbital swelling skull fracture or multiple injuries were advised x-ray film from casualty who were later advised CT scan after study of the film. X-ray showed fracture of skull in only 18 number of patients, whereas CT scan report revealed normal findings in 10 patients, of this, 2 patients were of axonal injury, fracture of skull in 21 patients intracerebral haemorrhage, 18 with brain contusion, 11 with cerebral oedema, 9 patients had subdural haematoma and 5 were with extradural haematoma.

90% of SDH and EDH were associated with fracture of skull. Surgical intervention was done on 60% of the lesion detected in CT scan.

<table>
<thead>
<tr>
<th>Findings</th>
<th>Number of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>10</td>
</tr>
<tr>
<td>Fracture skull</td>
<td>21</td>
</tr>
<tr>
<td>Intracerebral haematoma</td>
<td>20</td>
</tr>
<tr>
<td>Brain contusion</td>
<td>18</td>
</tr>
<tr>
<td>Cerebral oedema</td>
<td>11</td>
</tr>
<tr>
<td>Subdural haematoma</td>
<td>9</td>
</tr>
<tr>
<td>Extradural haematoma</td>
<td>5</td>
</tr>
<tr>
<td>Axonal injury</td>
<td>2</td>
</tr>
</tbody>
</table>

**Table 2. Types of Findings in CT Scan**

As x-ray skull advised to all head injury patients and fracture skull was found in 18 number of patients, there was normal x-ray film for rest of the 32 patients, whereas CT scan report revealed normal findings in 10 patients, skull fracture in 21 patients and 19 patients had other intracerebral findings like cerebral oedema, cerebral contusion, EDH, SDH, etc.
<table>
<thead>
<tr>
<th>Findings</th>
<th>Number of Patients in X-Ray Skull</th>
<th>Number of Patients in CT Scan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>32</td>
<td>10</td>
</tr>
<tr>
<td>Fracture skull</td>
<td>18</td>
<td>21</td>
</tr>
<tr>
<td>Cerebral pathology like cerebral oedema, haematoma, SDH, EDH, etc.</td>
<td>Nil</td>
<td>19</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>50</strong></td>
<td><strong>50</strong></td>
</tr>
</tbody>
</table>

**Table 3. Types of Findings in X-Ray Skull/CT Scan**

Periocular swelling found in 18 patients, proptosis in 9 patients and restriction of eye movement was seen in 11 patients. Decrease in visual activity found in 6 patients and there are 2 patients each who suffered from optic neuropathy and loss of vision.

**Minimally-Displaced Orbital Floor Fracture - Left Orbital Floor Fracture (Large Defect)**

Introduction of CT scan has brought a significant changes in the field of diagnosis and management of head injury including orbital injury. In our study, the young males are the commonest victims of orbital injury. Many different kinds of abnormal findings in head injury can be detected by CT scan. We found 60% of head injury cases in the most productive years of life, which is supported by Frankoski RF et al reported that 60-70% of head injuries occurring in young people. In present study, 60% of patients belonged to the 20-40 years of age group. Most likely reason is that this age group maximum involve themselves in driving and outdoor activities. Hukkelhoven et al concluded the age is an important factor that affects the outcome of head injury and the outcome is worse with increasing age group.

We found that males suffer more than female because of exposure of males to traffic and outdoor activities. It is evident in our study that male-to-female ratio is 3.5:1. This study was supported by Zimmerman RA et al to report that males were maximally suffered from head injuries (85%).

In our study, cerebral oedema was 22%, which coincides with the finding of Feliciano DV and Moore EE et al, which was 30-40%. The incidence of subarachnoid haematoma reported by different authors are 12-44%. In our study, it was 18%, which is quite significant.

**DISCUSSION**

A 10-year retrospective study by Buttner et al found the black eye is associated with orbital fracture in whom CT scan showed 68% of maxillofacial fracture and injury to the globe was 30% of orbital fracture.

**CONCLUSION**

CT scan is an effective imaging technique to detect different injuries including orbital fracture in road traffic accidents, which is many time better than x-ray film in regards to evaluation, diagnosis and prognostic factor for treatment. As per National Institute for Health and Clinical Excellence CG 176 of year 2014, the guideline advices plain x-ray skull should not be used to diagnose significant brain injuries.

**REFERENCES**


