Original Research Article

A study of incidence of different types of maxillofacial injuries in patients with head injury by MDCT evaluation

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Abstract

Background: Maxillofacial injuries are common presentation in casualty department. Majority of these injuries are due to road traffic accidents. These injuries should be treated promptly as the area is very vascular and various vital organs are present in this area. CT imaging is very useful for diagnosing maxillofacial injuries. **Aim and objective:** To study the different types of maxillofacial injuries in patients with head injury **Methodology:** Our study included the patients with maxillofacial injuries who were referred to the department of radio-diagnosis, Krishna Institute of Medical Sciences, Secunderabad, for CT imaging and those which are subsequently managed surgically in our institute over a period of 1 yr from August 2009 to August 2011. Incidence of various maxillofacial injuries were noted in patients of head injury. **Result and discussion:** Naso-orbito-ethmoid (18%) were the most common type of fractures, followed by zygomatico-maxillary fractures (17%). LF-1(9%), LF-2(16%), LF-3 (14 %), Orbital(11%), temporal bone(6%) and mandibular (5%) fractures. skull base(4%) fractures were the least common type of fractures constituting 4%.

Key Word: maxillofacial injury, head injury.

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Received Date: 30/12/2019 Revised Date: 14/01/2020 Accepted Date: 29/01/2020
DOI: https://doi.org/10.26611/10151522

Access this article online

Quick Response Code:

Website: www.medpulse.in

Accessed Date: 18 August 2020

INTRODUCTION

Facial trauma can be regarded as a form of social disease from which no one is immune. Automobile accidents probably cause more facial injuries than any other modality in most modern countries.[1,2] In developing countries, altercations, home accidents and other sources of trauma may account for the most. Recognition of true extent of fractures, displacements and soft tissue injuries of the facial skeleton is very much necessary for the optimum reconstruction of the face. Appropriate clinical radiographic investigation, together with an understanding of the normal radiographic anatomy of the facial skeleton, allows for precise delineation of facial fractures and associated soft tissue injuries encountered in clinical practice. Accurate diagnosis and complete evaluation of maxillofacial trauma requires a comprehensive knowledge of maxillofacial anatomy. Facial skeletal anatomy represents some of the most complex anatomy in the body. The complexities are compounded when the anatomy is shown in two dimensions as seen on radiographs. A combination of multiple plain radiographic views and coronal and axial computed tomographic images allow for optimal delineation of fracture patterns. This information is beneficial in the clinical and surgical management of patients with facial injuries.[3] The greatest advantage of multiplanar imaging is the improved depiction of fracture lines that are oriented parallel to the plane of axial scans. Surgeons frequently need to make their own evaluation of the degree of skeletal disruption revealed by imaging studies when planning initial treatment of facial fractures. Three dimensional (3D) images obtained from CT offer a subjectively attractive medium for displaying skeletal lesions and the technique has attracted interest in the management of patients with facial trauma, among surgeons in particular. Technological advances in computerized tomography (CT) have reduced data acquisition and reconstruction times so that three-dimensional (3D) CT

How to cite this article: Manjunath D Abbigeri, Puneet V Nayak. A study of incidence of different types of maxillofacial injuries in patients with head injury by MDCT evaluation. *MedPulse International Journal of Radiology.* August 2020; 15(2): 25-29. http://www.medpulse.in/Radio%20Diagnosis/

images of maxillofacial injuries may be economically and quickly generated. Several studies have judged three dimensional CT to be superior to multiplanar two-dimensional CT in demonstrating the spatial relationships of fracture fragments in complex mandibular and midfacial trauma. Surgeon's improved appreciation of the disrupted bony architecture facilitates preoperative planning.

There is a need for prompt identification and proper management of the associated life-threatening injuries in facial fracture patients. Clinical assessment should begin with evaluation of cerebral trauma, followed by hemorrhagic shock, airway compromise, and hemopneumothorax. Proper management may require a multidisciplinary and coordinated team approach for optimum stabilization and ongoing treatment of patients with facial fractures. [4, 5] In recent years computed tomography has taken quantum leaps in its utility and acceptance by the clinical community as it is easy to perform, quick, accurate and non-invasive. The introduction of multidetector CT into clinical practice has enabled the acquisition of very thin sections within short scan times so that good quality reformations can be achieved even in uncooperative patients. The present study outlines the role of multidetector computed tomography in the evaluation and management of maxillofacial trauma in the context of today's clinical practice.

MATERIAL AND METHODS

Present study was a prospective study carried out at Department of Radiology, Krishna Institute of Medical Sciences (KIMS) Secunderabad, during the period from August 2009 to August 2010. Study population was patients with traumatic maxillofacial injuries referred for CT imaging of brain to the department.

Inclusion criteria: 1. All patients with trauma to the maxillofacial region. 2. Patients willing to participate in the study

Exclusion criteria: 1. Paediatric patients. 2. Patients who were Dead on arrival.

Study was approved by ethical committee of the institute. A valid written consent was taken from the patients after explaining study to them.

Data was collected with pre tested questionnaire. Data included demographic data, clinical history of the patient. All patients were evaluated with MDCT to look for fractures suspected or investigated further for complex fractures identified on scans done elsewhere. All patients were imaged on a BRILLIANCE CT VERSION 2.0, 64 CHANNEL CONFIGURATION (PHILIPS MEDICAL SYSTEMS).

All patients were initially scanned in the axial projection. Later multiplanar reformatted images were reconstructed in 0.9mm true axial planes parallel to the Reid's base line and 2 mm thickness images in coronal and sagittal planes from the axial slices data using bone window settings. Volume rendered 3D images were then obtained with computer software. The obtained findings were compared with intra-operative findings.

Excel and Statistical analyses were performed using the Statistical Package for Social Science (SPSS version 10.5) software.

RESULTS

The study included 30 patients. Majority of the cases were males, constituting 77% of trauma patients. Most of the patients were in the age group of 20-40yrs (63.34%). (table 1, fig 1) Among the studied cases, total Number of fractures of each component bone identified on multiplanar reformatted (axial, coronal and sagittal) images were calculated. Fractures of the nasal bones (n-26), nasal septum (n-24), anterior maxillary wall (n-19), posterolateral maxillary wall (n-18) and zygomatic arch (n-17) were the most common. (table 2) Incidence of different types of fractures identified on MPR images were calculated. Naso-orbito-ethmoid complex were the most common type (n -97,18%) and zygomatico-maxillary complex(n -95,17%) were the second most common types of fractures identified followed by LF II (n-87,16%), LF III (n-74,14%), Orbital (n-58, 11%), LF I (n-46,9%), temporal bone(n-33,6%), mandible (n-29,5%) and skull base(n-21,4%) fractures.(table 3) Distribution of mandibular fractures among its different segments were calculated. Mandibular body is the most common fracture site observed in 9 patients, constituting 31% of the total, followed by alveolar process (n-6, 21%), condyle (n-4, 14 %), ramus (n-4, 14 %) , angle(n-3, 10 %), symphysis (n-2, 7 %). Coronoid process constituted the least common site (n-1, 3 %). Incidence of different types of fractures identified on VR 3DCT images were calculated. Naso-orbito-ethmoid were the most common of fracture types identified in total 19% of trauma patients and zygomatico-maxillary (16%) were the second most common type, followed by orbital (13%),LF II and III (15%), LF I (12%), temporal bone(13%), mandible (10%) and skull base(7%). (fig 3) Comparison of total number of fractures identified on MPR 2DCT and VR 3DCT images were done as shown in chart 10. MPR images were more efficient than VR 3DCT images in identifying the fracture sites by identifying total of 161 fractures in comparison to 138 fractures identified by the latter. (table 4) Comparison of different types of fractures identified on MPR and VR images was done. MPR images identified different types of fractures in more number of patients than on VR images. There is nearly one to one correlation between the two in identifying the fractures of NOE complex , ZM complex, LF 2 and Mandibular fractures. The difference existed between the two in identifying the fractures of orbit, LF 1, LF 3, temporal bone and skull base.

Table 1: Distribution of patients according to age group

Sr no	Age group	No of patients	Percentage
1	<20 years	04	13.33%
2	20-40 years	19	63.34%
3	41-60 years	06	20%
4	>60 years	01	3.33%

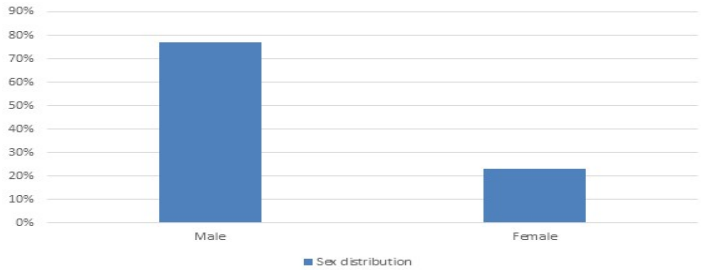

Figure 1: Distribution of head injury patients according to sex

Table 2: Distribution of fractures On MPR images in patients of head injury

Fractures	NO. OF FRACTURES IDENTINTIFIED ON MPR IMAGES
Orbital fractures	
Orbital floor (OF)	13
Orbital roof (OR)	11
Lateral Orbital wall (LOW)	16
Medial Orbital wall (MOW)	18
Naso-orbito-ethmoid complex	26
Nasal bone (NB)	
Frontal process of maxilla (FPM)	14
Lacrimal bone (LB)	16
Nasal bone (NS)	24
Hard palate (HP)	10
Cribriform plate (CP)	7
Zygomatico-maxillary complex	19
Anterior wall of maxilla (AMW)	
Posterolateral maxillary wall (PLMW)	18
Medial maxillary wall (MMW)	16
Body of zygoma (BOZ)	14
Zygomatic arch (ZA)	17
Pterygoid Plates	11
Root Of Nose	11
Mandible Fractures	3
Body	
Angle	3
Condyle and subcondyle	4
Symphysis and parasymphysis	7
Ramus	4
Alveolar process	8
Temporal Bone	16
Squamous part	
Petrous	2
Mastoid	1
Styloid	10
Tympanic	4
Anterio Cranial Fossa	10
Sphenoid Bone	9
Clivus	1
Posterior Cranial Fossa	1

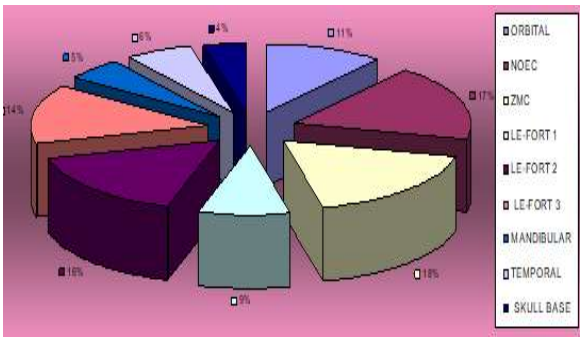

Figure 2: Distribution of Maxillofacial fractures on MPR

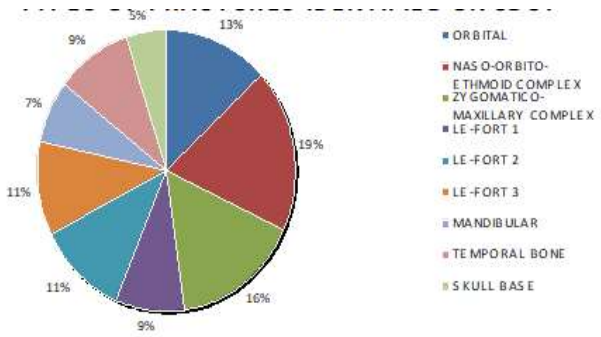

Figure 3: Type of fractures on 3DCT in patients of head injury

Table 4: Comparison of fractures on MPR 2D CT and VR 3DCT

Modality	Total no. of fractures identified
MPR 2D CT	161
VR 3D CT	138

DISCUSSION

In our study male to female ratio was about 4:1 and 64% of the patients were between 20 to 40 years. In a similar study done by Lee KH, Chou HJ also had a male to female ratio of 3:1 and 76% of patients were between first and third decade. [6] Both studies had more of male patients which may be due to increased use of vehicles by group. In our study we found that Nasal bone (n-26) was the most commonly fractured site, followed by nasal septum (n-24) and anterior maxillary wall(n-19). Fracture clivus was the least commonly fractured site (n-1). Among different fracture types in our study, naso-orbito-ethmoid (18%) were the most common type of fractures, followed by zygomatico-maxillary fractures (17%), LF-1(9%), LF-2(16%),LF-3 (14 %),Orbital(11%), temporal bone(6%), mandibular fractures(5%) and skull base(4%) fractures were the least common type of fractures. In studies done by Hopper RA [7] and Boeddinghaus R [8] , they concluded that fractures of the nasal bone are the commonest fractures in the maxillofacial region. Our study also correlated with this.

R. Boeddinghaus and A. Whyte [8] in their study concluded that Zygomatic complex fractures are the second commonest facial fractures (after nasal fractures), In our study also zygomatico-complex fractures are the second most common type of fractures occurring in maxillo-facial region. The study done by Hamad Ebrahim , Al Ahmed and others showed that most common type of fracture in the maxillofacial injuries was the mandible fracture, followed by zygomatico-maxillary fractures and the least common type was the Le Fort II fracture.[9] In contrast our study showed that nasal bone fractures are the most common type, followed by zygomatico-maxillary fractures. Mandibular fractures were the least common type of fractures. [10] Another study by Col GK Thapliyal and others also showed that mandible fracture is the most common type of fracture and Le fort II is the least common type, [11] which is again in contrast to our study. The difference in the above studies and our study may be due to bias in the identification of fractures and probably a different mechanism of injury. Among mandibular fractures, the study done by Balwant Rai and others showed that most frequently fractured site is the body in the canine region and least common site of fracture is the coronoid process, [12] which is in agreement with our study. Our study concluded that body (31%) is the most common site of fracture in the mandible, followed by alveolar process (27%) , angle and condyle (13%). A study by Huey-jen Lee and others concluded that the orbit floor was the most common and orbital roof the least common site of fracture of the bony coverings of the eye. [13] In contrast our study showed that medial orbital wall is the most common site and the orbital roof, the least common site. In our study, we identified more number of fractures on two dimensional multiplanar reformatted images than on volume rendered three dimensional computed tomographic images. Multi Detector Computed Tomography with multiplanar axial, coronal and sagittal reformations has greatly increased the accuracy of detecting fractures. Fractures like those involving the orbital floor and roof, which were missed on axial images were better picked up in the coronal and sagittal reformatted images. Similarly fractures involving cribriform plate, hard palate, alveolar processes of maxilla and mandible, disruption of pterygomaxillary junction were sometimes picked only on combined MPR images. In a similar study by Kreipke DL and others concluded that imaging in two planes, including the coronal plane is desirable for greatest accuracy in fracture detection. [14]

CONCLUSION

Naso-orbito-ethmoid (18%) were the most common type of fractures, followed by zygomatico-maxillary fractures (17%).

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Source of Support: None Declared
Conflict of Interest: None Declared