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THE ROLE OF MULTI DETECTOR COMPUTERIZED TOMOGRAPHY (MDCT) IN EVALUATION OF MAXILLOFACIAL FRACTURES.

Radiodiagnosis

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ABSTRACT

Objective: The purpose of our study was to assess the role of Multidetector Computerized tomography in the evaluation of maxillofacial fractures and to describe the frequency and types of fractures that underwent CT scans.

Subjects And Methods: The study included 50 patients suspected of facial trauma referred from the emergency unit from PESIMSR ,Kuppam. All patients were subjected to non contrast MDCT in axial cuts and images are transferred to workstation then coronal and sagittal reconstruction obtained.

Results: There were 37 male and 13 female patients. The maximum number of patients fall into 21-40 years followed by 41 to 60 years .50 patients had total 170 fractures. It was found that the maxillary sinus is the most common to be fractured (found in 24 cases) followed by nasal bone (18) , zygomatic arch (17), mandible (13) ,greater wing of sphenoid (9), sphenoid sinus (8), frontal sinus (7) ,pterygoid plates (7), bony nasal septum (6) ,ethmoid sinus (3).Among complex facial fractures orbital fractures are the most frequent (found in 47 cases), followed by zygomatico-maxillary junction fractures (4) ,Tripod fractures(4) , and Naso-orbito-ethmoid region fractures (3).

Conclusion: Maxillofacial trauma is one of the most common emergency requiring accurate and early diagnosis. MDCT is useful diagnostic tool for the identification and classification of maxillofacial region fractures and aiding in surgical planning.

KEYWORDS

MDCT, Maxillofacial trauma, fractures.

INTRODUCTION:

Facial injuries are one of the most common emergencies accounting for a large proportion of patients in the emergency department [1,2]. Facial trauma poses a challenge to radiologists due to the complexity of the facial anatomy, especially on radiograms. Maxillofacial injuries occur more commonly following road traffic accidents (RTA) and these injuries if not properly managed can negatively influence the cosmetic, functional and psychosocial activities of the patient. In the human body, face is one of the complex regions anatomically, some organizational principles that can help guide for the accurate evaluation of facial injury. The face can be divided into five distinct anatomic regions: nasal, orbital, zygomatic, maxillary and mandibular. The aim of imaging studies is to know the typical patterns and classifications of facial fractures, including those of the zygomaticomaxillary complex and naso-orbito-ethmoidal complex because each pattern is often associated with particular functional and esthetic complications.Fractures with displacement involving the zygomaticomaxillary complex often widen the angle of the lateral orbital wall, resulting in increased orbital volume and sometimes in enophthalmos. Entrapment of the inferior rectus muscles in orbital fractures can lead to diplopia.Injuries to the globe or infraorbital nerve can also be seen in orbital fractures. Frontal sinus fractures involving the posterior sinus wall can create a communication with the anterior cranial fossa resulting in leakage of cerebrospinal fluid, intracranial bleeding.

Multidetector computed tomography (MDCT) is the imaging technique of choice for assessing facial trauma due to its wide availability, its speed and the fact that it can be used to characterize facial fractures, soft tissue injuries and associated complications.

MATERIALS AND METHODS

A retrospective hospital-based study conducted from January 2020 to June 2021 in PES Institute of Medical Sciences and Research Hospital, Kuppam, Andhrapradesh. The study includes fifty patients with maxillofacial trauma referred for CT scan of the head and face. The study was done employing a General electronics (GE),16 slice helical CT scanner. CT scan of the face was performed with the patient in supine position, axial slices were taken at 0.625 mm collimation with a field of view extending from the top of frontal sinuses to the chin. The images were also reconstructed in coronal and sagittal plane for examination.

The images were primarily studied in bone window (WL 350 WW 2000), Soft tissue window (WL 40, WW 350) as well as 3D reconstructions with different windows being used wherever relevant. Fractures found were classified into the following groups: maxillary sinus wall fractures, nasal fractures, mandibular fractures, fractures of the zygomatic-maxillary complex, isolated zygomatic arch fractures, orbital fractures, tripod fractures, naso-orbito-ethmoidal fractures and other form of fractures. The results were tabulated in Microsoft Excel and statistical analysis was done using (SPSS)Statistical Package for the Social Sciences.

Inclusion Criteria:

1.All patients with clinical evidence of maxillofacial injuries who undergo multidetector CT examination and are shown to be positive for fractures.
2.Patients who are stable and does not require emergency treatment.

Exclusion Criteria:

1.Patients who are unstable and require emergency treatment according to Advance Trauma Life Support (ATLS)
2. Patients with past H/O maxillofacial surgery or intervention.

RESULTS:

This study comprised of a total of 50 patients .There were 37 males(74%) and 13 females(26%).Figure(1).

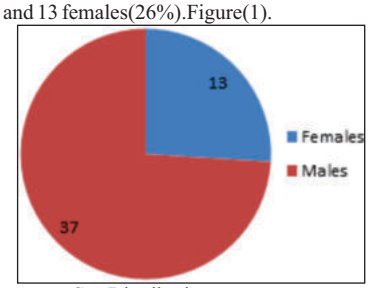


Figure 1 Represents Sex Distribution.

Highest number of cases presented were in the age group of 21 to 40 years (42%), followed by 41-60 (32 %) and 10 to 20 years (26 %)(chart 1)

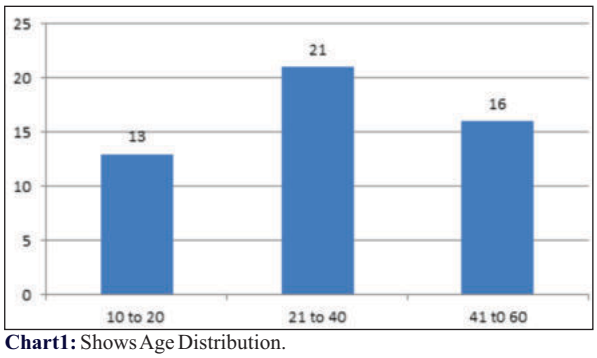


Chart1: Shows Age Distribution.

50 patients had total 170 fractures.(Table 1) .It was found that the maxillary sinus is most common to be fractured (14.1%) followed by nasal bone (10.6%) , zygomatic arch (10%), mandible (7.6%) ,greater wing of sphenoid (5.4%), sphenoid sinus (4.7%), frontal sinus (4.2%) ,pterygoid plates (4.2%), bony nasal septum (3.5%) ,ethmoid sinus (1.8%).Among complex facial fractures orbital fractures are the most frequent (27.6%), followed by zygomatico-maxillary junction fractures (2.3%) Tripod fractures(2.3%) and Naso-orbito-ethmoid region fractures (1.7 %)

Table 1: Frequency Wise Distribution Of Maxillofacial Fractures.

Type of Fracture	Number	Percent (%)
Maxillary sinus wall	24	14.1%
Nasal bone	18	10.6%
Zygomatic arch	17	10.0%
Mandible	13	7.6 %
Greater wing of sphenoid	9	5.4%
Sphenoid sinus wall	8	4.7%
Frontal sinus	7	4.2%
Pterygoid plates	7	4.2%
Bony nasal septum	6	3.5%
Ethmoid sinus	3	1.8 %
Orbital fractures	47	27.6%
Zygomatico maxillary	4	2.3%
Tripod fracture	4	2.3%
Naso-orbito-ethmoid region	3	1.7%
Total	170	100%

Figures 2 And 3: Showing Fractures Of Maxillary Sinus.

Figure 2: Axial CT Image Showing Fracture Involving Anterior And Posterolateral Walls Of Left Maxillary Sinus.

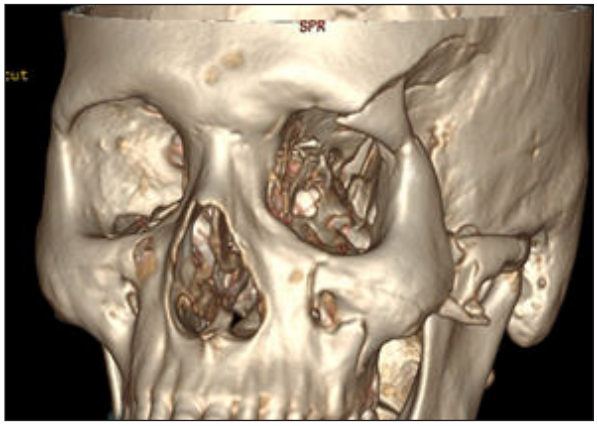


Figure 3: Volume Rendering Image Of Same Patient Showing Fracture Of Left Maxilla , Roof And Lateral Walls Of Orbit And Zygomatic Bone.

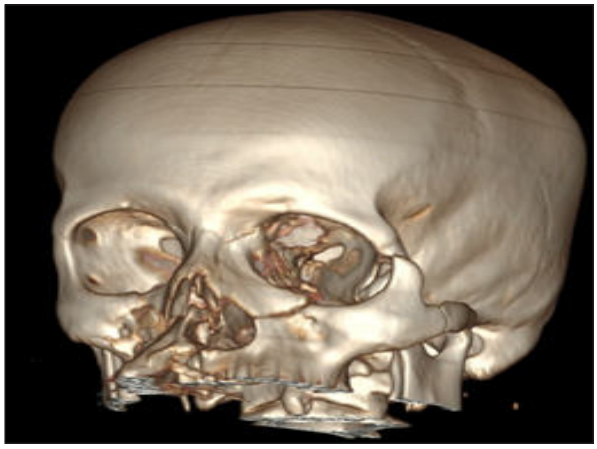


Figure 4: Volume Rendering Image Showing Tripod Fracture.

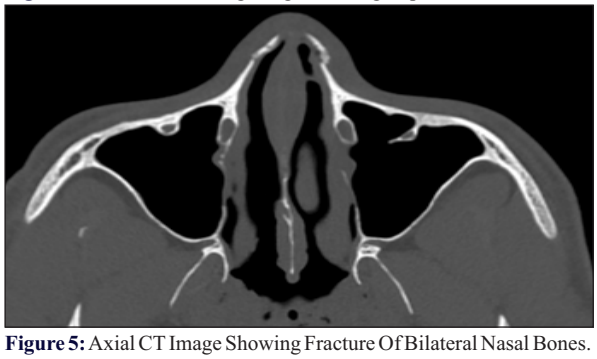


Figure 5: Axial CT Image Showing Fracture Of Bilateral Nasal Bones.

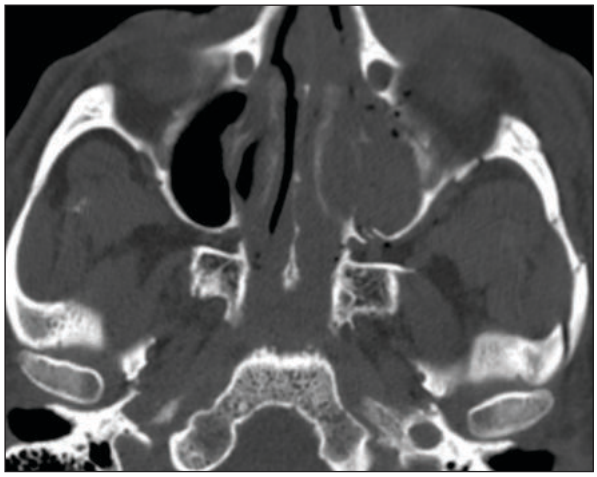


Figure 6: Axial CT Image Showing Segmental Fracture Of Left Zygomatic Arch.

Figures 7 & 8: Showing Fracture Of Mandible .

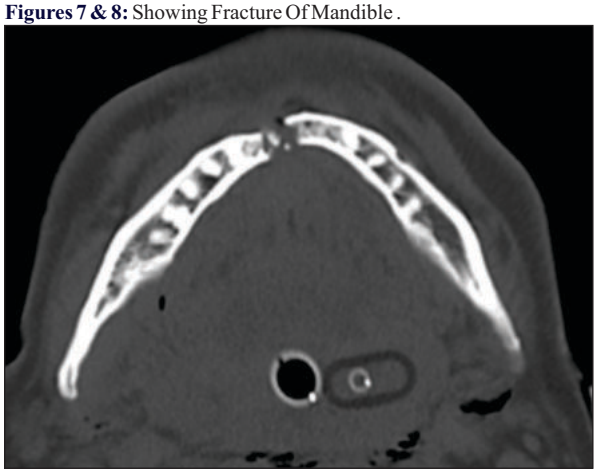


Fig 7: Axial CT Image Showing Fracture Of Mandible Near Midline

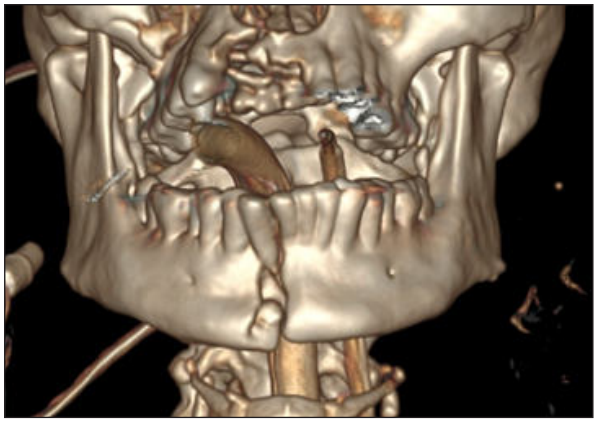
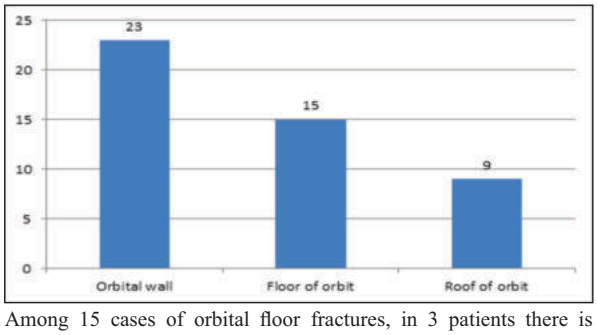


Fig8: Volume Rendering Image In Same Patient Showing Fracture Of Body Of Mandible In Midline With Fracture Line Extending Into Alveolar Region.

Among complex fractures 47 orbital fractures were found. Orbital wall was the most frequent fracture (23 cases) followed by floor(15 cases) and roof of orbit (9 cases) (Chart 2)

Chart 2 : Orbital Fractures.



Among 15 cases of orbital floor fractures, in 3 patients there is impingement of inferior rectus muscle by fracture fragment seen.

Figures 9&10 Showing Fractures Of Orbit.

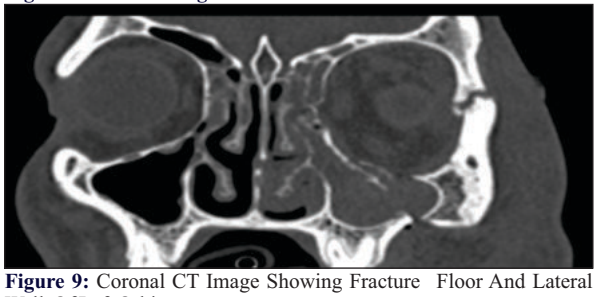


Figure 9: Coronal CT Image Showing Fracture Floor And Lateral Wall Of Left Orbit.

Figure 10: Volume Rendering Image In Same Patient Showing Floor And Lateral Wall Of Left Orbit.

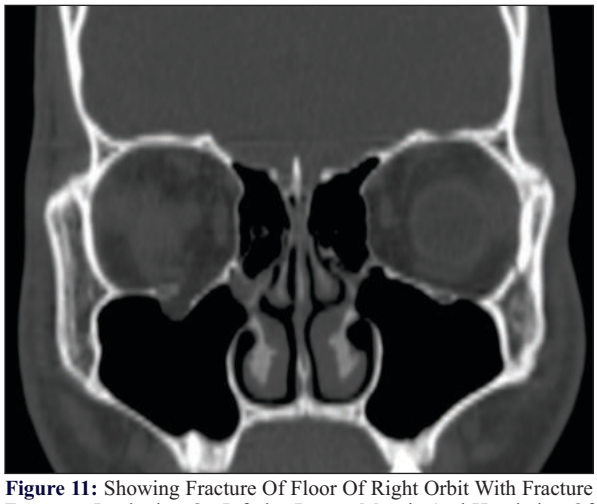


Figure 11: Showing Fracture Of Floor Of Right Orbit With Fracture Fragment Impinging On Inferior Rectus Muscle And Herniation Of Intraorbitral Fat.

Figure 12&13: Showing Fracture Involving Bilateral Naso-orbito-ethmoid Regions.

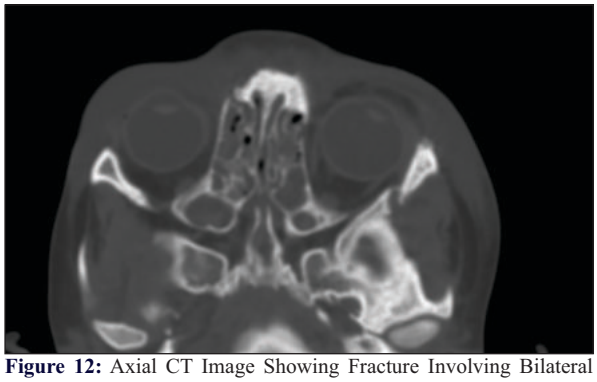


Figure 12: Axial CT Image Showing Fracture Involving Bilateral Naso-orbito-ethmoid Regions.

Figure 13: VR Image Of The Same Patient Showing Fracture Of Bilateral Naso-orbit-ethmoid Regions.

DISCUSSION

The human face is an individual esthetic identification.Facial fractures are more common today with increasing RTAs. One of the important factors determining the success of treatment of facial fractures is early and correct diagnosis [3,4]. Multi Detector Computerised Tomography is the imaging modality of choice to display the multiplicity of fracture fragments, the degree of rotation and displacement, or any skull base involvement [5,6] supported by the study conducted by Wang *et al*. and Moustafa *et al* [7,8].

Volume rendering images useful in visualizing bone fragments from all angles ,planes and also in the ready assessment of the mechanism of the injury. 3D reconstruction imaging is often preferred by surgeons as it simulates a surgeon's process of visualizing fractures in operative planning and also has helped a lot in patient and family education.

The present study was designed to identify the number ,frequency of fractures and classify fractures accordingly in cases of maxillofacial trauma by the use of CT scan.

Many studies have been conducted to identify and classify fractures of the maxillofacial region. There are some significant differences in the findings of studies done by different researchers at different time intervals.

A total of 50 patients under the age group of 10-60 years who presented with a history of injury to the maxillofacial region, who were found to have facial bones fractures were included in this study.

In this study, male predominance of facial trauma was noted consistent with the study conducted by Kaur J [9].

Out of 50 patients who underwent CT face,the total number of fractures recorded were 170. By far the commonest fracture on CT was maxillary sinus wall fracture (14.1%)followed by nasal bone (10.6%) , zygomatic arch (10%), mandible (7.6%) ,greater wing of sphenoid (5.4%), sphenoid sinus (4.7%), frontal sinus (4.2%) ,pterygoid plates (4.2%), bony nasal septum (3%) ,ethmoid sinus (1%).Among complex facial fractures orbital fractures are the most frequent (27.6%), followed by zygomatico-maxillary junction fractures (2.3%) Tripod fractures(2.3%) ,Naso-orbito-ethmoid region fractures(1.7%).

Axial and coronal scans were found to be beneficial in localizing and identifying maxillofacial fractures in detail. Qais H Muassa et al [10]) in their literature revealed that 42 (46.7%) fractures out of 92 were detected by coronal scans ,28 (30.4%) fractures were detected by axial scans. When combined the rest 21 fractures (22.8%) were detected.

CONCLUSION

Injuries involving maxillofacial region are one of the commonly seen emergencies which needs early diagnosis and prompt management. The purpose of imaging is to detect ,localize the number, site of facial fractures and to differentiate from soft tissue injuries so that proper management planning could be carried out. Multi Detector Computerised Tomography(MDCT) is an accurate, non-invasive technique for the evaluation of patients with maxillofacial trauma with an added advantage of shorter scan time and easy availability. Multiplanar reformation and 3D images help better evaluation of fractures detected on axial images ,but due to certain limitations of small sample size, low prevalence of maxillofacial trauma further studies with larger size of study sample is required to reach conclusive results.

REFERENCES:

1. Mehta N, Butala P, Bernstein MP (2012) The imaging of maxillofacial trauma and its pertinence to surgical intervention. Radiologic Clinics of North America 50(1): 43-57.
2. Pathria MN, Blaser SI (1989) Diagnostic imaging of craniofacial fractures. Radiologic Clinics of North America 27(5): 839-53.
3. Mould RF. The early history of x-ray diagnosis with emphasis on the contributions of physics 1895-1915. Phys Med Biol 1995;40:1741-87.
4. Curry TS, Dowdey JE, Murry RC. Christensen's Physics of Diagnostic Radiology. 4th ed. Philadelphia, PA: Lea & Febiger; 1990. p. 242-322.
5. Som PM, Brandwein MS Facial fractures and postoperative findings. Head and neck imaging 2003;374-438. 6. Manolidis S. Frontal sinus injuries: associated injuries and surgical management of 93 patients. J Oral Maxillofac Surg. 2004;62(4):882– 91.
6. Manolidis S. Frontal sinus injuries: associated injuries and surgical management of 93 patients. J Oral Maxillofac Surg. 2004;62(4):882– 91.
7. Wang P, Yu Q, Shi H. Comparison of 2D-CT and 3D-CT in diagnosing mid-facial fractures. Zhonghua Kou Qiang Yi Xue Za Zhi 2001;36:256-8.
8. Moustafa A. The role of multi detector computerized tomography in evaluation of maxillofacial fractures. Egypt J Radiol Nucl Med 2014;45:97-104.
9. Kaur J, Chopra R. Three dimensional CT reconstruction for the evaluation and surgical planning of mid face fractures: A 100 case study. J Maxillofac Oral Surg 2010;9:323-8.
10. Qais H Muassa, Ibrahim Saeed Gataa (2009) The diagnostic value of Computed Tomography in evaluation of maxillofacial Trauma. Kufa Med Journal.