Pattern of Maxillofacial Injury Associated with Head Injury at a Neuro Surgical Centre: An Analysis of 250 Cases

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ABSTRACT

Aim: The aim of the research was to determine and analyze the pattern of maxillofacial (MF) injury associated with head injury at a neurosurgical center (NIMHANS, Bangalore). **Methodology:** This is a descriptive analytical study of trauma patients at NIMHANS Bangalore in which the medical records of 250 patients who were referred for MF injury may or may not be associated with head and neurological injury were analyzed during a period of 6 month. **Results:** Road Traffic Accidents (RTA) were the most common cause and contributed to 77% of the injuries. A total of 229 males were affected in comparison to only 21 females. 85 patients (34%) were under the influence of alcohol. About 44.8% of the patients had MF injury. Midfacial injuries accounted for 73.2% of the total fractures. The soft tissue lacerations were distributed predominantly over middle and upper third of the face. Preponderance of patients had mild head injury and was handled conservatively in the present group. Operative instructions for maxillo-facial fractures were displaced facial bone fractures or pan facial trauma. **Conclusion:** Adult males were the typical frequent victims in MF trauma, and RTA were responsible for the majority of cranio- MF trauma. Most of the referred trauma patients sustained mild head injuries and were managed conservatively.

Key words: Head injury, maxillofacial injuries, road traffic accidents

INTRODUCTION

The mid face structure includes left and right paired, mirror-image bones that makeup the orbits, nasal structure, cheekbones, maxillae, and palate. The bones of the mid face fracture easily because they are composed of a network of fragile bones held together across sutures, which easily give way to minimal trauma.[1]

Access this article online	
Publisher	**Website:** http://www.renupublishers.com
	DOI: 10.5958/2394-4196.2014.00002.8

The maxillofacial (MF) trauma leaves an everlasting impression on patient's psychological development and behavior. Although many of these patients make a good recovery, morbidity includes transient or persistent distortion, loss of function and psychosocial problems.

The incidence and epidemiological causes of MF trauma and facial fractures vary widely in different regions of the world due to social, economic, cultural consequences, awareness of traffic regulations and alcohol consumption. India accounts for as high as 6% percent of the world's road traffic accidents (RTAs), although it has 1% of the world's vehicles. The 19-24 age groups were mostly affected, followed by 25-30 years. The RTA rate of 35/1,000 vehicles in India is one of the highest in the world and so is the

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Submission: 28 Aug 2014; **Revision:** 16 Oct 2014; **Acceptance:** 22 Nov 2014

RTA fatality rate of 25.3/10,000 vehicles.[2] The major causes of such accidents are:
- Traffic congestion
- Poor enforcement of traffic rules
- Interpersonal violence
- Too many distracted people
- Use of mobile phones
- Drunk and driving
- Low-velocity impact also causes severe damage
- High association of neurological trauma
- Missile injuries.

The relative contribution of each cause depends on such factors as geoFigureical location, socio-economic factors and the seasons of the year.[3] With regard to the anatomical sites, mandibular and zygomatic complex (ZMC) fractures account for the majority of all facial fractures and their occurrence varies according to the mechanism of injury and demoFigureic factors, particularly, gender and age.[3] Keeping the above facts in mind, the present study was conducted with following objectives:
- To evaluate the incidence and pattern of MF injury associated with head injury in a neurosurgical center (NIMHANS, Bangalore)
- Assess the cause, type, and incidence, demographic, data of MF injuries in NIMHANS Hospital in Bangalore, India
- To assess the importance of MF evaluation in neurosurgical trauma

METHODOLOGY AND DATA

This was a prospective descriptive analytical study in which the medical records of 250 patients who were referred for neurological or MF injury, head and neurological trauma at the NIMHANS, Bangalore during a period of 6 month were analyzed. The patient's age, gender, type of midfacial and associated/concomitant injury and mechanism of injury were recorded. Different patterns of MF injury were also noted.

MF trauma included trauma of the craniofacial skeleton (extending from the frontal bone to the mandible).[4] The types of cranial maxillary fracture were classified by anatomic location as frontal, sphenoid, temporal, parietal and occipital. Fractures of the facial skeleton[5] based on facial bone imaging were grouped as lower face (LF-mandible), mid-face (MF-maxilla, nose, zygoma, and orbits) and upper face (UF-frontal).

Statistical Analysis

Discrete (categorical) data were summarized as no. and % and compared by Chi-square (χ^2) test. A two-tailed $P<0.05$ was considered statistically significant. Analysis was performed by SPSS software (Windows version 17.0).

RESULTS

A total of 250 patients with MF injury or associated MF with neurological injury were evaluated. Among patients, 229 (91.6%) were males and 21 (8.4%) were females. The male and female ratio was 11:1. Of total, 130 had injury due to RTA and thus the prevalence being 52%. Further, mostly were two wheeler accidents, accounting 76% of the total accident. Moreover, 90% of the patients were not wearing helmets and 30% of the patients had consumed alcohol during the accident.

The distribution of MF and head injuries is summarized in Table 1 and also depicted in Figure 1. Among patients, 44.8% had faciomaxillary (MF) injury, 18.0% had head (neurological instead of head as head itself is whole) injury and also suffered from MF fractures, 28.4% had isolated facial lacerations with no fractures and 16.4% had facial injuries. Comparing the frequency

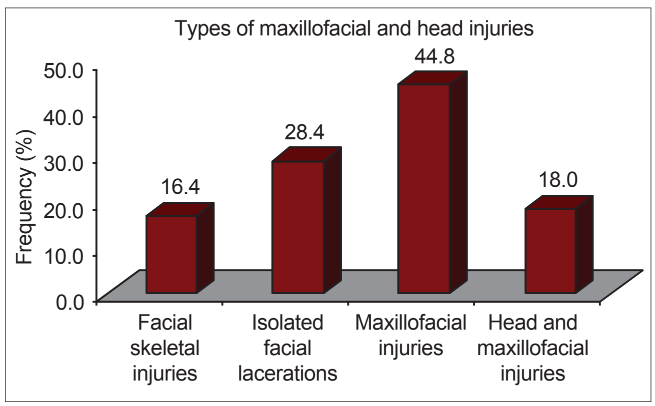

Figure 1: Distribution of types of maxillofacial and head injuries among patients

Table 1: Distribution of MF and head injuries

Types of MF and head injuries	Number of patients (n=250) (%)	χ^2 value	P value
Facial skeletal injuries	41 (16.4)	65.11	<0.001
Isolated facial lacerations	71 (28.4)		
MF injuries	112 (44.8)		
Concomitant head and MF injury	45 (18.0)		

MF: Maxillofacial

(%) of types of injuries, χ^2 test revealed significantly different higher frequency of MF injuries when compared to other MF and head injuries (χ^2=65.11, P<0.001). Almost all facial injuries were complex enough to warrant MF intervention.

Further, among patients, 158 (63.2%) had traumatic brain injury. Among traumatic brain injuries, 71 (44.9%) patients had soft tissue laceration of the face, 11 (7.0%) patients had cervical spine injury and 41 (25.9%) patients had fractures in MF region [Table 2 and Figure 2]. Comparing the frequency (%) traumatic brain injuries, χ^2 test revealed significantly different and higher frequency of soft tissue laceration of the face when compared to both cervical spine injury and fractures in MF region (χ^2=59.29, P<0.001).

The systemic injuries were grouped into following categories as lacerations and abrasions, injuries to liver, kidney, bladder and bowels, hemothorax, pneumothorax, loss of vision, fractures, long bone fractures, fracture, and spinal cord injury but is not included in this analysis. Patients with signs and symptoms of possible intracranial injury and/or facial bone fractures underwent computed tomography.

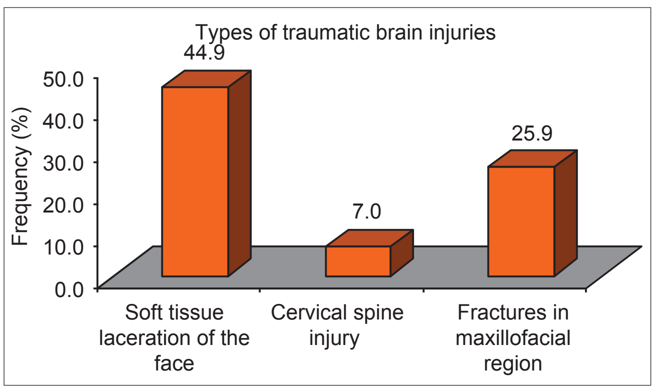

Figure 2: Distribution of types of traumatic brain injuries among patients

Table 2: Distribution of traumatic brain injuries

Types of traumatic brain injuries	No. of patients (n=158) (%)	χ^2 value	P value
Soft tissue laceration of the face	71 (44.9)	59.29	<0.001
Cervical spine injury	11 (7.0)		
Fractures in MF region	41 (25.9)		

MF: Maxillofacial

Table 3: Distribution of facial fractures

Types of facial fractures	Number of patients (n=41) (%)	χ^2 value	P value
Mandibular fractures	11 (26.8)	33.14	<0.001
Maxillary fractures	4 (9.8)		
ZMC	23 (56.1)		
Nasal fractures	3 (7.3)		

ZMC: Zygomatic complex

The distribution of facial fractures among patients is summarized in Table 3 and also shown in Figure 3. The facial injuries were predominantly seen in midfacial region. Mandibular fractures accounted for 26.8% of the total fractures. Mid facial injuries included fractures of ZMC fractures, maxilla and the nasal bones accounting 73.2% fractures of total mid-facial injuries. Comparing the frequency (%) facial fractures among patients, χ^2 test revealed significantly different and higher frequency of ZMC fractures when compared to other facial fractures (χ^2=33.14, P<0.001). The soft tissue lacerations were distributed predominantly over middle and upper third of the face.

DISCUSSION

A High association of faciomaxillary trauma with head injury was seen. Soft tissue lacerations are a major component of MF trauma. Majority of the injuries are concentrated around the mid face and upper third of the face. Mandibular fractures made only a smaller percentage of facial fractures. Midfacial traumas represented a majority of facial fractures. A similar study by Amit Agnihotri *et al.*[6] also reported nasal bone as the most common site of injury.[3] Isolated head injury was seen in only 27% of the patients.

Piotr Malara *et al.* studied the incidence and the pattern of MF injuries resulting from traffic accidents in the patients treated in the Department of MF Surgery at their institution. Most of the patients had injuries to the soft tissues of the face (22.21%), followed by tooth and alveolar process injuries (20.71%) and mandibular fractures (18.69%).[7]

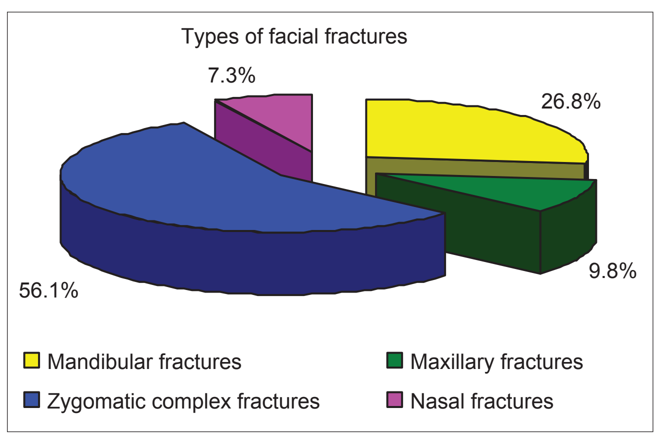

Figure 3: Distribution of types of facial fractures among patients

According to study of Back, *et al.*, most patients were males (76%), the average age was 38 years, and drugs or alcohol were a significant aspect of the history in 30% of the cases. The most common mechanism of injury was assault (47%), followed by falls and sporting injuries. 50% of the fractures involved the orbital or orbito-ZMC, and 55% had associated injuries.[8]

This study shows that the most common cause of facial injuries was RTA, which is consistent with the observation in other studies in India and other countries.[7,9,10]

Hashim *et al*.[11] determined the profiles including the causes of MF injuries seen in an urban government hospital in the mainland of Penang State, Malaysia. The majority of patients were men between 20 and 29 years of age. The main cause of injury was motorcycle accident (53.6%). The commonest injury (in isolation/combination with other injuries) involved the soft tissues (87.2%), dentoalveolar region (33.4%), and facial bones (23.9%). Laceration was the most common soft tissue injury, and crown fracture was the most frequent dentoalveolar injury. The facial bone that was most highly involved in the injury was the zygoma.

Obuekwe *et al*.[12] studied the etiological factors and the frequency of MF injuries due to RTA. Males 117 (37.5%) in the 21-30 years age range was most often involved. The forehead was most often the site of soft tissue injury (37.3%) while the mandible was the facial bone most often fractured (29.2%). Head injury (55.8%) was the commonest associated injury. The low utilization of safety devices likes seat belts and air bags, as well as the absence, and non-enforcement of road traffic legislation were identified as etiological factors.

Samuel Udeabor *et al.* determined the pattern of mid face trauma with associated concomitant injuries seen in Nigerian environment. They concluded that 20-29 years age group was mostly affected (44.6%) and the most common cause of mid face injuries was RTA (91.1%). Neurological injuries were the most common occurring concomitant injuries accounting for 47.2%, followed by ocular injuries with 24.3%.[13]

In fact, Haug *et al*.[14] was able to show from their series that motorcycle accidents were associated with the most severe head injury. Hogg *et al*.[15] in his study reported head injuries to have accounted for 87% of the associated injuries in their study in Ontorio, Canada, whereas Obuekwe and Etetafia[16] reported 55.8% of head injuries in Benin City, Nigeria. This wide range is probably due to different selection criteria and methods of detecting brain injury. Recognizing concomitant injuries in patients with a facial fracture is important for rapid assessment and further management of these patients.

LIMITATIONS

The current study works on the assumption that the given history was an accurate representation of the events. However, due to the retrospective nature of the study, it has inherent limitations that could be due to gaps in information and incomplete records, the accuracy of the original examination and documentation.

CONCLUSIONS

Strong association between head and face injuries implies need for sensitization of both faciomaxillary and neurosurgical specialties to each other's domain. Most MF units in India have associated neurosurgeons. Ironically few neurosurgical units have fulltime MF surgeons. The findings of this study emphasize the need for faciomaxillary surgeons in neurotrauma teams. Data from developed and uniquely developing countries symbolizes that RTA are on the acceleration and are observed to be fifth among major causes of mortality globally, leading to a notable proportion of injuries, deaths and disabilities in the community. The best outcome for these traumatized patients is associated with treatment by a multi-disciplinary trauma team, which includes a MF surgeon who has experience of these conditions. Furthermore, Neurosurgical casualty postings can provide tremendous learning opportunities for MF residents.

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How to cite this article: Dube A, Rao G, Tanwar A. Pattern of Maxillofacial Injury Associated With Head Injury at a Neuro Surgical Centre: An Analysis of 250 Cases. Int J Dent Med Spec 2014;1(2):2-6.

Support of Source: None, **Conflict of Interest:** None.