



Association of Head Injury and Maxillofacial Trauma: A Prospective Case – Control Study

KEYWORDS

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ABSTRACT *INTRODUCTION: There is paucity of information in literature regarding the relationship between head injury and facial trauma despite their anatomic proximity. This study aims at evaluating the type of injury, management and outcomes of patients sustaining maxillofacial trauma and concomitant cranial injury.*

MATERIAL AND METHOD: A prospective study was conducted in the department of plastic and reconstructive surgery, SMS hospital between January to December 2015. A total of 472 patients with maxillofacial injury were evaluated and their charts maintained. Patients were divided into two groups, patients with concomitant maxillofacial and head injury (study group-384 patients) and the others with only maxillofacial injuries (control group-88 patients). The groups were compared for demographic profile; pattern of head and maxillofacial injuries and correlation between head and maxillofacial injury was evaluated.

RESULTS: In this study we found that 81.3% patients with maxillofacial injury had associated head injury. There was a predominant sex bias with males being more prone to suffer maxillofacial injuries in both the groups. Majority of the patients were aged between 20-40 years. RTA was the most common cause of injury in the study group whereas fall from height was the most common cause in the control group. Fracture zygoma was the most common maxillofacial injury in the study group and fracture mandible was more common in the control group. Fracture mandible was also the most common isolated fracture in the whole study. Concussion was the most common associated head injury followed by pneumocephalus and depressed skull fracture. Loss of consciousness was the most common neurosurgical complaint followed by headache and vomiting. Most of the patients with head injury were managed conservatively and depressed skull fracture followed by intracranial hematoma was the most common cause of neurosurgical intervention. Fracture zygoma was found to have the strongest impact on the incidence of head injury followed by fracture of mandible and naso-orbito-ethmoidal complex. Fractures of the mid face region were most commonly associated with head injury and associated neurosurgical intervention.

CONCLUSION: Fractures of the bone in proximity of the brain were most commonly associated with head injury and also are the most common cause of neurosurgical interventions.

INTRODUCTION

Incidence of traumatic head injury and maxillofacial injury is increasing due to more number of road traffic accidents. There is lot of information on traumatic head injury and maxillofacial injury individually but there is paucity of information in literature regarding the relationship between head injury and facial trauma, despite their anatomic proximity.

Early detection of associated head injuries remains an important part of initial assessment and treatment planning in maxillofacial trauma patients and could significantly reduce morbidity and mortality associated with these life-threatening injuries. Existing literature on the correlation of traumatic head injuries and maxillofacial trauma is highly controversial. Some suggest that it is the facial skeleton that absorbs the energy of the trauma, protecting the brain from injury, whereas, others suggest that high energy trauma causing maxillofacial injury are high enough to cause concomitant head injury (1,2,3,4). The purpose of this study was to evaluate the pattern of head injuries in patients with maxillofacial trauma and to investigate the relationship between them.

MATERIALS AND METHODS

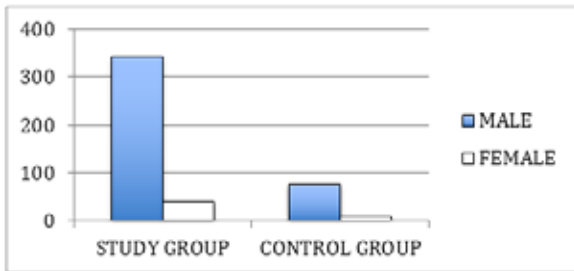
This is a prospective study that was conducted in the department of Plastic & Reconstructive Surgery, SMS Hospital, between January 2015 and December 2015. The study included 472 patients, who were admitted in the trauma centre of SMS Hospital with Maxillofacial injury and the workup included reviewing their medical history, physical examination, radiographic evaluation and neurosurgical consult. Information regarding age, gender, cause of injury, pattern of facial and head injury and neurosurgical symptoms were obtained and recorded. The mode of injury was noted as follows: Road traffic accidents, fall from height, assault, sports injuries and work related injuries etc. maxillofacial injuries were classified as fractures of mandible, maxilla, zygoma, naso-orbito-ethmoidal complex, frontal bone and panfacial fractures. Head injuries included intracranial injuries (concussion, cerebral contusion, intracranial hemorrhage, EDH, SDH, SAH) and skull fractures.

RESULTS

A total of 472 patients were admitted at the trauma center of SMS Hospital with maxillofacial injuries. Of these 384 patients (81.3%) had concomitant facial and head injury (study group) and 88 patients had maxillofacial injury without associated

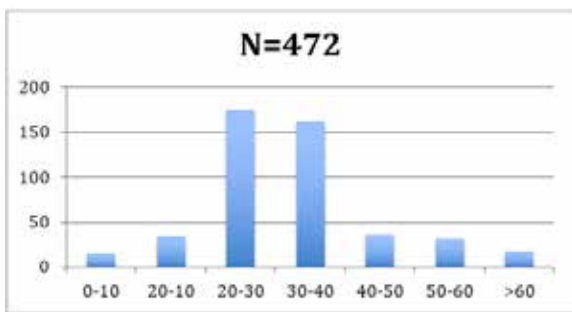
head injury(control group).

There was a predominant sex bias with male to female ratio of 8.36:1 in the study group and 7.8:1 in the control group. Overall there were 421 males and 51 females with maxillofacial injuries.(GRAPH 1)



GRAPH 1

Majority of the patients were in the age group between 15-40 years with 175 patients (38.7%) in the age group between 20-30 years and 162 patients (35.9%) in the age group between 30-40 years.(GRAPH 2)



GRAPH 2

The most common cause of injury overall was Road traffic accidents (RTA) 387 patients (82%) followed by fall from height 59 (12.5%), assault 16 (3.4%), work related injuries 8 (1.7%), sport injuries and others 2 (0.4%).

The most common cause of injuries in the study group was RTA 355 (92.4%), followed by fall from height 16 (4.16%), assault 9 (2.3%), work-related injuries 4(1%). In the control group fall from height 43(48.8%) was the most common cause followed by RTA 32 (36.36%), assault 7 (7.9%), work related injuries 4(4.5%) and sports related injuries 2 (2.2%). (TABLE 1)

	STUDY GROUP	CONTROL GROUP
RTA	355	43
FALL FROM HEIGHT	16	32
ASSAULT	9	7
WORK INJURIES	4	4
SPORT INJURIES AND OTHERS	0	2

TABLE 1

Out of the total 472 patients with maxillofacial injuries, zygoma was the most common fractured facial bone 46.8% (19.7% alone and 27.1% in combination). Fracture mandible followed it with 33.89% patients (21.6% alone and 12.29% in combination), fracture maxilla in 32.6% patients (7.2% alone and 25.4% in combination). Fracture of naso-orbito-ethmoidal complex (NOE) was present in 19.9% pa-

tients (8.26% alone and 11.64% in combination). This was followed by fracture of the frontal bone and supra orbital rim (SOR) which was present in 2.4% patients (1.25% alone and 1.15% in combination). (TABLE 2)

In the study group, the most common facial fracture was fracture zygoma 186 (48.4%), followed by fracture maxilla 129 (33.5%), fracture mandible 123 (32%) and fracture NOE and SOR 78(20.3%). In the control group, the most common facial fracture was fracture mandible 37(42.0%) followed by fracture zygoma 35(39.7%), fracture maxilla 25(28.5%) and fracture NOE and SOR 16(18.18%). Amongst all the isolated fractures, mandibular fracture 21.6% was the most common.(TABLE-2)

	TOTAL	STUDY GROUP	CONTROL GROUP
FRACTURE ZYGOMA	93	86	7
FRACTURE MANDIBLE	102	92	10
FRACTURE MAXILLA	34	29	5
FRACTURE NOE	63	55	8
FRACTURE SOR/ FRONTAL BONE	6	5	1
COMBINED FRACTURE	174	117	57

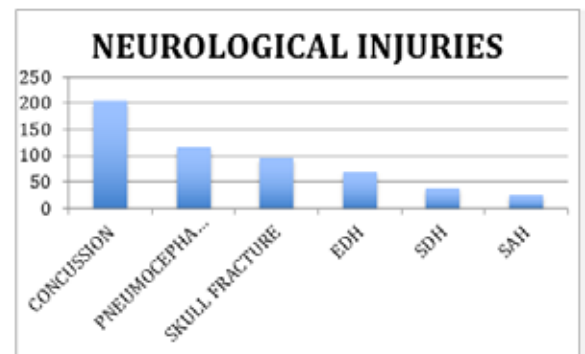
TABLE-2

It was found that fracture zygoma had the strongest impact(3.34 fold) on the incidence of head injuries. Mandibular and NOE fracture increased the risk of head injuries nearly 2.46 and 1.67 fold respectively. The risk was increased more than 1.36 times in the presence of fracture maxilla.(TABLE-3)

	ODDS RATIO OF ASSOCIATION WITH HEAD INJURY	CONFIDENCE INTERVAL
FRACTURE ZYGOMA	3.34	1.49-7.5
FRACTURE MANDIBLE	2.46	1.22-4.94
FRACTURE MAXILLA	1.36	0.51-3.61
FRACTURE NOE	1.67	0.77-3.22
FRACTURE SOR/ FRONTAL BONE	1.15	0.13-9.95

TABLE-3

Of the 384 patients with head injury, concussion 203 (52.86%) was the most common neurosurgical injury followed by pneumocephalus 115 (29.9%), depressed skull fracture 96 (25%), EDH 68(17.70%), SDH 39 (10.15%) and SAH 25 (6.51%). (GRAPH-3)



GRAPH-3

Most common neurosurgical symptom in patients with

head injury was loss of consciousness 277 (72%), followed by headache 164 (43.1%), vomiting 100 (26.1%), Rhinorrhoea 61(15.9%), Otorrhoea 27 (7%) and others 19 (4.9%). History of loss of consciousness was most commonly present in patients with fractures of SOR and NOE complex 86% followed by fracture zygoma 65%, fracture mandible 56% and fracture maxilla 46%.

Most of the patients in the study group were managed conservatively (305) and only 79 patients were operated upon. The most common cause for operative intervention was depressed fracture of the skull 58 patients followed by intracranial hematoma 64 patients.

Patients with single maxillofacial injuries were divided into 3 groups, fractures of the upper face, mid face, lower face and then its correlation with head injury and neurosurgical intervention was evaluated. It was found that fractures of the mid face increased the risk of head injury and related neurosurgical intervention by 2.7 fold and had the strongest association amongst all. Fractures of lower face (2.45 fold) and upper face (1.62 fold) were also associated with increased risk of head injury. TABLE-4

	NUMBER OF PATIENTS	PATIENTS REQUIRING NEUROSURGERY	ODD RATIO	CONFIDENCE INTERVAL
UPPER FACE	60	25(41.6%)	1.62	0.77-3.42
MID FACE	115	26(22.6%)	2.7	1.42-5.17
LOWER FACE	92	14(15.2%)	2.45	1.22-4.94

TABLE-4

DISCUSSION

There is scarcity of published data on the association of head injuries with maxillofacial trauma. The available data on this association is highly variable (5,6,7). The incidence reported ranges from 5.4% in study by Lim et al (9) to 86% by Hayter et al (4,8,9). The incidence found in our study was 81.35%. These variations are probably due to cultural, habitual or methodological differences in the populations studied.

The incidence of head injuries and maxillofacial injuries was more common in males as compared to females. There was no difference in the sex ratio in the study or control groups. This indicates that males are more prone to maxillofacial injuries with or without concomitant head injury which may be due to the fact that they are relatively more involved in automobile driving, motorcycling, violence and alcoholism.

It was found that the majority of patients were in the age group between 15-40 years, which may be due to more involvement of this age group in outdoor activities, alcoholism and thereby making them more prone to injuries.

In the study we found that RTA was the most common cause of concomitant maxillofacial and head injuries followed by fall from height, whereas, fall from height was the most common cause in the control group. This finding corroborates with the findings of Pappachan and Alexander, Haug et al.(5,10)

Overall the most common facial fracture in our study was found to be fracture zygoma followed by fracture mandible, fracture maxilla and lastly fracture NOE and SOR. In the study group also the most common fracture was that

of zygoma followed by fracture maxilla and then by fracture mandible and fracture NOE and SOR. In the control group, fracture mandible topped the list, which was also the most common isolated fracture. These findings are similar to the findings of Pappachan and Alexander, Haug et al and Rajender et al (5,6,7,10,11).

Similar to prior studies the most common neurosurgical symptom was loss of consciousness, which was also most common in patients with fractures of the upper face (5,10,12).

In this study, the most common head injury in patients with maxillofacial trauma was concussion followed by pneumocephalus and depressed skull fracture. This is comparable to results of previous studies. Intracranial hemorrhage was present in 34.36% cases in present study, which was more as compared to previous studies (5,10,12,14). This may be due to the differences in the mode and severity of injuries. As reported by Pappachan and Alexander and Zandi M et al, the incidence of CSF rhinorrhoea was twice as frequent as CSF Otorrhoea.(5,14). This is explained by the fact that anterior cranial base is relatively closer to midfacial structures and has more sutural connections with mid facial bones.

In the present study we observed that fracture zygoma had the strongest impact (3.3 fold) on the incidence of head injuries. This was followed by fracture mandible and fracture maxilla (2.45 and 1.35 fold, respectively). Fractures of NOE and SOR (1.67 and 1.14 fold, respectively) also had a positive correlation. These values are similar to what has been reported in previous studies by Hohlrieder et al(12) and Kloss et al(13). The results of the studies conducted by Zandi M et al and Haug et al were different from the present study in terms of the fracture site and showed much higher values. These differences in the facial bone or head injury being studied and the variation in classification, nomenclature, or methodology of prior studies may explain these conflicting results (7,12,13,15).

CONCLUSION

Adult males in the age group of 15-40 years are the most common victims of craniofacial trauma. Road traffic accidents were responsible for the majority and most of the patients sustained mild head injury who were then managed conservatively. Fracture zygoma was the most common maxillofacial injury and had the strongest impact on the incidence of head injury. More severe was the maxillofacial injury more were the chances of neurological injury. Fracture of the mid-face was found to be most commonly associated with head injury and the associated neurosurgical intervention, followed by that of the upper face.

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