

Original article :

Clinical profile of facial bony injuries in the foothills of Himalayas, Garhwal

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Abstract:

Facial injuries refer to any trauma to fleshy or bony structures of the face like fracture of facial bones, abrasions, lacerations, septalandaicular haematomas and other injuries around the nose, ears and eyes. Various types of injuries occur depending on the etiology and mechanism and can be broadly classified as soft tissue and bony injuries. The global status report of the World Health Organization (WHO) on road safety suggested that India is leading in road traffic accidents in the world.

Aims and Objectives: 1.To study the etiology and clinical profile of facial bony injuries; 2. To study the management and outcome of facial bony injuries.

Results: The present study over 12 months was carried out in Department of Surgery, Himalayan Institute of Medical Sciences. The maximum number of patients were in the age group 21-30 yrs and mode of injury was maximum by RTA, maximum number of patients 33 had a GCS of E4V5M6. 26 patients presented with tenderness & crepitus over the mandible and 29 patients had lacerations most commonly with 20% patients having associated head injury. 29 patients underwent 3D-CT scan as an investigating modality. Maximum number of patients underwent reduction with IMF with stabilization of the fracture and most patients had satisfaction both in subjective and objective outcome of the management.

Conclusion: The face not only occupies the most prominent position in the human body but also injuries in it are quite common as face is also the most exposed part.85% were males with 80% facial injuries were the result of road traffic accidents with 67% bony injury in middle face. The surgical procedures used were Reduction or elevation aor Reduction with IMF in most patients. The subjective and objective outcomes at 6th week were mostly satisfactory, with the exception of few like malocclusion, obvious scar, nasal asymmetry, zygomatic asymmetry, mandibular asymmetry.

INTRODUCTION

The face occupies the most prominent position in the human body rendering it vulnerable to injuries quite commonly. Facial injuries refer to any trauma to fleshy or bony structures of the face like fracture of facial bones, abrasions, lacerations, septalandaicular haematomas and other injuries around the nose, ears and

eyes. Main causal factors include road traffic accidents, interpersonal violence or homicidal injuries, domestic accidents, falls, gun-shots, bomb blasts, industrial accidents and other work or occupational related injuries, sports related injuries, animal injuries, suicidal, earthquake, and iatrogenic injuries (1). Among these causes, the four most commonly known

sources of facial trauma are Motor vehicle Collision (MVC), assault, sports and falls (2). The commonest type of soft tissue injury is laceration while the commonest etiology is road traffic accident followed by fall. Men are generally more involved than women and the commonest complication is wound dehiscence (3).

The precise nature of injury to the cranio maxillofacial region is determined by the degree of force and the resistance to the force offered by the craniofacial bones (4).

Various types of injuries occur depending on the etiology and mechanism and can be broadly classified as soft tissue and bony injuries. Facial bony fractures can again be classified as isolated fractures (fracture of single bone) and complex fracture (fracture of two or more facial bones). Facial bones affected in fractures may be: frontal bone, orbital bone, nasal bone, maxilla, zygoma and mandible (5).

Evaluation and management of a trauma patient requires a primary trauma survey and secondary assessment for concomitant injuries and specific factors that guide management. The global status report of the World Health Organization (WHO) on road safety suggested that India is leading in road traffic accidents in the world, and as the face is one of the most exposed part of the body, it is very prone to sustaining injuries during accidents (6).

The purpose of this study is to report the detailed clinical profiles and epidemiology of facial bony injury cases coming to the Department of surgery of this institution for better understanding of this health problem, finally aimed at reducing the incidence by identifying possible preventive measures and improving the patient management and care.

AIMS AND OBJECTIVES

1. To study the etiology and clinical profile of facial bony injuries.
2. To study the management and outcome of facial bony injuries.

MATERIALS AND METHODS

This descriptive and case series study of sample size 40 patients was carried out in Department of Surgery, Himalayan Institute of Medical Sciences, Swami Ram Nagar, Dehradun over a period of twelve months prospective. All the cases of the facial bony injuries being attended in the Emergency and Surgery O.P.D/Wards were included in the study after obtaining a written informed consent.

Inclusion Criteria

- Radiologically proven facial bony injury.

Exclusion Criteria

- The patients who lost contact in follow up (maximum of 6 weeks)
- The patients who died during the course of the study.

In all the patients with facial bony injuries, following information was collected to generate data for the study.

Demographic and other required general information, relevant detail medical history- Chief complaints in chronological order, mode of injury, Relevant general & specific medical examination, investigations and treatment modalities including operative procedures for the various facial bony injuries and the subsequent outcome were observed and recorded. All the patients in this series were called for follow up regularly at the interval of one week, three weeks and six weeks as and

when required. Interpretation of data was based on software SPSS (Statistical Package for the Social Sciences), version 19.0 for Windows. Descriptive statistics - frequency distribution, and if relevant, appropriate measures of central tendency and dispersion were calculated.

RESULTS

The present study over 12 months was carried out in Department of Surgery, Himalayan Institute of Medical Sciences. Gender-wise, number of male and female were in the ratio 34:6. According to the table 1 the maximum number of patients were in the age group 21-30 yrs that is 18 and minimum were in the age group 51-60 that is 1.

Table 1. Age group of the studied patients (n=40)

Age group (years)	Number
10-20	6
21-30	18
31-40	11
41-50	4
51-60	1

The mode of injury was maximum by RTA as patients were 32 (80.0%)(Table 2).

Table 2. Mode of injury among the studied patients (n=40)

Mode of Injury	Number of Patients
RTA	32
Assault	2
FFH	6

According to timing of injury, number of patients between 8AM to 4PM were 17(42.50%), between 4PM to 12AM were 18(45.0%) and between 12AM to 8AM were 5(12.5%) and alcohol intoxication was present in 31 patients out of 40.

Evaluating the Glasgow Coma Scale (GCS) of 40 patients, maximum number of patients

33(82.50%) had a GCS of E4V5M6 whereas 3 (7.50%) patients had a GCS of E3V4M5. However, the descriptive statistics of continuous parameters revealed mean±S.D for age to be 29.97±9.62 and for GCS to be 14.27±1.69(Table 3, 4)

Table 3. Descriptive statistics of the continuous parameters in the study.

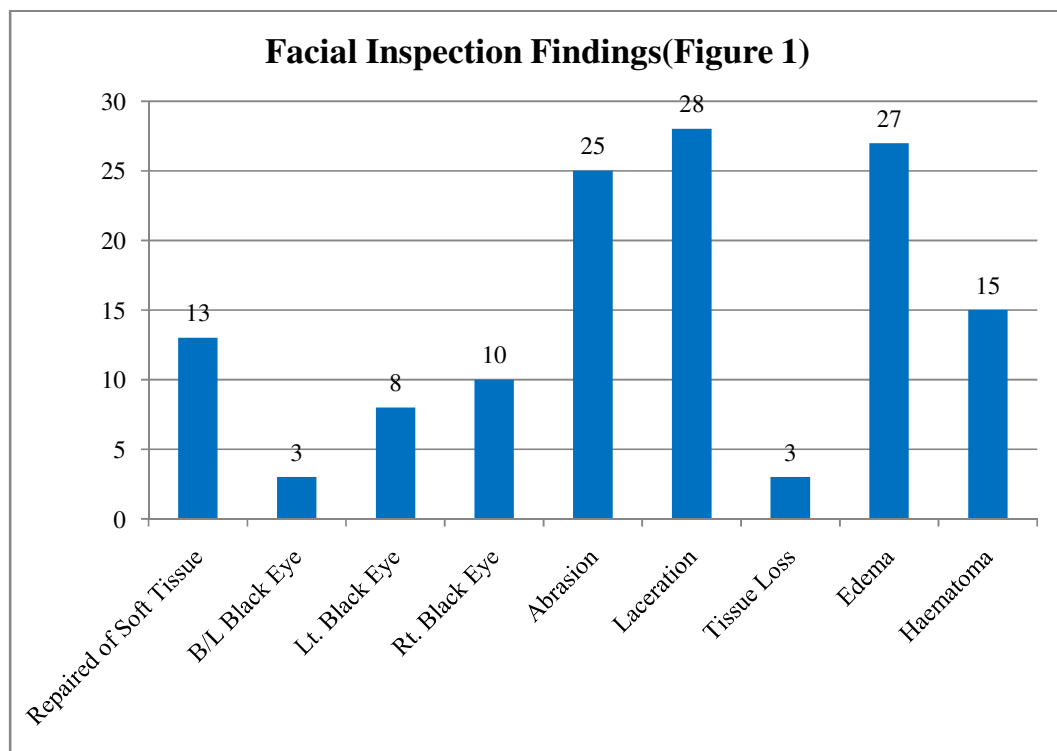
Parameters	N	Min.	Max.	Mean±S.D.
Age (years)	40	15	55	29.97±9.62
Total GCS (Score)	40	8.00	15.00	14.27±1.69

S.D.=Standard Deviation.

Table 4. GCS of the studied patients (n=40)

GCS	Number of the Patients
E4V5M6	33
E3V4M5	3
E3V3M4	1
E1V2M5	1
E2V5M4	1
E4V3M4	1

Multiple type of facial injury were present in many patients and most commonly 28 patients presented with laceration followed by 27 patients presented with edema (Figure 1)



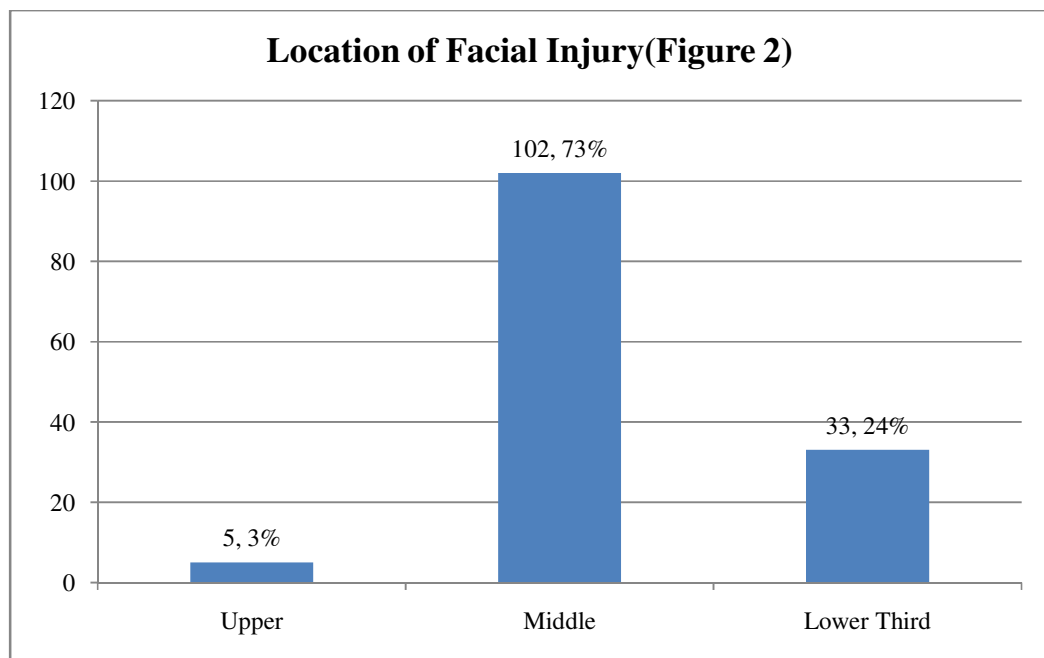
Tenderness and crepitus at more than one location was present in several patients and 26 patients presented with tenderness & crepitus over the mandible (Table 5).

Table 5. Location of crepitus & tenderness as found in facial palpation among the studied patients (n=40)

Location of Crepitus and Tenderness	Number of the Patients
Cranium	4
Orbital margins	10
One side of nasal bones	11
Bilateral nasal bone	1
Zygomatic	16
Mandible	26
Maxilla	18

Out of 40 patients, 12 had comminuted and displaced type of fracture whereas 10 patients had displaced, 9 patients each had Undisplaced and Comminuted fractures.

Of these 40 patients, they had 140 different bony injuries out of which 102 patients had injury of middle face (Figure 2).



In upper face, 2 patients each had injury of frontal sinuses and supraorbital ridges whereas 1 patient had injury to frontal bone.

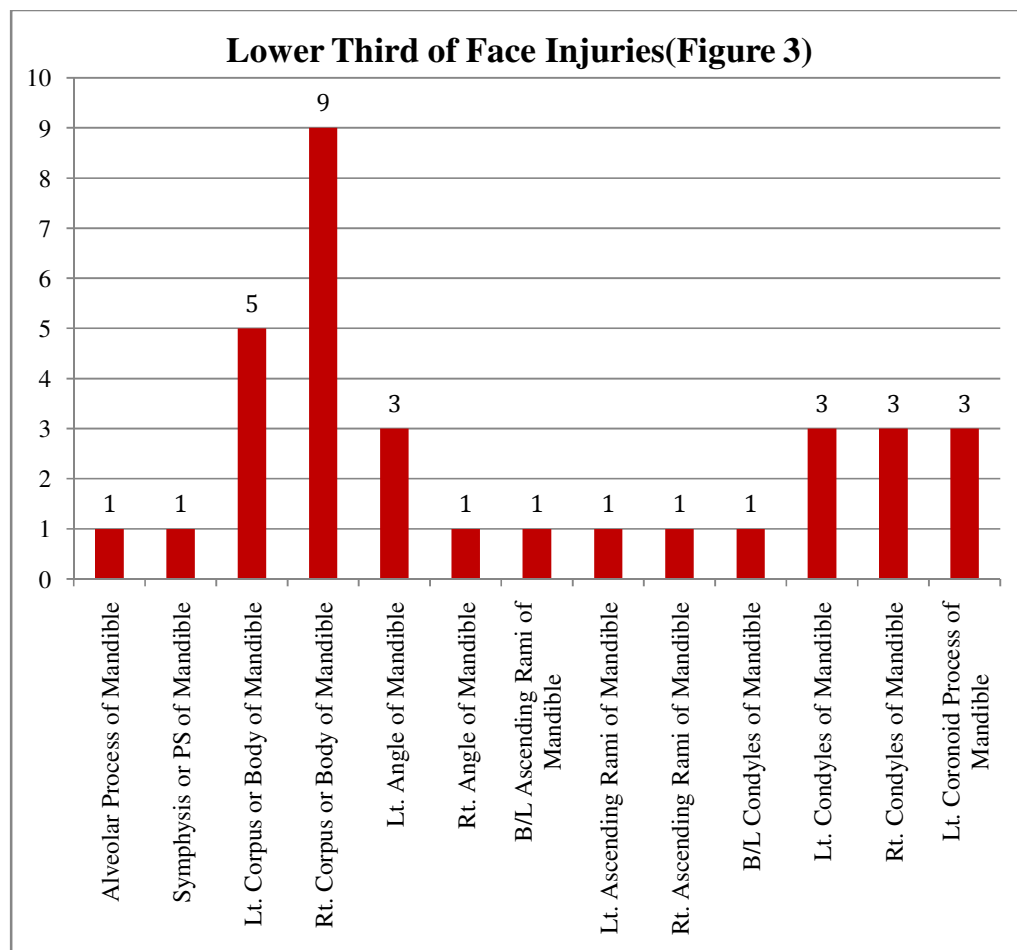
In middle face, more than one location of middle face injury was seen in almost all the patients. 20 patients had injury to maxillary bone, 18 patients had injury to maxillary sinuses and only 9 patient had injury to septum.

According to the maxillary fracture location, 10 patients had Le Forte type II fracture and 5 patients each had Le Forte I and Le Forte III fractures(Table 6)

Table 6. Maxillary fractures among the studied patients (n=40)

Maxillary fracture	Number of the Patients
Left Le Forte I	3
Right Le Forte I	2
Left Le Forte II	3
Right Le Forte II	4
Bilateral Le Forte II	3
Le Forte III	5
Absent	20

Amongst lower third face injury among 40 patients, most commonly 14 patients had fracture to body of mandible (Figure 3).

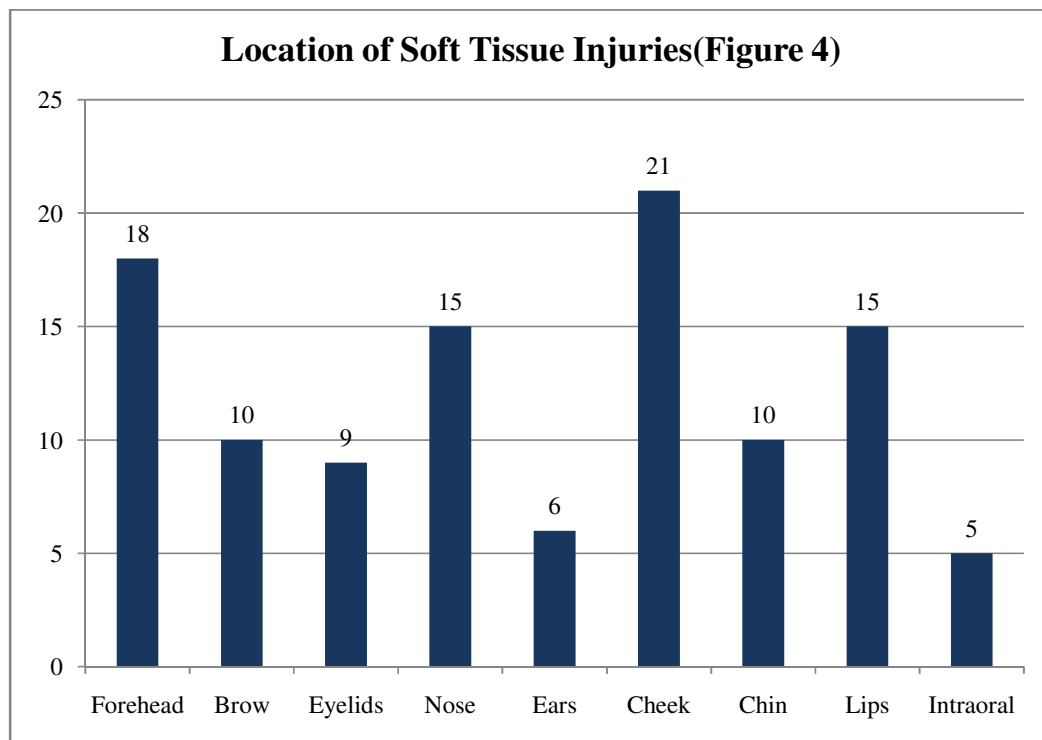


Multiple soft tissue injuries were present, out of which 29 patients had laceration (Table 7).

Table 7. Type of soft tissue injuries among the studied subjects (n=40)

Soft Tissue Injury	Number of the Patients
Contusion	20
Retained foreign body	5
Puncture	3
Laceration	29
Avulsion flap	1
Loss of tissue	0

These 40 patients had more than one location of soft tissue injury each. 21 patients had injury over the cheek followed by 18 patients had injury over the forehead and others (Figure 4).



Amongst 40 patients, 20% patients had associated head injury, 10% patients had limb injury and 5% patient had cervical spine injury whereas injury to head, chest and abdomen were minimal. Based on the dental status of 40 patients, 25 patients had malocclusion, 4 patients were edentulous and 11 patients had normal dental status. 29 patients had restricted jaw opening pre-operatively whereas 11 patients had normal jaw opening.

Based on imaging done in 40 patients, 29 (72.50%) patients underwent 3D-CT scan as an investigating modality (Table 8)

Table 8. Imaging done among the studied subjects (n=40)

Imaging	Number of the Patients
X-ray	4
3D-CT	29
X-ray & 3D-CT	7

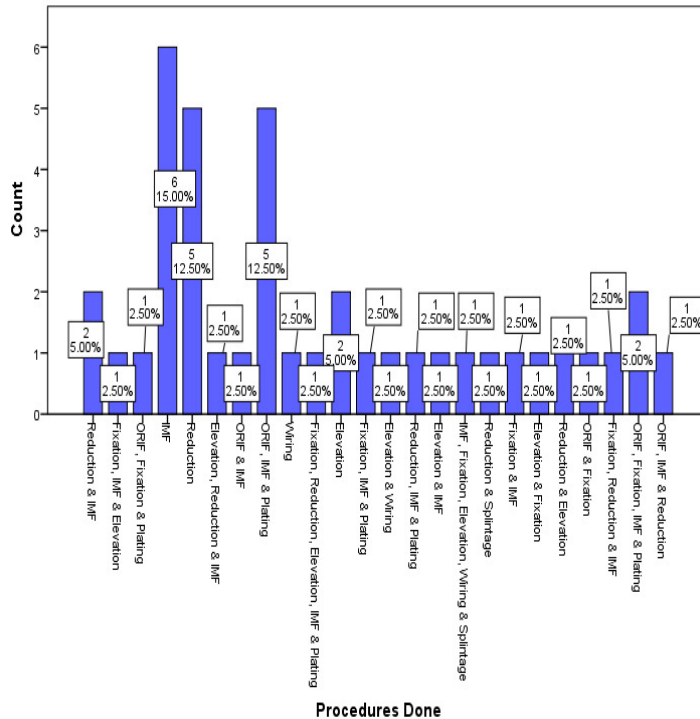
On the basis of surgical procedures, maximum number of patients underwent reduction with IMF with stabilization of the fracture that was 16 (40.0%) (Table 9, Figure 5)

Table 9. Surgical procedures, which were done in the studied patients (n=40).

Procedure	Number of the Patients
# Reduction / elevation	9
# Reduction + IMF	11
# Reduction + Stabilization	4
# Reduction + IMF + Stabilization	16

The above table shows surgical procedures which were done in 40 patients. Maximum number of patients underwent reduction with IMF with stabilization of the fracture that was 16 (40.0%) and 11(27.5%) patients underwent reduction with IMF of the fracture.

Surgical Procedures done(Figure 5)

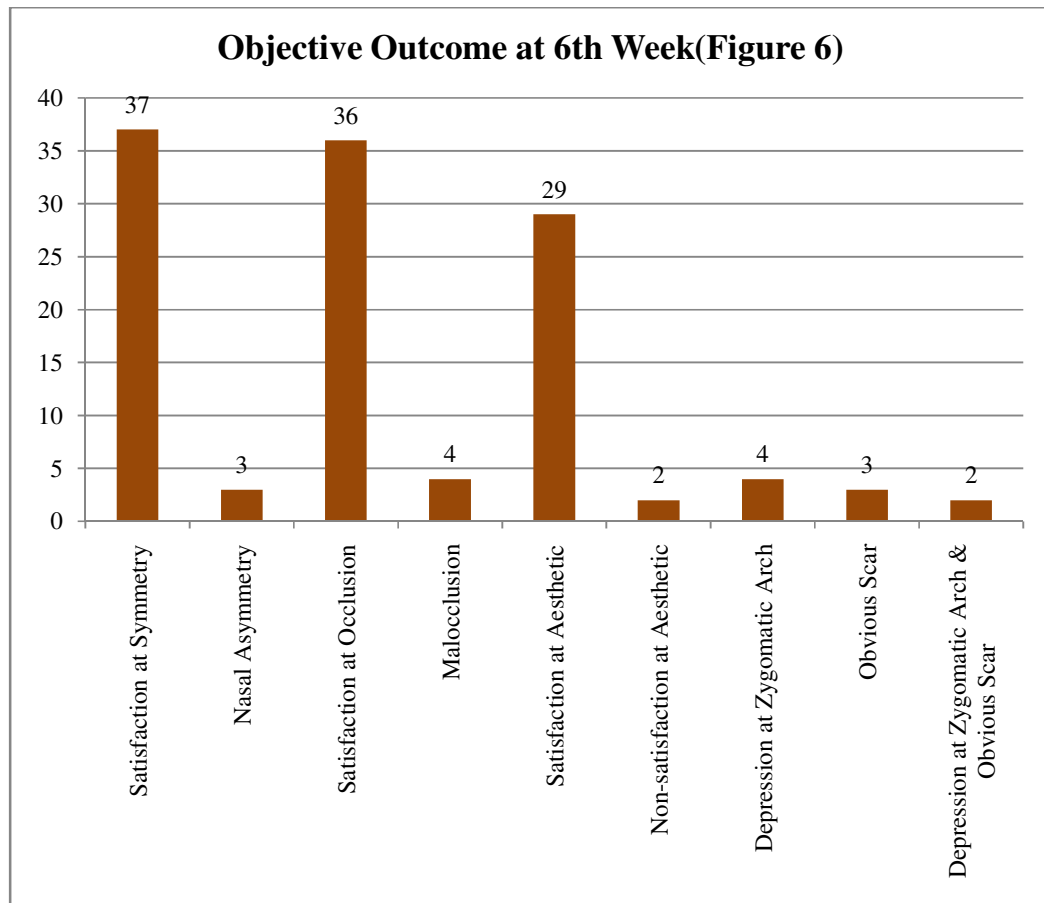


The subjective outcome at 6th week among 40 patients is shown in Table 10.

Table 10. Subjective outcome at 6th week among the studied patients (n=40).

Criteria	Outcome	Number of the Patients
Occlusion	Satisfactory	36
	Malocclusion	4
Aesthetic	Satisfactory	28
	Obvious Scar	3
	Nasal asymmetry	2
	Zygomatic asymmetry	4
	Mandibular asymmetry	3

This figure shows objective outcome at 6th week among 40 patients(Figure 6).



The below table shows presence of unfavourable results if any in 40 patients (Table 11).

Table 11. Status of postoperative jaw opening, unfavourable results and overall outcome among the studied patients (n=40)

Criteria	Status	Number of the Patients
Postoperative jaw opening	Normal	40
Unfavourable results	Absent	34
	Loss of Teeth	3
	Hypoaesthesia	2
	Loss of Teeth & Hypoaesthesia	1
Outcome	Satisfactory	40

DISCUSSION:

In human body, face holds one of the most important yet exposed positions, which render it vulnerable to various injuries. Face may suffer any trauma to its fleshy or bony structures, which may be caused by road traffic accidents, assaults, industrial accidents and other work or occupational related, sports related, natural disasters associated etc (1). Injuries to the face not only impart a high degree of emotional, but also a severe physical trauma to patients (6). With increasing number of patients admitted to hospital, facial injuries are also a main cause of expensive treatment and rehabilitation, temporary or lifelong morbidity, and loss of human productivity (5). In the present study, out of all the studied patients, 85% (34 out of 40) were males as compared to 15% (6 out of 40) were females. Similar finding was reported by Chandra Shekar B and Reddy C (7), Abbas et al (8), Ozgenel et al (9), and Patrocínio et al (10) who attributed the higher incidence among the males due to the fact that men are mostly involved in outdoor activities.

When age groups of the studied patients were analyzed, maximum belong to 21-30 years age group (45%) followed by 31-

40 years age group (27.5%), indicating the majority of the injuries occurred in the age group of 21-40 years. This is in conformity with the reports of Abbas et al (8), Ozgenel et al (9) and Deogratius BK et al (11) who attributed this high frequency to frequent travel, firearms, industrial jobs and sports.

In the present study it was noticed that road traffic accidents were the most common mode of injury (80%), followed by fall from height (15%). Ortakoglu et al (12) and Ferrira et al (13) reported similar observations from developing countries. Rowe N (14), and Khosla and Boron (15) also reported high incidence due to road traffic accidents, and attributed this to hustle bustle of fast modern life style, increasing number of vehicles on crowded, congested road networks, faster vehicular movement and poor traffic compliance & regulation, poor road illumination, poor vehicular maintenance and increasing density of diverse vehicle on the roads in this geographical region.

Hussain et al (16), Ortakoglu et al (12), and Al Ahmed et al (17) reported high incidence in middle and upper region of face. The ratio of lower third to middle third bony injuries in our study was 0.47:1. On the

contrary, this ratio was 2.8:1 as reported by Krekule and Balakan (18), and 4:1 as reported by Rowe N in their respective series (14). The high incidence of bony facial injuries to middle and lower third may be due to the fact that they are relatively more prominent and exposed (19).

When maxillary fractures were considered, the maximum was Le forte III (12.5%), followed by right Le forte II (10%). However, Al Ahmed et al (17) and Deogratius BK et al (11) reported Le forte I fracture as the most common among the middle thin facial fractures in their finding, which may be due to difference in geographical and etiological reasons.

In the lower third of face, maximum injuries including bony injuries occurred in the region of right corpus or body of mandible (28%). This could be attributed to the fact that right is the dominant side of the body. Wong K (20) and King et al (21) reported canine region and body of mandible as the common site of mandibular fracture in their studies. Ortakoglu et al (12) reported, on the other hand, mandibular body fracture as the most common. It could be due to the difference in sites of initial impact in different series (12).

In the present study, the commonest type of soft tissue injury present was laceration (50%), followed by contusion (34%), retained foreign body (9%), puncture (5%), and avulsion flap (2%). The commonest site of location of soft tissue injuries were cheek (19%), forehead (17%), lips (14%), nose (14%), brow (9%), chin (9%), eyelids (8%), ears (5%) and intraoral (5%).

Apart from the facial bony injuries described, other common associated injuries included head injury (20%), limb injury (10%),

cervical spine injury (5%), head & chest injury (2.5%), chest & abdominal injury (2.5%), and chest injury (2.5%). Malocclusion (62.5%), followed by edentulous (10%) were the common dental injuries noted in the study. The above observation was supported by the finding of Fasola et al who reported that the most common associated injury with bony facial injuries was laceration, followed by orthopaedic injuries and ophthalmic injuries (22).

The coma scale in our study were on higher side for most of the patients, with majority having the scale of E4V5M6 (82.5%), followed by E3V4M5 (7.5%), and E3V3M4 (2.5%), E1V2M5 (2.5%), E2V5M4 (2.5%) and E4V3M4 (2.5%). The mean total GCS was 14.27 ± 1.69 with 82.5% of the patients having total GCS of 15. There was no mortality in our study. The mean duration of hospital stay was 7.80 ± 8.46 days with 15% of the patients having stayed for 6 days. Terry (23), Cowlly (24), and Champion and Harmer (25) also mentioned that even severe facial injuries are not generally associated with threatening of life.

In our study, the diagnostic radiological investigations being sought were: 3D-CT (72.5%), X-ray & 3D-CT (17.5%) and X-ray (10%).

The surgical procedures used in our study were in consistent with those of Kruger (26), Hopkins (27) and others. Kimitani et al in their study suggested conservative procedure to be the first choice as a reasonable and less invasive procedure for functional repair of mandibular condyle fractures (28). Most of the zygomatic fractures were commonly reduced by Gillies temporal approach for elevation of zygomatic arch and complex. Balasubramanian

has reported that upper buccal sulcus approach has more advantage in comparison to Gillies method as less force is required for reduction (29). The subjective and objective outcomes of patients at 6 weeks were studied. There was malocclusion in 4 patients. As far as aesthetics were concerned, 4 patients had zygomatic asymmetry, 3 patients had obvious scar, 3 patients had mandibular asymmetry and 2 patients had nasal asymmetry. Rest had satisfaction both in subjective and objective outcome of the management. As far as unfavourable results were associated with the injury management was concerned, which was recorded at 6th week, 3 patients had loss of teeth, 2 patients had hypoaesthesia, and 1 patient had both loss of teeth & hypoaesthesia. Rest had nil complication. Also, post-operative jaw opening was normal in 100% of the patients. It is to be noted that pre-operative jaw opening was restricted in 72.5% of the total patients studied. The overall outcome of the injury management done was satisfactory in all the studied patients. Hence, the conventional time tested methods of treatment of facial bony and soft tissue injuries associated provided a reasonable and satisfactory outcome.

CONCLUSION

The face not only occupies the most prominent position in the human body but also injuries in it are quite common as face is also the most exposed part. In our study, among the studied patients, 85% were males, and maximum belonged to the age group of 21-40 years. Most of the facial injuries were the result of road traffic accidents (80%), followed by fall from height (15%). Most of the patients sustained bony injury in middle face (67%), followed by

lower third (32%). Out of the all the fractures, maximum were comminuted & displaced (30%), followed by others. The bony injuries in middle face, were mostly in maxillary (43%), followed by nasal (27%) and others. The commonest site of injury in lower third of face was right corpus or body of mandible (28%), and in upper third of face were frontal sinuses (40%) and supraorbital ridges (40%). The commonest types of soft tissue injury and dental injuries were laceration (50%) and malocclusion (62.5%) respectively. Majority of the patients had GCS of E4V5M6 (82.5%) with mean duration of hospital stay being 7.80 ± 8.46 days. 3D-CT (72.5%) was the most commonly radiological investigation done. The surgical procedures used were Reduction or elevation in 9 (22.5%) patients, Reduction with IMF in 11 (27.5%) patients, Reduction with stabilization in 4 (10.0%) patients and Reduction with IMF with stabilization in 16 (40.0%) patients in accordance with the type of bony injuries. The subjective and objective outcomes at 6th week were mostly satisfactory, with the exception of few like malocclusion, obvious scar, nasal asymmetry, zygomatic asymmetry, mandibular asymmetry present in 4, 3, 2, 4 and 3 patients respectively. There were few unfavourable results after the treatment like loss of teeth, hypoaesthesia and both loss of teeth & hypoaesthesia present in 3, 2 and 1 patients respectively. Post-operative jaw opening was normal in 100% as compared to pre-operative restricted jaw opening of 72.5%. The overall outcome of the injury management done was satisfactory in all the studied patients.

REFERENCES

1. Olayemi AB, Adeniyi AO, Samuel U, Emeka OA. Pattern, severity, and management of cranio-maxillofacial soft-tissue injuries in Port Harcourt, Nigeria. *J Emerg Trauma Shock*. 2013;6(4):235-40.
2. Muraoka M, Nakai Y, Nakagawa K, Yoshioka N, Nakaki Y, Yabe T et al. Fifteen-year statistics and observation of facial bone fracture. *Osaka City Med J*. 1995;41(2):49-61.
3. Kumar RV, Devireddy SK, Gali RS, Chaithanyaa N, Sridhar. A Clinician's Role in the Management of Soft Tissue Injuries of the Face: A Clinical Paper. *Journal of maxillofacial and oral surgery*. 2013;12(1):21-9.
4. Krausz AA, Krausz MM, Picetti E. Maxillofacial and neck trauma: a damage control approach. *World journal of emergency surgery : WJES*. 2015;10:31.
5. Hwang K, You SH. Analysis of facial bone fractures: An 11-year study of 2,094 patients. *Indian J Plast Surg*. 2010;43(1):42-8.
6. Rahman SA, Chandrasala S. When to suspect head injury or cervical spine injury in maxillofacial trauma? *Dent Res J (Isfahan)*. 2014;11(3):336-44.
7. Chandra Shekar B, Reddy C. A five-year retrospective statistical analysis of maxillofacial injuries in patients admitted and treated at two hospitals of Mysore city. *Indian Journal of Dental Research*. 2008;19(4):304.
8. Abbas I, Ali K, Mirza YB. Spectrum of mandibular fractures at a tertiary care dental hospital in Lahore. *Journal of Ayub Medical College, Abbottabad : JAMC*. 2003;15(2):12-4.
9. Ozgenel GY, Bayraktar A, Ozbek S, Akin S, Kahveci R, Ozcan M. A retrospective analysis of 204 mandibular fractures. *Turkish journal of trauma & emergency surgery*. 2004;10(1):47-50.
10. Patrocinio LG, Patrocinio JA, Borba BH, Bonatti Bde S, Pinto LF, Vieira JV et al. Mandibular fracture: analysis of 293 patients treated in the Hospital of Clinics, Federal University of Uberlandia. *Brazilian journal of otorhinolaryngology*. 2005;71(5):560-5.
11. Deogratius BK, Isaac MM, Farrid S. Epidemiology and management of maxillofacial fractures treated at Muhimbili National Hospital in Dar es Salaam, Tanzania, 1998-2003. *International dental journal*. 2006;56(3):131-4.
12. Ortakoglu K, Günaydin Y, Aydintug YS, Bayar GR. An analysis of maxillofacial fractures: a 5-year survey of 157 patients. *Military medicine*. 2004;169(9):723-7.
13. Ferreira PC, Amarante JM, Silva PN, Rodrigues JM, Choupina MP, Silva AC et al. Retrospective study of 1251 maxillofacial fractures in children and adolescents. *Plastic and reconstructive surgery*. 2005;115(6):1500-8.
14. Rowe N. Fractures of the facial skeleton in children. *Journal of oral surgery (American Dental Association: 1965)*. 1968;26(8):505.
15. Khosla M, Boren W. Mandibular fractures in children and their management. *Journal of oral surgery*. 1971;29(2):116-21.
16. Hussain SS, Ahmad M, Khan MI, Anwar M, Amin M, Ajmal S et al. Maxillofacial trauma: current practice in management at Pakistan Institute of Medical Sciences. *Orbit*. 2003;12:5.7.
17. Al Ahmed HE, Jaber MA, Fanas SHA, Karas M. The pattern of maxillofacial fractures in Sharjah, United Arab Emirates: a review of 230 cases. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology*. 2004;98(2):166-70.
18. Krekule J, Balabán D. The incidence of fractures of the facial bones. *Ceskoslovenska stomatologie*. 1969;69(6):344-9.

19. Horibe EK, Pereira MD, Ferreira LM, Andrade Filho EF, Nogueira A. Epidemiological profile of mandible fractures treated at the Federal University of Sao Paulo-Paulista Medical School. *Rev Assoc Med Bras* (1992). 2004;50(4):417-21.
20. Wong K. Mandible fractures: a 3-year retrospective study of cases seen in an oral surgical unit in Singapore. *Singapore dental journal*. 2000;23(1 Suppl):6-10.
21. King RE, Scianna JM, Petruzzelli GJ. Mandible fracture patterns: a suburban trauma center experience. *American journal of otolaryngology*. 2004;25(5):301-7.
22. Fasola A, Obiechina A, Arotiba J. Concomitant injuries in 531 patients with maxillofacial fractures. *African journal of medicine and medical sciences*. 2002;31(2):101-5.
23. Terry PH. Complication associated with maxillofacial injuries. *Brit J Oral Maxillofac Surg*. 1969;3:62.
24. Cowley JK. Study of maxillofacial trauma. *Brit J Oral Surg*. 1970;4:42.
25. Champion H, Harmer P. Emergency care in facial trauma. *Brit J Oral Surg*. 1980;6:18.
26. Kruger GO. *Textbook of Oral Surgery*. St. Louis: CV Mosby; 1979.
27. Hopkins K. Intermaxillary fixation as treatment in facial trauma. *Brit J Oral Surg*. 1985;3:44.
28. Kamitani K, Murakami K, Chen W, Nose M, Matsuki M, Hyo Y et al. Clinical study on mandibular condylar fracture. 2. Long-term follow-up study in 48 patients with 66 joints. *Nihon Ago Kansetsu Gakkai Zasshi*. 1988;1(2):63-72.
29. Balasubramaniam S. Intra-oral approach for reduction of malar fractures. *British Journal of Oral Surgery*. 1966;4:189-91.