



**ORIGINAL RESEARCH PAPER**

**Plastic Surgery**

**MORBIDITY OF FACIAL TRAUMA**

**KEY WORDS:**

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**ABSTRACT**

The incidence of facial fractures and soft tissue injuries are increasing with time. As such, the morbidity due to facial fractures is very high, which is worsened when there are associated complications. Different complications which depends on various factors and whose incidence varies with different sites are not uncommon. This study was undertaken to identify the incidence of various complications of facial fractures and factors affecting them. The results of study coincides with various previous literatures. The results of treatment are controlled by so many independent factors, at times the scope of reconstruction is limited. Prevention of facial injury is the best modality of management

**INTRODUCTION**

The Maxillofacial region is very vulnerable to injuries. The incidence of facial fractures and soft tissue injuries are increasing with time. Facial fractures constitute approximately 10 to 30 % of the injuries presenting to emergency departments resulting in a significant burden (1,2). As such, the morbidity due to facial fractures is very high, which is worsened when there are associated complications. Different complications occur following different sites of injury. Each complication has a varied incidence rate which depends on several factors. Complications in facial fractures may cause aesthetic problems, functional problems or both. Certain complications can be treated conservatively whereas others might require single or multiple stages of surgical correction. Also, certain complications may cause temporary deficits with delay in recovery period whereas others can result in permanent deficits. Analyzing complications and the associated factors is necessary to improve the outcome of facial fractures management. This study was undertaken

1. To identify the incidence of various complications of facial fractures
2. To identify the factors affecting the occurrence of complications

**REVIEW OF LITERATURE**

General incidence of complication among all facial fractures is approximately 21 to 25% (3). Infection is the most common early complication of all fractures. Removal of hardware is required in approximately 6 to 13 % of patients (4).

Frontal bone fracture constitutes approximately 5 to 15% of all facial bone fractures(5). Most common early complication is infection and most common delayed complication is cosmetic deformity. Complications can occur in 10 – 20% of the cases (6).

There is a wide variation of incidence of Nasal bone fracture in the literature, ranging from 6 to 37% (7,8). The most common complications following nasal bone fracture are nasal deformity, septal deviation and nasal obstruction. Complications occur in approximately 10 % of all patients(9).

Naso Orbito Ethmoidal fractures constitute less than 5% of facial bone fractures. Nevertheless NOE fractures are considered to be one of the most difficult fractures to manage. The most common complication following NOE fractures is epiphora due to post traumatic dacryostenosis. It is seen in approximately 50% of NOE fractures. Other common complications are telecanthus, enophthalmos and nasal deformity (10).

Orbital fractures are seen in approximately 7% of facial fractures (8). Common late complications following orbital injury are enophthalmos and diplopia. Complications are seen in 15% of the patients. A rare but devastating complication in the early period is Retro bulbar hematoma , which requires emergent surgical drainage(11).

Zygomatic fractures include zygomatico orbital, zygomatico maxillary and zygomatic arch fractures. The incidence of zygoma fracture also varies widely in the literature ranging from 6% to 23 % of all facial fractures depending upon the cause of injury (8,12,13). Complications following zygomatic fractures are seen in 13 to 19% of the patients. Most common complications are infra orbital hypoesthesia and minor facial asymmetry(14,15).

Leforte fractures constitute approximately 25% of facial fractures (16). Early complications are seen in 40 % of the patients. Common early complications are visual disturbances, masticatory difficulty and difficulty in breathing. Most of the early complications can be managed conservatively. Common late complications include chronic infection, facial deformity and tempero mandibular joint stiffness. It is seen in 10% of the patients (17)

Mandible is the most common location of fracture among facial bones. The incidence of isolated mandible fracture is approximately 40 to 70 % (16,18) , although lower incidence rates have also been reported (19). Common complications following mandibular fractures are hypoesthesia of chin and lip, malocclusion, hardware infection and exposure. Complication are seen in approximately 20 to 26% of Mandible fractures (20–22)

**MATERIALS AND METHODS**

This retrospective study was conducted by analyzing the data obtained from inpatient records of patients admitted under The Department of Plastic Reconstructive and Faciomaxillary Surgery, Madras Medical College. Hundred patients who were diagnosed to have facial bone fractures, with or without soft tissue injuries were included in the study. Patients who expired due to complications from other injuries were excluded from the study.

Following Parameters were analyzed

1. Age distribution
2. Sex distribution
3. Cause of injury
4. Presence of associated soft tissue injury
5. Fracture
  1. Anatomical distribution
  2. Early complications

- 3. Delayed complications
- 4. Risk factors
  - 1. Comminuted or Simple fracture
  - 2. Single or multiple bones involved
  - 3. Closed or open fracture
  - 4. Surgical or conservative management
  - 5. Immediate or delayed surgery

**RESULTS**

The incidence of facial trauma was highest in the age group of 20 to 20 years (54%). Second highest incidence was seen among patients in the age group of 30 to 39 years (20%). Majority of the patients were male (83 %). Road traffic accidents were the most common cause of injury causing facial fractures, constituting 78% of all cases. Second commonest cause was due to assault (12%). CT facial bone with 3D reconstruction was done in all the 100 cases for pre operative diagnosis.

AGE	NUMBER
10 – 19	2
20 -29	54
30 -39	20
40-49	4
50-59	10
MORE THAN 60	10

Out of the 100 cases , 89 cases presented within 72 hours of injury and 11 cases presented after 72 hours from injury. Among the 89 cases that presented early 7 cases were managed conservatively. 82 cases were operated immediately (within 72 hours of injury). In the late presentation group, 9 cases were operated after a period of 1 week (delayed surgery) and 2 cases were managed conservatively. In our study, we have defined conservative management as – arch bar fixation with mandibular maxillary fixation for 3 weeks for fractures of maxilla and mandible, dorsal splinting with nasal packing for 24 hours followed by dorsal nasal splinting only for 14 days for nasal bone fractures and observation for orbital and NOE fractures. Indications for conservative management are tabulated.

S.NO	AGE	SEX	FRACTURE	INDICATION
1.	62	F	Nasal bone	Multiple medical comorbidities
2.	47	M	Zygoma	Undisplaced isolated zygomatic fracture
3.	30	M	Orbit	Anesthesia contraindicated due to pneumothorax
4.	49	M	NOE	Neurosurgical observation
5	21	F	Nasal bone	Patient did not give consent for surgery
6.	37	M	Maxilla	Other priority injury requiring surgery – abdominal hollow viscus trauma
7.	29	M	Mandible + maxilla	Hemodynamic instability
8.	50	M	NOE	Neurosurgical observation
9.	26	M	Orbit	Isolated undisplaced orbit fracture

Among the 91 cases that were operated, 82 cases were operated within 72 hours of injury and 9 cases were operated after one week from injury, based on time of presentation. Operative management included open or closed reduction with dorsal splinting for nasal bone fractures and open reduction with internal fixation for all other fractures. Tracheostomy was required in 5 cases – 2 cases of pan facial injury and 3 cases of combined mandible and maxillary injuries. 2mm stainless steel mini plates

with 2x8 mm stainless steel screws were used for internal fixation in all the operated cases. Post operative antibiotic were given for 5 days for all patients. Dorsal nasal splinting was maintained for 7 days. Arch bar fixation was maintained for 3 weeks.

Among the 100 patients, 79 patients had isolated fracture (NOE complex and zygomatico maxillary orbital complex are considered as individual units) and 21 patients had multiple facial bone fractures. In terms of anatomical distribution there were 45 Mandible fractures, 19 Maxillary fractures, 3 NOE fractures, 23 Zygoma fractures, 10 Orbit fractures, 14 nasal bone fractures and 6 frontal bone fractures. 38 patients had open injuries and 62 patients had closed injuries.

ANATOMICAL LOCATION	NUMBER
<b>ISOLATED FRACTURES</b>	
FRONTAL	4
NASAL	11
ORBITAL	6
ZYGOMATIC	10
NOE	3
MAXILLA	8
MANDIBLE	37
<b>COMBINED FRACTURES</b>	
ZYGOMATIC + FRONTAL	2
ZYGOMATIC +ORBITAL	3
ZYGOMATIC + MAXILLA	8
MANDIBLE + MAXILLA	5
PANFACIAL INJURY	3

Complications were seen in a total of 22 patients. Among them, 14 patients had isolated injury and 8 patients had multiple bones injury. Closed injuries were seen in 13 patients and open injuries in 9 patients. Simple fractures were seen in 4 patients, whereas comminuted fractures were seen in 17 patients. We have defined early complications as those occurring within 6 months of injury and late complications as those persisting after 6 months of injury. 11 patients had early complications, 12 patients had late complications and 7 patients had both early and late complications.

Fracture location	Total number of cases	Total number of complications	Early complications	Late complications	Early and late complication
Frontal	6	1	0	1	0
Nasal	14	2	0	0	2
Orbit	10	3	0	2	1
Zygoma	23	4	1	2	1
NOE	3	2	0	0	2
Maxilla	19	6	2	3	1
Mandible	45	12	8	4	0

One among the 6 frontal bone fracture patient had a late complication of forehead deformity. The patient had an open comminuted depressed fracture of frontal bone. He was managed surgically by debridement, elevation of frontal bone with internal fixation and soft tissue suturing. He was operated within 72 hours of injury. Second stage surgery for treatment of facial deformity was not done because, the patient refused further surgeries

Complications	Number	Simple	Comminuted	Open	Closed	Conservative	Surgical	Immediate	Delayed
Forehead deformity	1	0	1	1	0	0	1	1	0

Two nasal bone fracture patients had nasal obstruction in the early period and nasal deformity with septal deviation in the late period. Both the patients had closed comminuted fracture of nasal bone

that was managed conservatively. Both the patients underwent septo rhinoplasty for correction of nasal deformity.

Complications	Number	Simple	Comminuted	Open	Closed	Conservative	Surgical	Immediate	Delayed
Nasal obstruction	2	0	2	0	2	2	0	0	0
Nasal deformity and septal deviation	2	0	2	0	2	2	0	0	0

Among the 10 patients with orbital fractures 3 patients had complications. Two patients had late complications which included cheek numbness in a patient who was a case of closed simple fracture and blindness in a case of globe rupture with open comminuted fracture. One patient who was a case of closed, simple fracture had both early and late complications. He had diplopia in the early period. Enophthalmos and cheek numbness were seen in the late period. All the patients were managed operatively within 72 hours in the first stage. Diplopia and enophthalmos was managed by second stage orbital floor reconstruction using titanium mesh.

Complications	Number	Simple	Comminuted	Open	Closed	Conservative	Surgical	Immediate	Delayed
Diplopia	1	0	1	0	1	1	0	0	0
Cheek numbness	3	1	2	0	3	0	3	3	0
Blindness	1	0	1	1	0	0	1	1	0
Enophthalmos	1	0	1	0	1	1	0	0	0

There were 23 patients with fracture zygoma. Four of them had complications. One patient had facial deformity in the early period. He was a case of closed comminuted fracture. Two patients had late complications which included malar flattening in a case of closed comminuted fracture and infra orbital hypoesthesia in a case of closed simple fracture. One patient had both early and late complications – facial deformity in early period and infra orbital hypoesthesia in late period. All the cases were surgically managed within 72 hours of injury in the first stage. Malar flattening was treated by fat injection in second stage. Infra orbital hypoesthesia was treated conservatively.

Complications	Number	Simple	Comminuted	Open	Closed	Conservative	Surgical	Immediate	Delayed
Facial deformity	2	0	2	0	2	0	2	2	0
Malar flattening	1	0	1	0	1	0	1	1	0
Infra orbital hypoesthesia	2	1	1	0	2	0	2	2	0

Two among 3 patients with NOE fractures had epiphora due to lacrimal apparatus injury and dacryostenosis. Both the patients were closed comminuted fractures managed conservatively.

Complications	Number	Simple	Comminuted	Open	Closed	Conservative	Surgical	Immediate	Delayed
Epiphora	2	0	2	0	2	2	0	0	0

Maxillary fracture was seen in 19 patients. Six patients among them had complications. Two patients had malocclusion in the

early period. One patient was a case of closed simple fracture and one patient was a case of open comminuted fracture. Three patients had late complications. Two patients had implant infection. Both the patients had open comminuted fractures. One patient who was a case of open comminuted fracture had TMJ stiffness. One patient, a case of open comminuted fracture had both early and late complications – malocclusion in the early period and TMJ stiffness in the late period. All cases were managed operatively within 72 hours of injury in the first stage. Malocclusion was managed conservatively by arch bar fixation and elastic band application for molding. TMJ stiffness was managed by physiotherapy. Implant infection was managed by implant exit and antibiotic therapy.

Complications	Number	Simple	Comminuted	Open	Closed	Conservative	Surgical	Immediate	Delayed
Malocclusion	3	1	2	2	1	0	3	3	0
Implant infection	2	0	2	2	0	0	2	2	0
TMJ stiffness	2	0	2	2	0	0	2	2	0

Twelve among 45 patients with mandibular fracture had complications. Eight patients had malocclusion in the early period. Two patients were cases of simple closed fractures and 5 patients were cases of open comminuted fractures and 1 patient was a case of compound fracture without comminution. Four patients had late complications. One patient, a case of closed simple fracture managed conservatively had non union. Three patients with open fractures had hardware exposure. One among them had implant infection, whereas the other two had exposure without frank infection. All four patients had chin hypoesthesia persisting in the late period. Malocclusion was managed conservatively by arch bar fixation and elastic band application. Non union was managed by second stage open reduction and internal fixation. Hardware exposure and infection were managed by exit of implant and antibiotic therapy. Chin hypoesthesia was managed conservatively.

Complications	Number	Simple	Comminuted	Open	Closed	Conservative	Surgical	Immediate	Delayed
Malocclusion	8	3	5	6	2	0	8	8	0
Chin hypoesthesia	4	1	3	3	1	1	3	3	0
Hardware exposure	3	0	3	3	0	0	3	3	0
Implant infection	1	0	1	1	0	0	1	1	0
Non union	1	1	0	0	1	1	0	0	0

Associated soft tissue injury was seen in 38 patients. All the patients with soft tissue injuries were in the early presentation group, and all of them were operated within 72 hours. Soft tissue laceration was the most commonly associated soft tissue injury. Lacerations were thoroughly debrided, washed and sutured in layers. Eyelid injuries were cautiously debrided and sutured in layers with lacrimal canaliculi reconstruction. Lip lacerations were debrided and primary suturing was done. Facial nerve injuries were explored and primary end to end repair was performed. Parotid duct injuries were explored and primary end to end repair performed with stent placement. Enucleation was performed for one case of globe rupture. The incidence of various soft tissue injuries is tabulated.

SOFT TISSUE INJURY	Number
LACERATION	38
UPPER EYELID	7
LOWER EYELID	7
LACRIMAL APPARATUS	3
UPPER LIP	11
LOWER LIP	9
FACIAL NERVE INJURY	10
GLOBE RUPTURE	1
PAROTID DUCT	4

In patients with soft tissue injuries 9 patients had early complications. Most common early complication was infection in 6 patients with skin necrosis in 4 among them. Parotid fistula was seen in 2 patients. Lip vermilion necrosis was seen in one patient. Facial nerve palsy until 6 months following repair was not considered a complication, allowing time for regeneration. Infection and skin necrosis were treated by debridement and antibiotic therapy with second stage skin closure. Parotid fistulas were managed conservatively with anticholinergics and regular reviews. Lip tissue was debrided and second stage reconstruction was performed.

Delayed complication due to soft tissue injuries was seen in 11 patients. Most common delayed complication was an unsightly scar, which was seen in 9 patients. Two among these patients had lower lid ectropion and epiphora due to lacrimal canaliculus injury. All the 4 patients with skin necrosis in the early period had unsightly scars in the delayed period. Two patients had persisting facial nerve palsy after 6 months period. Unsightly scars were managed by scar excision, revision or conservatively depending upon the nature of scar and complaints of the patient. Facial palsy was treated by lateral tarsorrhaphy and cross facial nerve grafting using sural nerve.

There was one death due to gas gangrene and septicemia in a patient of pan facial trauma, with extensive soft tissue injury. Patient was managed by surgery within 72 hours from injury. Patient succumbed to the infection in spite of adequate debridement of the infected soft tissue and administration of anti gas gangrene serum.

**DISCUSSION**

We conducted this retrospective study with the aim of analyzing the various factors that cause and aggravate the morbidity associated with facial fractures. According to our analysis the incidence of facial trauma was highest in the age group of 20 to 30 years (54%). Majority of the patients were male (83 %). Road traffic accidents were the most common cause of injury causing facial fractures, constituting 78% of all cases. These findings are similar to previous papers on facial trauma. Male predilection with this predominant age distribution is due to the fact that young males are most frequent users of two wheelers, which make them most susceptible for road traffic accidents.

The most commonly involved facial bone was Mandible. Most of the patients were managed operatively (89%). The most common indication for first stage conservative management was associated neurosurgical injury (22 %). Complications were seen in 22 % of the patients, whereas the complication rate in conservatively managed patients was higher (33%) compared to the general group. Highest rate of complication was seen following NOE fractures (66%). Rate of complications in other fractures were - Frontal – 16%, Nasal – 14%, Orbital - 30 %, Zygoma – 17%, Maxilla – 31 %, Mandible – 26 %. Of all complications 80% of the cases were comminuted fractures. Rate of complication among closed fractures was 20 % and rate of complication among open fractures was 23 %. All cases of implant infections were cases of open injuries. No complications were seen in the delayed surgery group. Most common early complication in cases with associated soft tissue injuries was infection and most common late

complication was unsightly scar.

Analysis of the results of our study shows that the total complication rate and individual complication rates in our institution is comparable to previous papers. Comminuted fractures, Open fractures and fractures managed conservatively in the first stage are associated with an increased number of complications. Implant infection was more common in open fractures. All the cases with open injuries presented within 72 hours of injury. We infer that the more alarming and symptomatic nature of the open wounds enables earlier referral from primary healthcare facilities, leading to early presentation. Delayed surgical management did not result in an increased incidence of complications.

**CONCLUSION**

Facial fractures result in significant burden to individuals and to the healthcare department. Although there have been significant advances in the diagnosis and management of facial injuries, treatment does not always result in complete recovery of pre-injury form and function. The nature of the injury and presence of associated injuries can affect the outcome in spite of best possible treatment. As the results of treatment are controlled by so many independent factors, at times the scope of reconstruction is limited. Public awareness of the morbidity caused by facial fractures and their complications is very less and needs to be improved by health education. Prevention of facial injury is the best modality of management.

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