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Mandibular Fractures

M.Madhusudana Naik [1*], E.Mahender [1], N.Nagaprasad[2]

[1]Assistant Professor, Department of Plastic Surgery, Osmania Medical College, Hyderabad, Telangana, India
[2]Professor and HOD,Department of Plastic Surgery, Osmania Medical College, Hyderabad, Telangana, India

ABSTRACT

Aim and Objectives: To study the age and sex , etiological factors causing mandibular fracture, types of fractures, its modalities of treatment and complications associated with various modalities of treatment. **Materials & Methods:** A prospective study of 250 consecutive cases of mandibular fractures that are treated over a period of 28 months. Patients who died due to polytrauma in Emergency ward have not been included in our study. **Results:** It is seen that in our series of 250patients, 88.8(222) are Males, only 11.2% (28) are females. Maximum number of patients is in 21-30 age groups i.e. 40.8% (102) cases, Total numbers of pediatric cases are 9. Distributed in 2:1 ratio (boys-6—66.6% and girls-3-33.3%). The minimum age being 3yrs. 92% (230) Patients had a unilateral mandibular fractures while 8% (20) patients had bilateral fractures. Only in 12.8 %(32) of cases the mandible fracture is associated with other facial bone fractures while in majority 87.2% (218) no such associated injury was observed. Fractures of parasymphysis (70.5%), body(10.4%), angle(7.8%), condyle(5.9%), dentoalveolar(2%) and symphysis(1.3%) are the most common sites while fractures of ramus(0.7%), coronoid(0.7%) and subcondyle(0.7%)are the least common fracture sites. Among the cases having multiple site fractures (65),fracture parasymphysis+angle is the commonest(64.6%), The most common associated injury are to other facial bones, in which maxilla involved more i.e., 22 cases (8.8%) followed by 10 cases (4%) of Zygoma. 218 cases (87.2%) are mandible fractures, which are exceeding over associated injuries. **Conclusion:** We conclude that open reduction and internal fixation along with Inter Maxillary fixation is the best method among the three alternatives with very less morbidity and complications.

Key words: Fracture, mandibular

Introduction

Fracture of mandible represents one of the most common facial bone injuries. It is the one serious bone injury that the average practicing plastic surgeon may expect to encounter frequently. The prominent position of the mandible renders it susceptible to Trauma. In automobile accidents, mandible is the most commonly encountered fracture at major trauma centres. Any external force may fracture the mandible. The common causes are automobile accidents, falls, fistfights, missile injuries and sports accidents. Fractures may also occur in the course of a difficult tooth extraction or during conditions such as electro shock therapy.The fundamentals of mandibular fracture repair are similar to the orthopaedic principles of management of fractures of long bones. The objective of fracture management is anatomical restoration of displaced bone fragments to their native premorbid position with application of inter maxillary or/ and open reduction and internal fixation to stabilize the reduction until osseous union takes place. Whereas these objectives are common in both the specialties, fractures of mandible, being one of the most important facial bones, must uphold another defining distinction immobilization for pre-operative occlusion with inter maxillary fixation. surgical repair of the mandible must be accomplished with as few surgical stigmata as possible. Unfavourable outcome and stigmata may result from residual skeletal malreduction, loss of normal dental occlusion, deviation of angle of mouth, marginal mandibular nerve palsy, anaesthesia/ paraesthesia along distribution of mental nerve or infection and non-union of fracture fragments. An

**Correspondence*
Dr.M Madhusudana Naik
Assistant Professor, Department of Plastic Surgery, Osmania Medical College, Hyderabad, Telangana, India

improved understanding of bone healing, greater availability of antibiotics, advances in the field of anesthesia, improved dental care and the introduction of internal fixation have contributed to the development of surgical techniques with improved efficacy and outcomes. Minimally invasive and endoscope techniques are the most recent addition to the surgical armamentarium. Their use in certain situations has been supported by improved outcomes for patients with a simultaneous decrease in overall costs of patient care. But till now they have not revolutionized the management of these injuries as these endoscopic techniques are not too easier to apply than the traditional methods, take longer operating time and in addition endoscope instrumentation represents additional costs that a treating institution may not be willing to afford. Finally, swelling and haemorrhage make these techniques of minimal access surgery sometimes difficult to apply. A study of 250 cases of fractures of mandible treated from August 2012 to December 2014 (28 months) is presented. Various etiological factors causing injuries, anatomical sites of the fractures and various modes of treatment & their complications have been evaluated and the results analysed.

Materials and Methods

A prospective study of 250 consecutive cases of mandibular fractures that are treated over a period of 28 months from August, 2012 to December, 2014 is carried out in the Department of plastic Surgery, Osmania Medical College / Hospital, Hyderabad. These cases were directly admitted in the plastic surgery department either from causality or out patient department. Cases also referred from other department like Neurosurgery, orthopedic surgery and General surgery Department. Patients who died due to polytrauma in Emergency ward have not been included in our study. Initially all the patients were assessed clinically by symptoms and signs of mandibular fractures and other associated injuries. After stabilization of general condition of the patient, patient was subjected to relevant radiological investigations and orthopontogram (OPG). Patient who has been diagnosed having other injuries were investigating appropriately by X-rays and CT-Scan. Patients were investigated for Anesthesia point of view. The Preliminary Treatment Included the following; Tetanus Prophylaxis, Antibiotics, to prevent infections, Analgesics and anti inflammatory drugs were given to decrease pain and edema, Maintenance of oral hygiene, Betadine mouth Gargles, Liquidized diet / Soft Diet. Definitive Treatment of Facial Fractures was carried out once the patient was fit for surgery and Anesthesia. Pre-operative occlusion was recorded according to patient's history and occlusal surfaces of the teeth. Definitive management of Fractures of Mandible included Arch Bar or Eyelet Fixation and intermaxillary Fixation which was done in patient who had favorable fractures of mandible with minimal displacement, Arch Bar or Eyelets and Intermaxillary fixation was done in proper occlusion. Patient was given post operative antibiotics and proper maintenance of oral hygiene with Betadine mouth gargles, and advised liquid diet to maintain nutritution. Patient was assessed after one week for oral hygiene, proper occlusion and intactness of intermaxillary fixation. Intermaxillary fixation was removed after 3 weeks. Patient was followed up regularly at 8 weeks ,12weeks and after 6 months. Open Reduction and Internal Fixation & intermaxillary fixation which was done in all cases of unfavorable fractures and most of the combined fractures, open Reduction and Internal Fixation was done with either Transosseous wiring or with 4 – holed or 6- holed stainless steel mini plates (2.5 mm hole size) with gap. Transosseous wiring is done with no. 24G or26G stainless steel wires, and few patients are treated using both mini plates and wires. Fractures of Symphysis, Parasymphysis and Body of the Mandible were approached either intra oral route or extra oral route depending upon the concomitant soft tissue lacerations. Patients who had other associated injuries, who need further surgeries and patients with head injuries, epileptics and irritable, uncooperative patients were treated with only open reduction with either stainless steel mini plates or wires after intraoperative proper occlusion was achieved. Intermaxillary fixation was removed once Open Reduction was done. Follow up: Patients were followed up regularly at 1 week, 2 weeks, 4 weeks, and 6weeks and assessed for wound, occlusion and mouth opening in all the patients who had undergone Open Reduction with or without intermaxillary fixation. All the patients who were treated were advised regular active physiotherapy once intermaxillary fixation was removed and advised soft diet for 8 weeks. Patients with Condyle fractures, either single or combined with other fractures were managed with removal of intermaxillary fixation after 2 weeks and advised active Physiotherapy for mouth opening. Pediatric mandible fractures were managed conservatively with intermaxillary fixation (with capsplint). Patients were advised to undergo X-Ray OPG who had complications like wound infection, suspected delayed union and malocclusions. Most of the complications of mandible fractures were managed conservative except for very few cases (2) where hardware material was removed.

Results

Table 1: age wise distribution, sex distribution and etiology wise distribution

Age (in years)	Male	Female	Total	Percentage
1-10	06	03	09	3.6
11-20	34	07	41	16.4
21-30	95	07	102	40.8
31-40	63	05	68	27.2
41-50	20	04	24	9.6
51-60	04	02	06	2.4
T0TAL	**222**	**28**	**250**	**100**

From above table, it is seen that in our series of 250patients, 88.8(222) are Males, only 11.2% (28) are females. The patients in the lower age group (0-10) and higher age group(50-60) only had single fracture site.

Table 2: Details of fractures in surgery

Etiology	No of subjects	Percentage
Road traffic accidents	152	60.8
Fall from height	76	30.4
Assault	15	06.0
Trauma	07	02.8
Site		
Unilateral	230	92
Bilateral	20	8
Type of injury		
Associated injuries	32	12.8
No associated injuries	218	87.2
Site		
Parasymphysis	108	70.5
Body	16	10.4
Angle	12	7.8
Condyle	9	5.9
Dentoalveolar	3	2
Symphysis	2	1.3
Coronoid	1	0.7
Ramus	1	0.7
Sub Condyle	1	0.7

Road traffic accident (60.8%) is the commonest cause of mandibular fractures in majority of cases Table 2 shows incidence of mandibular fractures to unilaterality and Bilaterality, mandibular fractures and associated facial injuries, site of mandibular fractures. 92%(230) Patients had a unilateral mandibular fractures while 8% (20) patients had bilateral fractures. Only in 12.8%(32) of cases the mandible fracture is associated with other facial bone fractures while in majority 87.2%(218) no such associated injury was observed. Fractures of parasymphysis (70.5%), body (10.4%), angle(7.8%), condyle(5.9%), dentoalveolar(2%) and symphysis(1.3%) are the most common sites while fractures of ramus(0.7%), coronoid(0.7%) and subcondyle(0.7%)are the least common fracture sites.

Table 3: Combination of fracture sites

Site	No of subjects	Percentage
Parasymphysis+angle	42	64.6
Parasymphysis+subcondyle	13	20.0
Parasymphysis+body	4	6.2
Parasymphysis+condyle	4	6.2
Body+subcondyle	1	1.5

Dentoalveolar+parasymphysis	1	1.5
Body+body	0	0
Subcondyle+subcondyle	0	0
Parasymphysis+ramus	0	0
Dentoalveolar+subcondyle	0	0
Symphysis+subcondyle	0	0
Para+parasymphysis	0	0
Body+angle	0	0

Among the cases having multiple site fractures (65),fracture parasymphysis + angle is the commonest(64.6%), followed by fracture parasymphysis + subcondyle (20%), fracture parasymphysis + body(6.2%), fracture parasymphysis + condyle (6.2%), fracture body + subcondyle (1.5%) and parasymphysis + dentoalveolar fracture (1.5%). The above table shows, the most common associated injury are to other facial bones, in which maxilla involved more i.e., 22 cases (8.8%) followed by 10 cases (4%) of Zygoma. 218 cases (87.2%) are mandible fractures, which are exceeding over associated injuries.

Table 4: Complications in different treatment methods

Mode of treatment	Infection (%)	Malocclusion (%)	Restricted mouth opening (%)	Exposure of implant(plate &screw) (%)
CAP SPLINT	Nil	Nil	Nil	Nil
ARCH BAR	12 (4.8%)	6 (2.4%)	8 (3.2%)	Nil
ORIF+IMF	18 (7.2%)	8 (3.2%)	5 (2.0%)	4 (1.6%)
EYE LETS	6 (2.4%)	4 (1.6%)	6 (2.4%)	Nil

IMF-Inter maxillary fixation, ORIF- Open reduction and internal fixation.

The above table shows the different types of treatment used in our institute. Intermaxillary fixation is done with Archbar or Eyelet wires with inter maxillary wiring.IMF is done mostly for single favorable fractures. ORIF+IMF is done in 203 cases(81.2%) which is the highest mode of treatment followed by ArchBar+IMF 34(13.6%),capsplint-8(3.2%) and Eyelet wires+IMF5(2%). 211(84.4%)cases were done under general anaesthesia. In GA either nasotracheal or submandibular intraoral intubation is used. only 39(15.6%)cases were done under local anaesthesia. The patients with wound inflammation in either in soft tissue lacerations or in surgical incisions, abscess in wounds and sinuses in postoperative period are included in the wound infection category. infection is the common complication found in our series i.e 36 cases (14.4%).The wound infection ,most commonly seen in patients who are treated with IMF+ORIF (plate and screws+sswires-7.2%) and 4.8%cases in patients treated with only Eylet wires. Wound infections are seen in single fractures, in about 18cases, commonly seen in parasymphyseal region followed by body and angle. In combined fractures 12 cases had wound infection, most commonly seen in parasymphysis and angle fractures.The patients with wound inflammation in either in soft tissue lacerations or in surgical incisions, abscess in wounds and sinuses in postoperative period are included in the wound infection category. infection is the common complication found in our series i.e 36 cases (14.4%).The wound infection ,most commonly seen in patients who are treated with IMF+ORIF (plate and screws+sswires-7.2%) and 4.8%cases in patients treated with only Eylet wires. Wound infections are seen in single fractures, in about 18cases, commonly seen in parasymphyseal region followed by body and angle. In combined fractures 12 cases had wound infection, most commonly seen in parasymphysis and angle fractures.

Discussion

In this study we have analyzed 250 cases of mandibular fractures managed by us from August 2012 to December 2014. Our results have been compared with published series across the world.

Sex Incidence: It is a common observation that the incidence of Mandible fracture was higher among males in all the series. In our series 88.8% were male and in other series 81.8% of patients were males whereas 11.2% were females in our series and 18.2% in other series The higher incidences of fractures in

males are due to their increased vulnerability and exposure to machines and travel. The intoxication has great role to play. The lower incidence on fractures in females may be because of less traveling and less exposure to outdoor activities and their less aggressive nature. In Martin et al study, there were 75.5% males and 24.5% females. In Ellis et al study, there were 76% males and 24% females. In Sawney and Ahuja et al study, there were 79.3% males and 20.7% females. In Ugboko et al study, there were 80.5% males and 19.5% females. In Moreno et al study, there were 84.5% males and 15.5% females. In Alexander et al study, there were 83.3% males and 16.7% females. In Robert King et al study, there were 82.1% males and 17.9% females. In Khalid et al study, there were 79% males and 21% females.

Age incidence: May et al (1972) [1] in their series of fracture mandible state that 20 – 40 years was the common age group involved. Ugboko et al (1998) [2]also stated that the largest number of fractures (39.1%) occurred amongst 21-30 years of age group, Sawhney and Ahuja (1998) [3] in their series of 262 patients of Maxiallofacial injuries had 77% in the age group of 16-45 years. Moreno et al (2000)[4]in their series showed that the mean age was 28.9 years. Alexander et al (2001) [5] in their series stated that the highest incidence was in 3rd decade, in females in the age group of 40 years. Schoen et al (2001)[6] in their series also stated that highest incidence was 22-40 years of age group both in males and females. Ogundare et al (2003)[7]showed in their series that 37% of the patients are in the age group of 25-35 with mean age being 34.2 years. Robert E King et al (2004)[8]in their study of 134 patients, 42.5% were in 17-30 years and 29.5% were in the 31-50 years. Khaled Sakr et al (2005)[9] reported in their series of 55 patients that maximum number of male patients were involved in the age group of 0-30 years and female patients were in the 0-10 years. Their mean age was 22 years in males and 17 years in females. Saeed Asraf et al (2006)[10] in their series showed maximum number of patients were 11-30 years followed by 31-50 years in both males and females. In females, maximum numbers of patients was in the age group above 60 years in both sexes. In most series it was seen that Maxiliofacial injuries are common in the younger age group. In our series also it was observed maximum numbers of mandible fractures (40.8%) were observed in the age group between 21 & 30 years of age and (27.2%) were in the 31-40 years age group. The mean age was 30.5 years in both sexes. The maximum numbers of patients were in the age group 21-30 years in both males and females.

Mode of injury: In USA[11]most common mode on injury was due to inter personal violence than motor vehicle accidents, may be due to increased alcohol and drug abuse and following correct principle of traffic regulations. Even in Australia[6], assault injuries were more common a cause of injuries causing mandibular fractures (83%) than motor vehicle accidents (10%). In Spain[4]there was minimal difference in between RTA and assaulting mode of injuries. In African continent[2], Motor vehicle accidents were most common cause of injury. The number of patients with mandibular fractures caused by fall injuries (34%) is more than assault injury (16%). In Pakistan[10] again motor vehicle accidents were the most common cause of injury causing maxillofacial injuries (54%). In our series and Sawhey et al[3], RTA was most common cause of mandibular fractures (60.8%, 47.85%), followed by fall from height and assault injuries (30.4%, 34.4%).

In most of the patients where fractures are caused by motor vehicle accidents were using more of two wheelers. The increased economic growth and congestion of roads, alcoholic abuse is the cause of more cases due to motor vehicle accidents. In our series, 3% patients are caused by trauma mainly occupational and agricultural machinery**.**

Associated Injury: Paul Howard et al (1986)[12], in their series Head injuries (30%) were the most common associated injury followed by other facial injury and other trauma. Renton et al (2004)[11]series had a less number of facial injuries and more number of head injuries and other body trauma. In all above series, the head injury was the commonest associated injury followed by other injuries than facial injuries. In our series the associated injury to other facial bones were the most common (12.8%) comparative to other series. The head injuries are less in number than other series. The other injuries in our series are fracture of the long bones and fractures of ribs, fractures of the small bones of the hand and soft tissue injuries of hands, face and foot. The maxillary fractures are more common (8.8%) than other facial bone (4%) in our series. In literature nasal bones are the commonest associated injuries with mandible fractures are but in our series we find that maxilla fractures are most common followed fractures of Zygoma Bone.

Anatomic sites of fractures and number of fractures: In our series, single fractures were more than combined fractures. In Ellis et al (1985)[13] Schon et al (2001)[6]and Khalid sakar et al (2006)[9]also single fractures were more than combined fractures Similar to our series. Ugboko Et al (1998)[2] had almost equal percentage for both single and combined fractures. **Common Sites of Fractures:**

Fractures of mandible involve different anatomical sites of mandible depending on the intensity of force. Overall in all series horizontal part of mandible was involved more than vertical part. In literature, it was shown that Condyle was the commonest site of fractures, but in recent studies, Condyle was the least involved. Ugbokao et al (1998)[2] in their series, body was the most common site of fractures followed by Parasymphysis. Condoyle was least involved. Angle was the most common site of fractures in Schon et al (2000)[6], Ogundara et al (2003)[7] and Khalid sake et al (2006)[9] In our series Parasymphysis (70.5%) was the most common site followed by body (10.4%). The Coronoid and Ramus are least involved. The site of fracture in relation to mode of injury in assault and fall, were symphysis or parasymphysis involving Condyle is common. **Treatment of mandibular fractures:** The objectives of the mandibular fracture management include the restoration of the pre-existing anatomical form, functional occlusion and facial aesthetics. Even though this objectives can be achieved by closed reduction and inter maxillary fixation, unfavorable and displaced fractures required open reduction and internal fixation. The treatment of mandible fractures varies from developed nations and nondeveloped nations, surgeon to surgeon, and availability of equipment and patients desires.Closed reduction has been slowly replaced by open reduction and internal fixation by wires, stainless steel plates, AS/AO plates and recently absorbable plate and screws. But still closed reduction was the main stay of treatment for most of the fractures which are favorable, undisplaced and minimally displaced. Alexander et al (2001)[5] in their series open reduction was main stay of treatment of fractures than closed reduction. The authors used very less number of fractures treated with interosseous wires (11.72%) and more number of fractures treated with mini plates and screws. Zacharaides et al (1996)[14] in their series more cases were treated with closed reduction (57.5%) than open reduction (42.5%). In their study they have showed that they have used plates and screws (stain less or titanium) (23.8%), more than interosseous wires (18.6%). Khaled sakr et al (2006)[9], in their study more number of fractures were treated with closed reduction methods than open reduction. They used only observation and follow up in small number of cases. In their series, they also used more number of plates and screw (63.4%) than stainless steel wires (36.5%). In our series closed reduction is done only in (18.8%) cases. Open reduction is done with plates and screws (stainless steel or titanium) in (81.2%) of the cases.

Complications: Renton et al (1996)[11] in their series had more number of complications. Malocclusion (17%) was the most common complication followed by wound infection. The number of patients with nonunion or delayed union is more in number compared to other series. Zacharaides et al (1996)[14] in their series had high rate of infection (19.5%) than in all other series. In Moreno et al (2000) series, wound infection and non union are the most common complications. The nonunion or delayed union was due to very rigid internal fixation. Alexander et al (2001)[5] in their series had very less number of complications than other series even though they had more number of patients who were treated with Open Reduction and internal fixation. In our series over all complications are more or less equal compared to other series. Wound infection and mouth opening restriction were the common complications. The percentage of nonunion complication was very low compared to other series. We have removed hardware (plate and screws, wires) only in four cases which was very less when compared to all other series. In all above series the nerve disturbances either sensory or motor nerve are the least involved complications. Most of these complications are managed conservatively.

Conclusion

Mandible fractures are common in males. Highest number of cases was seen between 21-30 year in age group in both sexes; most of them were between 25-30 years. Motor vehicle accidents are the predominant cause of these fractures. Driving two wheelers and three wheelers in haphazard manner with disregard for the traffic rules tops the list amongst the contributory causes and also without valid driving liesence. Isolated mandibular fractures were common. Parasymphysis was the most common and highest site of fracture on constitutes the highest number of cases. In multiple fractures, the most common site were Parasymphysis with contra lateral angle and bilateral parasymphysis. Multiple sites were involved in patient with assaults and fall from height cases. There was no case with bone loss or gap in this series. Open reduction with Erich's arch bars fixation and inter maxillary fixation was the mainstay of treatment with good healing and class-I occlusion with least complication. Closed reduction with fracture fixation using Arch bars + Inter maxillary fixation and Eylet wires + Inter maxillary fixation or both were used in selected cases. Wound infection was the single signification complication. We conclude that open reduction and internal fixation along with Inter Maxillary fixation is the best method among the three alternatives with very less morbidity and complications.

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