

MANDIBULAR FRACTURE OSTEOSYNTHESIS: A COMPARISON OF THREE TECHNIQUES

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ABSTRACT

The purpose of this study was to determine various postoperative complications associated with different regimens used for the treatment of mandibular fractures. The study design was interventional Quasi-Experimental and study was carried out in the Department of Oral and Maxillofacial surgery, King Edward Medical College/ Mayo Hospital, Lahore from 1st Sep 2004 to 31st July 2005.

The study was carried out on sixty patients with mandibular fractures. These were divided into three categories. At different intervals of their postoperative visits, these patients were evaluated for postoperative complications and the differences between the three Groups were assessed. Data concerning the patients' demographics, aetiology and pattern of fracture were also obtained and analyzed.

Patients treated by Mini plating showed less complications as compared to MMF group and TOW group i.e. 20%, 30% and 50% respectively. Based on this study mini plating was considered as the best available method for the treatment of mandibular fractures.

Key words: Mandibular fracture, Maxillomandibular fixation, Transosseous wiring, Mini plating, Postoperative complications.

INTRODUCTION

Mandible is a very prominent and vulnerable bone on the face,¹ since the projected chin is a favored target of adversaries lower jaw fractures are twice as common a major role in the mastication, speech and deglutition. Its fractures result in severe loss of function and disfigurement.

Causes^{5,6} of mandibular fracture are: road traffic accidents, interpersonal violence, accidental falls, sports injuries, industrial trauma, pathological fracture etc.

In third world countries road traffic accident⁷ is the common cause of mandibular fractures due to lack of implementation of the traffic laws, while in developing countries alcohol related⁸ interpersonal violence is the leading cause.

Any age and sex group may sustain trauma to the lower jaw but children below the age of 12 are less susceptible to fracture because their bones are more resilient.⁹

The proper management of mandible fracture is essential in order to restore the patient's pre injury occlusion and to avoid serious complications and secondary operative procedures. The management of mandibular fractures varies in various maxillofacial units depending on the presentation, surgical expertise and the facilities available. The general principles of treatment for mandibular fractures do not differ from the treatment of fractures elsewhere in the body. The fragments are reduced into a proper position and then immobilized until such time as bony union occurs¹⁰ i.e. reduction and fixation.

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Different modalities^{10,11} available for treatment for mandibular fractures are:

- (a) Maxillomandibular fixation (MMF) alone: e.g. dental wiring, Arch bar.
- (b) Maxillomandibular fixation with osteosynthesis: e.g. Transosseous wiring, circumferential wiring, and external pin fixation.
- (c) Osteosynthesis without maxillomandibular fixation: e.g. mini plating, Non compression and compression plates, Lag screws.

Previously traditional methods i.e. maxillomandibular fixation and transosseous wiring were the most popular methods used for mandibular fracture fixation. These are still today commonly used methods¹². These methods have got various disadvantages such as preventing normal jaw function, weight loss due to restriction of food to liquid consistency, oral hygiene problem and reduction of ventilatory volume.^{10,13}

For all these reasons alternative methods of treatment are applied nowadays, which avoid or shorten the period of immobilization.

Non-compression, monocortical mini-plates osteosynthesis is a worldwide used method. It has made possible a more rapid return of function resulting in the patient being able to resume normal life earlier¹². Despite these evident advantages, this method is criticized for different reasons such as increased morbidity, difficulty of the procedure, increased operating time, cost of the equipment, the necessity of the 2nd operation for the removal of plates and increased hospital stay¹². Also this method has resulted in post-operative complications that are different from those of the traditional methods¹³. If the plates have not been correctly placed, there will be post-operative malocclusion. Also the approaches used, extra oral and intra oral may result in nerve damage. In addition there may be damage to dental roots or these plates may be a cause of continuous infection¹².

Different complications, which may occur after the treatment of mandible fracture, are: infection, malocclusion, nerve damage, malunion, nonunion, trismus, asymmetry, and temporomandibular joint derangement.^{10,12,13,14}

Different studies¹²⁻¹⁴ have been carried out comparing the traditional methods of treatment with the newer techniques regarding their post-operative complications.

MATERIALS AND METHODS

This clinical study had been carried out on sixty surgically treated patients of mandibular fractures at the department of Oral and Maxillofacial Surgery, King Edward Medical university / Mayo Hospital Lahore from 1st Sep 2004 to 31st July 2005. Patients were distributed into three groups and were treated with three of the standard techniques. Twenty patients were included in each group.

- (A) Maxillomandibular fixation (MMF) with Dental wiring
- (B) Maxillomandibular fixation with Transosseous wiring (TOW)
- (C) Mini-plating with Maxillomandibular fixation for short period

A standard history and examination chart was completed for each patient. Data concerning the patients' demographics, aetiology and pattern of fracture were also obtained and analyzed. Orthopantomogram (OPG) was the standard radiograph and if required supplemented by postero-anterior (PA) view of the face or any other radiograph of the face.

Each patient was followed up for 3-months time. Postoperative Orthopantomogram (OPG) was taken in follow up for each patient, whenever required. During the follow up period any complication found was recorded on the proforma.

The collected data was analyzed by SPSS statistical package version 10.0. The significance test used was Chi-square test and t-test.

RESULTS

A total of sixty patients were treated for mandibular fractures out of which 56 (93.3%) were male and the remaining 04 (6.7%) were females with male to female ratio of 14:1.

The mean age of the patients in the study was 27.2 years. The most common age group was 21-30 years followed by 12-20 years. Fig 1 & 2

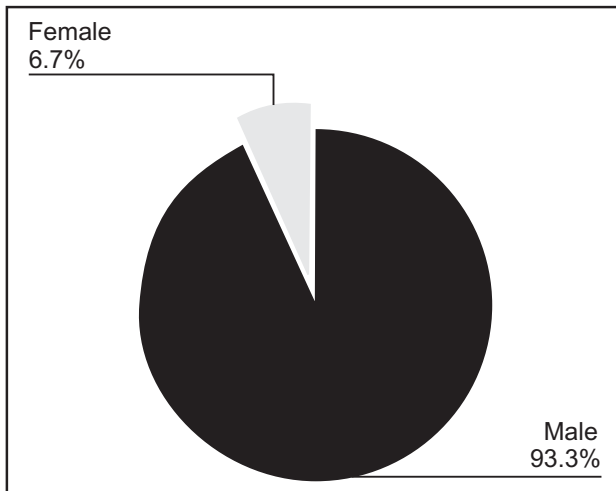


Fig 1: Sex Distribution of patients

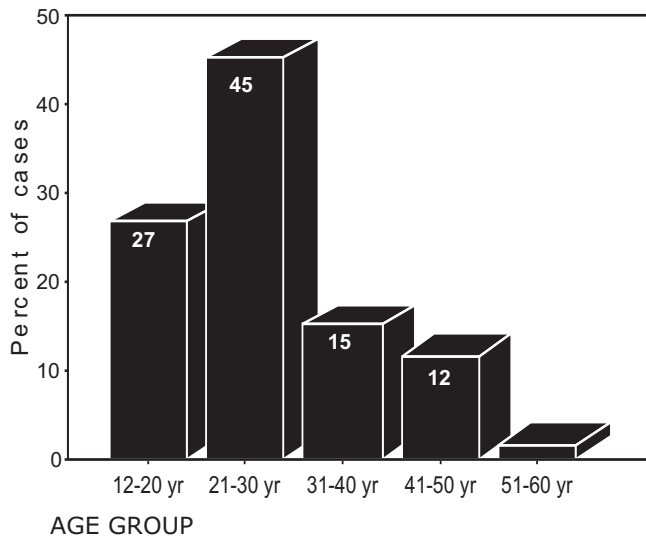


Fig 2: Age Distribution of Patients

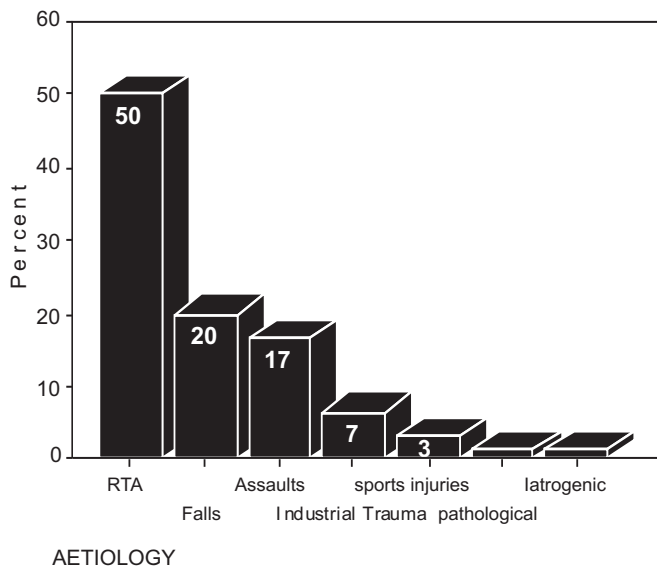


Fig 3: Aetiology of injury

Most of the patients came under the category of road traffic accidents (50%) and least in that of pathological and iatrogenic (1.7%). The results are shown in Fig 3.

In our study the mandibular fractures were most commonly seen in the parasymphysis region (48.3%) followed by the body fractures accounting for 26.7% and angle fracture 18.3% of the total. The details are given in Fig 4.

A total of sixty patients were treated for mandibular fractures. Maxillomandibular fixation (MMF) was done for the period of six weeks in MMF-group and TOW-group. While in plating group only temporary MMF was done for 7-10 days. Details about postoperative complications related to different treatment modalities are given in Fig 5, Tables 1 and 2. 20 complications were encountered in a total of twenty patients. Of these complications 20 % occurred in plating group,

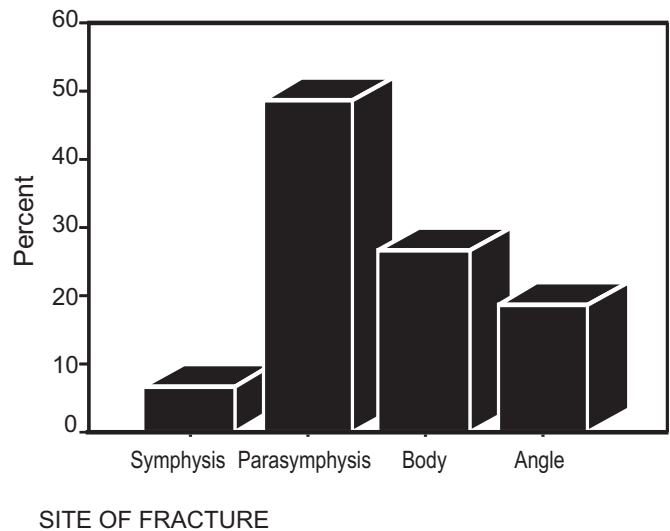


Fig 4: Site of Fracture

TABLE 1: COMPLICATION RATES IN THE ENTIRE TREATMENT GROUP (n = 60)

Complications	No of patients	Percent-age
Infection	6	10.0
Malocclusion	5	8.3
Malunion	3	5.0
Nonunion	0	0
Nerve Damage	3	5.0
TMJ-Dysfunction	3	5.0

TABLE 2: FREQUENCY OF COMPLICATIONS IN EACH CATEGORY

Complications	MMF	%	TOW	%	Plating	%
Infection	1	5.0	3	15.0	2	10.0
Malocclusion	1	5.0	2	10.0	2	10.0
Delayed union	2	10.0	1	5.0	0	0
Nonunion	0	0	0	0	0	0
Nerve Damage	0	0	3	15.0	0	0
TMJ-Dysfunction	2	10.0	1	5.0	0	0
OVERALL	6*	30.0	10*	50.0	4*	20.0

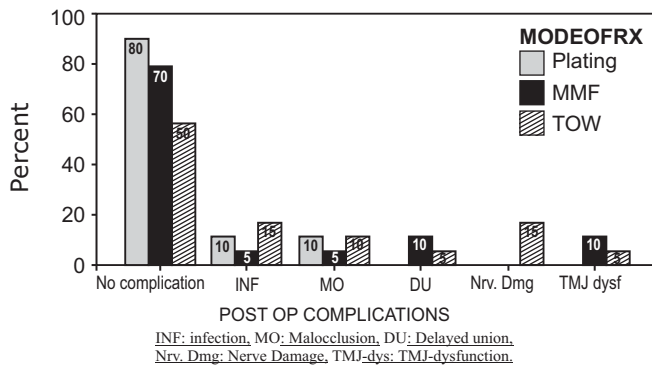


Fig 5: Comparison of complications

30% in MMF group and 50% in TOW group. The most common complication was infection, occurred in 10% of the patients, followed by malocclusion occurred in 8.3% of the total patients.

DISCUSSION

In this study 50% of the fractures were the result of Road traffic accidents, 20% because of falls, 16.7% due to assaults and 6.7% due to industrial trauma. Our findings of road traffic accident as leading cause of mandibular fracture followed by falls due to kite flying is well supported by the study of Abbas I⁵ and Moreno JC.¹³

Emshoff have reported sports as the major cause of mandibular fractures.¹⁷ In our study falls related to kite flying were responsible for 20% of the cases.

Most of the patients were males accounting for 93.3 % and females 6.7% of the total, with male to female ratio of 14:1. The mean age of the patients in the study was 27.2 years. The age ranged between 12-60. The most common age group was 21-30 yrs followed by 12-60 yrs age group. Similar age & sex distribution were reported by Abbas et al² and Mosby & Dugan.^{18, 19}

Similarly mandibular fractures have been reported to be more common in males.⁵

The most common mandibular site found to be fractured was the parasymphysis accounting for 48.3 % of the total. According to Moreno and Renton parasymphysis is the most common fractured site of the mandible.^{12, 13} Similarly, Abbas has reported the parasymphyseal fractures to be the most common accounting for 29.40 % of the total.⁵

In this study infection proved to be the most common complication accounting for 10% of the total cases followed by the malocclusion accounting for 8.3%. Different studies have been carried out comparing the traditional methods of treatment with newer techniques. Theriot²⁰ compared compression plates, Miniplates and TOW osteosynthesis. Similarly, Renton¹² compared miniplates with TOW osteosynthesis. These all have supported the rigid internal fixation as the treatment of choice. On the other hand Lamphier¹⁶ and Moulton²¹ have found the traditional techniques superior to the newer techniques regarding to their postoperative complications. In our study the results show the differences between the complications in each of the procedures. Since the number of sample (20 in each) and number of complications within each group (6, 10 & 4) are low, the differences could not be found statistically significant. However, the comparison is clinically significant.

In our study infection occurred in 5% of MMF group, 15% of TOW group and 10 % of the plating group. Our results regarding postoperative infection are comparable with that of international data. As according to Moreno infection rates for MMF and plating were 4.4 % and 12.5 % respectively.¹³ Similarly Renton has also provided nearly the same data for TOW (10 %) and

plating (15 %).¹² Higher infection rates for TOW group and plating group were most probably due to the direct intra oral contamination of the fracture site from the intra oral incision. Other factors which may be involved are type of fracture, kind of treatment used, when it was carried out, oral hygiene, presence of tooth in the line of fracture, osteosynthesis material as a foreign body, mobility of the fracture site, etc. Those patients were treated with broad-spectrum antibiotics.

The second most common complication was post surgical malocclusion which occurred in 8.3 % of the total cases and it occurred in 5 % of MMF group, 10 % of TOW group and 10 % malocclusion was seen in the plating group. Our data is matching with that of Renton¹² and Moreno et al¹³ (MMF=2.9 % and 8.3% for other groups).

The presence of post surgical malocclusion depends on the patient's dental condition, the number of fractures and their displacement, the reduction that can be achieved, the kind of immobilization and the time of immobilization. MMF as the only treatment achieves reduction of the fracture that is sufficient to obtain good post surgical occlusion²², which this series also showed but at the expense of prolonged functional limitation. No doubt rigidity of the osteosynthesis material is an advantage because it allows for immediate jaw mobility, but it can also be a drawback if it prevents correction of a post operative malocclusion with MMF.¹³ In this study MMF was done in all the three groups but in plating group MMF was done on temporary basis for shorter duration.

The malocclusion noted was minimal and was treated easily by corrective occlusal adjustment.

Delayed union was defined as excessive mobility of the fracture site three to four weeks post-treatment. This occurred in 5% of the total patients. In MMF group delayed union occurred in two patients (10%), in TOW group one patient (5%) while none of the plating group faced this complication. Our findings regarding delayed union are similar to those of Renton.¹² None of these patients required further surgical intervention and were progressed to normal union with only prolonging the period of MMF.

Non Union means that the fracture is not only united but will not unite on its own. Radiographs show

rounding off and sclerosis of the bone ends called eburnation. Fortunately none of our patients faced this complication. This finding is matching with that of Abbas.²

Both sensory and motor neuropathies were noted according to the patient complaint. Sensory disturbances were recorded as the disturbances of mental and inferior alveolar nerves. The only group, which showed sensory disturbances, was TOW group, accounting for 15% of the patients. The mental nerve is usually affected in the fractures of the body and the parasymphysis, where as the inferior dental nerve affecting the sensation of the lower lip usually occurs in the fractures of the angle of the mandible.²³

In this study there was no record of any involvement of the mandibular branch of the facial nerve (motor disturbance) as has been reported by Iizuka and Lindqvist.²³ These findings regarding sensory disturbance in TOW group patients is matching with that of Renton¹² and is probably due to the excessive manipulation of the fracture ends in the placement of the transosseous wiring. All these patients were treated conservatively.

Any reduction in mouth opening post operatively was considered as trismus. In this study trismus was encountered in three patients, two related to MMF group (10%) and one related to TOW group (5%). None of these patients was in plating group. Our findings regarding trismus are comparable to those of Moreno¹³. Our finding of no trismus in plating group is also supported by the study of Anderson²⁴ (1992). The reason for postoperative trismus in MMF group and TOW group is probably longer duration (6-weeks) of maxillomandibular fixation. Post operative mouth opening exercises (wooden stick exercises) were advised to these patients and fortunately all of them were relieved in a week to ten days time.

CONCLUSION

This study was undertaken to investigate different treatment modalities of mandibular fractures. It was seen that rigid internal fixation in the form of plates was advantageous as it allows immediate or early mandibular mobility, with good functional and aesthetic results and a low rate of complications. The major operative morbidity proved to be infection fol-

lowed by malocclusion. Miniplates osteosynthesis had reduced complication rate as compared to the traditional methods. In the light of this study the following **recommendations** can be given:

- To reduce the incidence of road traffic accidents the traffic rules and regulations should be improved and there should be amendments in legislation about the use of seat-belts. Motorbike wheeling by the today's youngsters should be banned. Kite flying should be banned as well.
- Record keeping should be improved.
- The best available modality of treatment with less complication should be provided to all of the patients, free of cost, on government basis.
- Further research work is required in the area to improve the present status of treatment.

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