# POST OPERATIVE COMPLICATIONS IN MANDIBULAR FRACTURE MANAGEMENT. COMPARISON OF THREE DIFFERENT TREATMENT MODALITIES

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## ABSTRACT

***Objective:*** To compare the post-operative complications for mandibular fractures with three different treatment options i.e. miniplate fixation without maxillomandibular fixation (MMF), maxillomandibular fixation exclusively and maxillomandibular fixation with non-rigid fixation.

***Study Design***: Randomized controlled trial (RCT).

***Place and Duration of Study:*** Oral and maxillofacial surgery department, Armed Forces Institute of Dentistry, Rawalpindi, Pakistan from February 2007 to January 2008.

***Subjects and Methods:*** The study was carried out over a period of one year on 90 patients with mandibular fractures. They were randomly divided into three equal groups for three treatment options. At different levels of their post-operative visit, these patients were evaluated for post-operative complications. Data were entered and analyzed in SPSS version 10.

***Results***: Patients treated by MMF had fewer complications, 3 (10%) as compared to patients treated by miniplate without MMF or non-rigid fixation with MMF, 16.7% (5) in each group. Statistically difference was not significant (*p*-value =0.138).

***Conclusion:*** The occurrence of post-operative complications in the treatment of mandibular fractures is fundamentally related to the severity of the fracture rather than the type of treatment used.

**Keywords:** Complications, mandibular fractures, maxillomandibular fixation.

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## INTRODUCTION

Trauma to the maxillofacial area produces a variety of injuries. These injuries may be simple and limited to the soft tissues or they may be complex and involve multiple facial bones. Of all injuries, none perhaps is of more concern to the patient than those involving the facial region[1]. Mandible, being the only mobile bone of facial skeleton plays a major role in mastication, speech and deglutition. Among the maxillofacial trauma, mandible is the high risk exponent[2,3]. Mandibular fractures are one of the most common fractures of the facial skeleton[4,5]. It's fractures result in severe loss of function and disfigurement[2].

The pattern of mandibular fractures varies with geographic location, physical activity, social, cultural and environmental factors[6]. Mandible is the second most fractured bone in the whole body. It may fracture alone or in combination with other facial bones[7,8]. The most common location is the angle of mandible[9] and the prominent causes of fracture mandible include road traffic accidents, falls, interpersonal violence and sports injuries[10].

Various treatment modalities[11, 12] available for mandibular fractures are:

1. Maxillomandibular fixation (MMF) alone e.g. dental wiring.
2. MMF with non-rigid osteosynthesis e.g. transosseous wiring or circumferential wiring.
3. Osteosynthesis with rigid fixation e.g. miniplates or compressive plates.

Previously traditional methods i.e. MMF and transosseous wiring were the popular methods used for the treatment of mandibular fractures[13]. Currently rigid fixation with one or two miniplates has become a widely acceptable method of providing internal fixation and

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*Received: 11 Feb 2016; revised received: 27 May 2016; accepted: 14 Jun 2016*

eliminating the need for post operative maxillomandibular fixation[7]. This method has also resulted in post-operative complications if the plates are not correctly placed. Also the approaches used for the placement of plates either extraoral or intraoral may result in nerve damage and these plates may be a source of infection[13].

The most unacceptable sequelae of surgery are post operative complications associated with surgical procedures. The type and rate of post operative complications associated with different treatment modalities play pivotal role in the selection of most suitable treatment option. In this study we used different available treatment options for mandibular fracture and compared the complications associated with various treatment options. This will improve our understanding towards complications associated with various treatment options for mandibular fractures, thereby selecting the treatment option with less post operative complications and morbidity, thus providing better patient care.

## SUBJECTS AND METHODS

This randomized controlled trial (RCT) was carried out at oral and maxillofacial surgery (OMFS) department of Armed Forces Institute of Dentistry (AFID) Rawalpindi, Pakistan over a period of 1 year starting from February 2007 to January 2008. After ensuring the initial emergency management, assessment of the patient was carried out giving priorities to other serious injuries. All the patients of the facial trauma were treated as in door cases. Diagnosis was made with history, clinical examination and radiographs.

The sampling technique used was consecutive non-probablity sampling and sample size was calculated by using WHO sample size calculator. Microsoft excel programme was used at WHO website to fill the columns as per instructions and step wise calculation was done. Study included 90 patients divided into three equal groups by simple randomization using lottery method.

- Group-A:- Patients treated with open reduction and rigid internal fixation with miniplates Osteosynthesis.
- Group-B:- Patients treated with MMF alone.
- Group-C:- Patients treated with MMF along with open reduction and non-rigid fixation e.g. transosseous wiring.

Patients with obvious bone pathology, comminuted and unfavourable fracture(requiring open reduction and fixation), children below 10 years of age, maxillary and mandibular edentulism were not included in the study. Procedure was carried out under general anesthesia by one surgical team for all groups of patients. An informed written consent was taken from each patient after explaining risks and benefits of procedure to include them in study and permission was granted from ethical committee of AFID for conducting this study.

Post operatively patients were discharged on 2nd-4th post operative day and all patients were prescribed antibiotics and analgesics for 07 days. Follow up was done regularly on weekly basis for first four weeks, then fortnightly for another eight weeks. Post operative radiographs were taken for each patient. Data of every patient was entered in predesigned proforma. The proformas containing variables of post operative complications i.e. infection, limited mouth opening, sensory nerve damage and a need for removal of osteosynthesis material were completed within 12 weeks follow up period.

Data were entered in SPSS version 10.0 for analysis. Mean and standard deviation was calculated for age. Frequencies and percentages were presented for all qualitative variables. Chi-square test was used to compare complications associated with various treatment options. A *p*-value of less than 0.05 was considered significant.

## RESULTS

Out of 90 patients, there was a majority of male patients i.e. 84 (93.3%) and 6 (6.7%) were female with male to female ratio of 14:1. The age

of the patients ranged from 12 to 60 years with mean age of 32.7 ± 12.83 years.

The most common etiology of fracture mandible was road traffic accident (RTA), 57 (63.3%) cases, followed by falls 14 (15.6%), sports 9 (10%), interpersonal violence 8 (8.9%) and others 2 (2.2%) which include gunshot wounds. Preoperative status of patients in respect of occlusion, associated facial fracture and inferior alveolar nerve paresthesia is shown in table-I.

Total number of 15(16.5%) complications was recorded in 13 (14.4%) patients. Most patients were in group A and C, 5 (16.7%) patients each. Fewer patients were in group B, 3(10%) patients. Detail about post operative complications related to the three groups is given in table-II.

The statistical analysis of this data did not show significant differences among the different types of treatment options ($p$-value=0.138).

## DISCUSSION

Man is exposed to trauma since the days of Adam but ever increasing vehicular accidents and interpersonal violence has compounded the problem. Increased awareness about esthetics and optimized need for earlier functional recovery to life has posed maxillofacial surgeons to innovate surgical techniques to provide better options in the treatment of mandibular fractures[14]. Rigid internal fixation has challenged the traditional methods of treatment i.e. MMF, use of splints and transosseous wiring for maxillofacial fractures. Technique of internal fixation by plates and screws has provided

**Table-I: Preoperative status of patients.**

| Pre-operative status of patients | | Groups of patients n= 90 | | | Total | |
|---|---|---|---|---|---|---|
| | | Group-A Miniplate fixation without MMF (n= 30) | Group- B MMF alone (n=30) | Group- C Non-rigid fixation with MMF (n=30) | | |
| **Pre-surgical occlusion** | Minimally disturbed | 3 (10%) | 13 (43.3%) | 5 (16.7%) | 21 (23.3%) | 90 |
| | Malocclusion present | 27 (90%) | 17 (56.7%) | 25 (83.3%) | 69 (76.7%) | |
| **Associated facial fractures** | Present | 11 (36.7%) | 4 (13.3%) | 7 (23.3%) | 22 (24.4%) | 90 |
| | Not Present | 19 (63.3%) | 26 (86.7%) | 23 (76.7%) | 68 (75.6%) | |
| **Inferior alveolar nerve status** | No altered sensation | 12 (40%) | 18 (60%) | 12 (40%) | 42 (46.7%) | 90 |
| | Paresthesia present | 18 (60%) | 12 (40%) | 18 (60% | 48 (53.3%) | |

**Table-II: Post-operative complications in each group (n=90).**

| Complications | Group A Miniplates Fixation Without MMF* (n=30) | Group B MMF Alone* (n=30) | Group C Non-Rigid Fixation (Tow) With MMF* (n=30) | Total |
|---|---|---|---|---|
| Infection | 1(3.3%) | - | 1 (3.3%) | 2 (2.2%) |
| Malocclusion | 3 (10%) | - | 1(3.3%) | 4 (4.4%) |
| Delayed union | - | 2 (6.7%) | - | 2 (2.2%) |
| Limited mouth opening | - | 1 (3.3%) | 1 (3.3%) | 2 (2.2%) |
| Sensory nerve damage | 2 (6.7%) | - | 1 (3.3%) | 3 (3.3%) |
| Miniplate removal | 2 (6.7%) | - | - | 2 (2.2%) |
| Overall | 8 (30%) | 3 (10%) | 4 (16.6%) | 15 (16.5%) |

*$p$= 0.138

precise anatomic reduction, superior aesthetic results, increased comfort and safety of the patients and early restoration of functional life[15,16]. Studies comparing wire osteosynthesis with plating have proved the superiority of the later[17]. Fewer studies have directly compared the two techniques in a prospective manner. In our study, we have evaluated complications seen with MMF exclusively, wire osteosynthesis with MMF and miniplating system in management of mandibular fracture.

MMF as the only treatment achieves a reduction of the fracture that generally does not coincide with anatomic reduction, but this is sufficient to obtain good post surgical occlusion, which this series also showed but at the expense of prolonged functional limitation[14].

In this study 15 (16.5%) complications were seen in 13 (14.4%) patients. Malocclusion proved to be the most common complication accounting for 4 (4.4%) of the total cases followed by the sensory nerve damage accounting for 3 (3.3%)[2]. Two percent (2.2%) complications were seen in cases of infection, delayed union, limited mouth opening and miniplate removal. Total number of patients having complications in group A and C were 5 (16.7%) each and in group B was 3(10%). This shows that traditional methods have least complications as compared to miniplates and transosseous wiring. Similarly Lamphier[17] Moulton[18] and Leach[19] have found the traditional technique superior to the new techniques regarding their post operative complications.

In our study the results show the differences between the complications in group A, B and C of the procedure. Since the number of samples (30 in each group) and number of patients with complications in each group (5,3 and 5 respectively) are low, the difference was not statistically significant. However the comparison is clinically significant.

Infection was recorded when it was manifested by abscess formation. In our study total infection rate was 2.2%. Infection occurred 3.3% in group A and C each and there was no infection in group B. Our results regarding post operative infection are comparable with that of the international data. As according to Bochlogyros PN[20], infection is reported to develop in 0.4% to 32% of all cases. In study by Hussain[21] infection was the commonest post operative complication (7.5%). This may be due to greater number of patients (80) in this study. Infection rate of 3% to 27% has been reported in previous studies with the use of metal plates and screws for the treatment of mandibular fractures[13,22]. Over all infection rates of 2.2% is comparable to other studies.

Malocclusion was based on evaluation of occlusion, checked for maximum inter digitations, midline relationship, molar relationship and attrition wear facet relationship. The most common complication in our study was post surgical malocclusion. This was seen in 4.4 % of the total patients. In group A it was 10 % and in group C it was 3.3% while in group B there was no patient of malocclusion. In international literature it is 3.4% in total population[14]. In a study by Hussain[21] malocclusion was 5% which is in accordance with our study, It should be noted that MMF was used more frequently in patients with minimal disturbance in post traumatic occlusion and good dental status. Malocclusion up to 18.2% has been reported in previous studies while during this study it was 4.4%. Inappropriate bending and adaptation of plates is said to be the cause of it[13].

Limited mouth opening in this study was assessed if it was less than 35 mm after follow up period. Limited mouth opening was seen in 2.2% in total patients while in the international literature it is 1.7%[14]. There was no patient with limited mouth opening in group A and there was 3.3% limited mouth opening in group B and Group C each. It was due to prolonged MMF in group B and C. Our data is matching with that of Renton and Wiesenfeld[13] and Moreno et al[14].

Sensory testing was performed using light touch with cotton wool and sharp/ blunt differentiation with a dental probe on the skin of chin and lower lip. Sensory nerve injury particularly of the inferior alveolar nerve and

mental nerve is a common complication associated with mandibular fractures. In our study sensory nerve damage was 3.3 % of the total patients. Nerve damage was 6.7 % in group A and 3.3 % in group C. There was no nerve damage in group B. Closed reduction generally results in low rates of nerve dysfunction compares with surgical treatment[20]. In Moreno[14] there was no sensory nerve damage with open reduction (2mm miniplates). The incidence is reported as ranging from 11% to 59 % of all displaced mandibular fractures that present with nerve injury. Most injuries are neuroprexia, and are secondary to stretching or compression and resolve spontaneously[23].

By definition delayed union go on healing without additional surgical therapy. Infection, mobility, mandibular atrophy, increased age and systemic illnesses are the causes. In our study delayed union was observed in 2.2 % of total cases of mandibular fractures which was present in group B only. In international literature delayed union occurs in 0-4.4% of mandibular fractures[24]. In Moreno et al 13 delayed union was present in 2.2% cases. In our study, there was no delayed union in group B and group C. In our study miniplates were used only in group A. Miniplates were removed in 2.2 % of the total cases while in Bhatt V[25] study removal of miniplates was 5.2%. Cause of removal of 1 plate was infection at the angle of mandible and other plate on patient's request. In Bhatt V[25] study the most significant cause of plate removal was also infection.

## CONCLUSION

The occurrence of post operative complications in the treatment of mandibular fractures is fundamentally related to the severity of the fracture rather than the type of treatment used. The major operative morbidity was proved to be malocclusion followed by sensory nerve damage.

Miniplate osteosynthesis had high complication rate as compared to the traditional methods. In future similar studies with larger number of patients should be conducted to elaborate upon complications associated with different treatment options.

## CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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