

# COMPARISON OF TRANSOSSEOUS WIRING AND MINI PLATES IN THE MANAGEMENT OF ANTERIOR MANDIBULAR FRACTURES

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## ABSTRACT

**Objective:** The purpose of this study was to compare transosseous wiring and mini plates in the management of anterior mandibular fractures.

**Materials and Methods:** A total of 200 participants were included in the study (100 in each Group). Patients in Group A were subjected to transosseous wiring with maxillomandibular fixation. Patients in group B were subjected to miniplate fixation. Patients' follow up was done on the first, second, fourth, and eighth week for the assessment of infection and malocclusion and were recorded.

**Results:** In this study, the mean age was 30 years with standard deviation  $\pm 1.62$ . Sixty percent of the patients were male, and 40% of patients were female. Regarding the infection in the Transosseous wiring group, the postoperative infection was found in 15(15%) patients, and in the Mini plates group, the postoperative infection was found in 4(4%) patients. While malocclusion in Transosseous Group, postoperative malocclusion was found in 10(10%) patients, and mini plates group postoperative malocclusion was found in one patient(1%).

**Conclusion:** The major operative morbidity proved to be infection followed by a malocclusion. As the rate of infection and malocclusion was found more in transosseous wiring as compare to mini plates, which concludes that Mini plates technique is best than transosseous wiring technique in the management of anterior mandibular fractures.

**Keywords:** Mandibular fractures, transosseous wiring, mini plates, malocclusion, infection

## INTRODUCTION

Mandible being important bone of the facial skeleton attached to the skull plays important functions like speech, mastication, and deglutition. The fractures of the mandible, being prominent in the facial skeleton, are the most common occurrence in maxillofacial trauma. Being an important part

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of the facial skeleton, its injuries causes loss of the functional capabilities as well as disfigurement of facial structure.<sup>1</sup>

Road traffic accidents, falls, firearm injuries, industrial injuries, sports accidents, and interpersonal violence are the etiological factors for mandibular fractures while road traffic accident documented is the most common cause of fracture mandibular.<sup>2</sup>

The basic objective for the treatment of the mandibular fracture is to restore the form and function by rapid bone healing, which includes the return

of normal masticatory system, return of normal facial with dental esthetics, and return of the normal speech. It is also important to mention that during and after the treatment, it is important to lessen the discomfort and normalization of the patient's nutritional status. These objectives for the management of the mandibular fractures revolve around four principles of reduction, fixation with stability and immobilization.<sup>3</sup>

Different treatment modalities have been mentioned in the literature. One of the treatment modality includes intermaxillary fixation by dental wiring, by gunning splint, or with the help of an arch bar. Another mention method in the literature includes fixation of the mandible by transosseous wiring or mini plates osteosynthesis along with intermaxillary fixation. The fixation can also be done with the help of lag screws, non-compression plating or by dynamic compression plating without intermaxillary fixation.<sup>4</sup>

Basic trends towards the treatment of mandible fractures include a conservative method involving close reduction and intermaxillary fixation and open reduction and fixation. In the conservative method, the mandible is closely reduced, and intermaxillary fixation is done. In open reduction and fixation, the mandible is fixed with transosseous wiring or by miniplate osteosynthesis with or without intermaxillary fixation.<sup>5</sup> Open reduction and rigid fixation are considered an important treatment option which achieves an early return of function and more speedy recovery during the healing phase. The first return of the function is considered important, especially in children, which prevents the ankylosis of the temporomandibular joint. It also prevents life-threatening events in epileptic patients, firearm injuries, mentally disabled, and polytrauma patients as no IMF are needed.<sup>6</sup>

The rigid mandibular fracture internal fixation has been debated for having difficulty with the procedure, more operating time, cost of the equipment, more morbidity with prolonging stay at a hospital, and need of the second reoperation for the plate removal in case of complication and children. This treatment modality also carries complications of postoperative malocclusion by placing the plate incorrectly. Other complications include postoperative infection, nerve damage, visible scar or dental

root damage.<sup>7</sup> Mal-union, Delayed union, nonunion limitation of the opening of the mouth are some of the other complications that occur during rigid fixation. The derangement of the occlusion, injury to the inferior alveolar nerve, and infected hardware are reported in the literature to be 27.65%. Missed placed surgical site drilling, injudicious retraction, and mal application of the surgical hardware are associated with having more nerve injury.<sup>8</sup>

The objective of the study is to compare transosseous wiring and mini plates fixation in the management of anterior mandibular fractures in terms of postoperative infection and malocclusion.

## MATERIALS AND METHODS

This randomized control clinical trial was carried out in the department of Oral and Maxillofacial Surgery Gajju Khan Medical College, Bacha Khan Medical Complex, Swabi, from Mar 15, 2019, to Sept 15, 2019. Two hundred patients were included in the study. Patients of both genders from ages from 17 to 55 years and the patients with isolated anterior mandibular fracture assessed clinically and radiographically were included in the study. The patients having comminuted anterior mandibular fractures detected during clinical and radiographic examination, fractures associated with Pan facial trauma, pathological fractures (tumors, cyst, etc.), and immunocompromised patients were not included in the study.

After approval of the hospital ethical committee, all patients who met the inclusion criteria (patients complaining of pain during mastication and history of trauma and x-ray showing break in the continuity of mandible) were included in the study. The benefit and the purpose of the study were explained to the patient, and informed consent was taken. All patients were evaluated with detailed clinical history, with relevant clinical examination and routine preoperative investigations. All patients were randomly allocated in two groups by lottery method. Fracture segments are exposed, reduced, and fixed through an intraoral buccal vestibular incision. Patients in Group A transosseous wiring was done with maxillomandibular fixation in group A. In group B miniplate fixation was done. Mini plates of 5 holes adapted at the lower border, while four holes mini plates adapted at the upper border. Screws of 2 mm diameter with 7mm length were used. Broad-spectrum antibiotics

are prescribed to all patients for a week.

Postoperative radiographs were advised on the first week. Patients were advised semi-liquid diet and strict oral hygiene instructions. Patients’ follow up was done on the first, second, fourth, and eighth week for the assessment of infection and malocclusion and were recorded on the proforma. The data were analyzed into a Statistical package for social sciences (SPSS) version 22. The qualitative variables like sex and postoperative complications such as infection and malocclusion were presented as frequency and percentages. The mean and the standard deviation were computed for quantitative variables like age. Infection and the malocclusion were compared with the help of the “chi-square test.” In both groups, a P-value of less than or equal to 0.05 was considered as significant.

**RESULTS**

Age distribution showed that 38(19%) patients were <20 years of age, 60(30%) patients were in age ranged 21-30 years, 56(28%) patients were in age ranged 31-40 years, 36(18%) patients were in age ranged 41-50 years, and 5(10%) patients were in age ranged 51-60 years. The mean age was 30 ±

1.62 years. The males (n=120, 60%) were more than females (n=80, 40%). The site of fracture among 200 patients was analyzed, as 70(35%) patients had Symphysis, while 130(65%) patients Parasymphysis. (Table 1).

Status of infection in Transosseous Group, the postoperative infection was found in 15(15%) patients, after two weeks showed that 9(9%) patients had an infection, after four weeks 3(3%) patients had an infection, after eight weeks only one patient had an infection. On the other hand, among 100 patients of miniplate Group revealed that postoperative infection was found in 4(4%) patients; after two weeks, 2(2%) patients had an infection; after four weeks, only one patient. Status of Malocclusion showed that in transosseous Group, postoperative malocclusion was found in 10(10%) patients; after two weeks, 6(6%) patients had malocclusion, after four weeks 3(3%) patients had malocclusion, and after eight weeks only one patient had malocclusion. On the other hand, among 100 patients of miniplate Group, postoperative malocclusion was found in one patient. (Table 2).

**Table 1: Frequency of age, gender, and location of mandibular fracture**

Variable	Category	Frequency	Percentages
Age group (years)	<20	38	19
	21-30	60	30
	31-40	56	28
	41-50	36	18
	51-60	10	5
Gender	Male	120	60
	Female	80	40
location of mandibular fracture	Symphysis	70	35
	Para-symphysis	130	65

**Table 2: Comparison of infection and malocclusion at various time points between the transosseous wire and miniplate group**

Variable	Transosseous				Miniplate group				P-value*
Age group (years)	1 week	2 week	4 week	8 week	1 week	2 week	4 week	8 week	
Infection (Yes)	15 (15%)	9 (9%)	3 (3%)	1 (1%)	4 (4%)	2 (2%)	1 (1%)	-	0.063
Malocclusion (Yes)	10 (10%)	6 (6%)	3(3%)	1 (1%)	1 (1%)	1 (1%)	-	-	0.067

\* Chi-square test

## DISCUSSION

In mandibular fracture management, early restoration of the physical integrity and return of functional needs with minimal possible morbidity is the rule. In the study, the age ranges from 5-70 years. The mean age of the patients was 30 years  $\pm 1.62$ . The most common age group was 21-30 years (30%), followed by 31-40 years (28%).

In terms of age distribution, 60% were male patients (n= 120), and 80% were female patients (n=40), and the ratio of male to female was 5.6:1. Abbas et al<sup>1</sup> conducted a study that had similar observations regarding age distribution and gender distribution.

The study conducted by Cheema AS et al.<sup>9</sup> also shown that the second and third decade was a common age group for mandibular fractures. In this, the same study the male to female ratio was 5:1 in coherence to our research. As human life is most active between the second and third decades so are more vulnerable to accidents. In these age groups, sports activity is more, more high-speed vehicle transportation, more engagement in interpersonal violence, greatly susceptible to an industrial injury. Also, males are most of the time outdoor with more mobility and more subjective to injuries compared to females.

The common site of fracture of mandible was the parasymphysis fracture, about 65%, body 18.29%, and angle (24.39%). Parasymphysis being the prominent area is more subject to injury. In correlation to the study conducted by Abbas, et al<sup>1</sup> also found parasymphysis being a common site for mandibular fractures. A similar finding was also observed in another study as well.<sup>7</sup>

The majority of patients in our study had a unilateral mandibular fracture, about 97.5%, followed by 2.5 % of bilateral mandibular fracture. The study conducted by Khan AA<sup>10</sup> reported similar findings and reported about 82.7% and 17.2% for unilateral and bilateral mandibular fracture, respectively. Our research has a similar finding and is in correlation with is study. In contrast to our study, a study conducted by Adi M et al.<sup>11</sup> reported 41% of bilateral mandibular fracture, while unilateral involvement was 47%.

Sensory disturbances of mental nerve in 15 patients (18.8%), as suggested by Adi M and coworker<sup>11</sup> observed 15% mental paraesthesia in a mandibular fracture as an important sign to look for the fractures in mandible.

This study shows that postoperative infection in Transosseous Group was found in 15 (15%) patients, whereas in Mini plates Group postoperative infection was found in 4 (4%) patients. The results of the study were in coherence with the study by Hussain S.<sup>12</sup> In his research, there was a 7.5% infection, while mandibular fracture was fixed rigidly. In another study conducted by Cawood JI (1985),<sup>13</sup> reported 6% and 9.63% reported in the study conducted by Odem et,<sup>14</sup> which have the same finding as our study.

An even higher infection has been documented in other studies as up to 15%.<sup>7</sup> In consistence with the study conducted by Khan, AA<sup>10</sup> also reported 18% of infection percentage.

Dodson reported an 11.3% infection in the rigid fixation of the mandible. But the overall infection was 7.5% for rigid fixation, while for non-rigid fixation, it was 15%, which is comparative to the mentioned studies.<sup>13,14</sup> Sixteen percent (16%) higher infection has been documented in literature when transosseous wiring was used because of the large size of wiring with exposure to intraoral contaminated environment as well as difficulty in maintaining oral hygiene.<sup>16</sup> As transosseous wiring gives non-rigid fixation, there is also mobility of the fractured segments, which compromise the healing process. The patient's compliance is significantly reduced, unable to maintain oral hygiene and poor nutritional intake. Debris entrapment is the consistent source of infection when it is exposed.<sup>17</sup>

In this study, the post-surgical malocclusion was checked by a molar relationship with maximum intercuspation, midline dental relationship, patient's perception, and examination of wear facets. In our study, 10 patients in the transosseous Group had malocclusion while in the miniplate osteosynthesis group, only one patient had malocclusion. In the study conducted by Cawood et al<sup>12</sup> also shown 8% malocclusion in non-rigid fixation while in other literature, the malocclusion in non-rigid fixation was 7.7%. The study conducted by Hussain S et al<sup>12</sup> 4% of malocclusion in the mandibular fracture rigid fixation.

In the rigid fixation of mandibular fracture Renton TF<sup>7</sup> and Dodson TB<sup>15</sup> documented 2.9% and 1.9% malocclusion. In open reduction and fixation method of fixation of mandibular fractures carry the advantage of direct visualization of fractured segments with stable occlusion and helps in less time for functional recovery<sup>18</sup> and miniplate fixation is preferred way of treatment.<sup>19</sup>

## CONCLUSION

In fixation of the mandible, the important post-operative morbidity was infection followed by a malocclusion as the rate of infection and malocclusion was found more in transosseous wiring as compare to mini plates, which concludes that miniplate osteosynthesis technique is best than transosseous wiring technique in the management of anterior mandibular fractures.

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