

Comparison of Single vs Double Miniplates in the Management of Mandibular Angle Fractures

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ABSTRACT

The main aim of this study was to compare the occurrence of neurosensory deficit and infection after osteosynthesis with open reduction and internal fixation (ORIF) with single and double plates. A sample of 30 patients who were above 13 years of age, was taken. All of them were diagnosed with displaced or un-displaced fractures on the basis of clinical examination and radiographs (OPG, PA mandible). These patients were divided into two groups A and B. Group A underwent treatment by single non-compression miniplates ventral to oblique line of the mandible and group B with double miniplates one at the same site and other at the buccal cortex below the inferior alveolar canal. Patients were evaluated for lip numbness and infection on day 1, week 1, week 2, week 4, week 6 and week 12. No statistically significant p value for association of infection and lip numbness was obtained for single plate and double plate.

Keywords: Fracture mandible, management, single vs double miniplates

INTRODUCTION

The mandibular trauma is most common among facial bones, representing 45% of all facial fractures^{1,2}. Fractures of mandible are influenced by factors such as direction, severity and impact of force, the presence of soft tissue bulk, occlusal loading pattern and biomechanical characteristics such as bone density, mass and anatomic structures creating weak areas. Other factors that are thought to be responsible include the presence of soft tissue bulk and biomechanical characteristics of the mandible, such as bone density, mass, and normal or pathologic anatomic structures creating weak areas within the bone.

Mandible can be fractured at condylar, ramus, angle, body, symphyseal, alveolar and coronoid process area with frequency of mandibular angle fracture being 42% of all mandibular fractures^{3,4}. The common causes of mandibular angle fractures are road traffic accidents and falls.

The ideal treatment of mandibular angle fractures remains subject of great debate and is treated by various methods such as open and closed reduction. However, osteosynthesis with open reduction and internal fixation (ORIF) remains the gold standard for the treatment of most adult mandibular fractures⁵. Champy recommended placement of a single non-compression mini plate ventral to the oblique line for mandibular angle fractures (Champy's technique)⁶. However adequacy of this technique was subject to skepticism by Kroon et al who showed that with this technique there is inferior distraction or splaying of lower mandibular border which is attributed to opposing muscular forces of the elevator group of muscles (masseter, medial and lateral pterygoid and temporalis muscle) and the depressor group of muscles (geniohyoid, mylohyoid, genioglossus and digastric

muscle)⁷. This splaying of lower border leads to different complications like facial widening, infection, malocclusion and non-union. Choi et al addressed this concern by addition of a second mini plate along the inferior border helps to stabilize fixation during functional loading⁸.

These concerns resonate with other clinicians as well who have treated angle fractures with single mini plate according to Champy's technique and have faced complications like opening of fracture line at the lower border, lateral displacement of the fragment at the inferior mandibular border, posterior open bite on the fracture side, infection and lip numbness^{6,9,10}. The addition of the second mini plate along the inferior border prevented all the complications mentioned above.

This dichotomy of thought processes and clinical experiences of various individuals highlights the lack of consensus amongst clinician as to what constitutes the most appropriate treatment modality for mandibular angle fractures

Treatment of angle fractures is continuing subject of debate; currently ORIF of mandibular angle fractures at my current center is being done with single miniplate placement at the superior border of angle. International studies advocate placement of a second miniplate at the inferior border to reduce postoperative complications.

The purpose of this study is to Compare postoperative complications of non-compression onemiplate versus two miniplates used for the fixation of mandibular angle fractures.

MATERIAL AND METHOD

This randomized controlled trial was conducted in the OPD Department of OMFS, Punjab Dental Hospital, attached with de'Montmorency College of Dentistry, Lahore. A sample of 130 patients was taken by Non-probability purposive sampling technique. The sample includes both genders above 13 years of age. All the patients were diagnosed for displaced or un-displaced fractures on the basis of clinical examination and radiographs (OPG, PA mandible). They were randomly allocated two groups A and B, 65 patients in each group. Group A having patients who

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underwent treatment by single non-compression miniplates ventral to oblique line of the mandible and group B with double miniplates one at the same site and other at the buccal cortex below the inferior alveolar canal.

The patients were followed up to evaluate infection and lip numbness on first day, first week, second week, fourth week, sixth week and twelfth week. The mean, standard deviation was calculated for quantitative variable like age and qualitative variable like sex, site, infection and lip numbness are presented as percentages and frequencies. Infection and lip numbness were compared with the help of 'Chi square test'. In both groups a p value less than or equal to 0.05 was considered significant. Statistical analysis was done through SPSS version 10 (SPSS, Inc. Chicago, IL).

RESULTS

The mean age of patients is 27.65 years with standard deviation of SD 9.84 with age ranging from 14 to 65 years.

Table 1: Occurrence of infection and lip numbness

Time	Infection		Lip numbness	
	Group A	Group B	Group A	Group B
First day	Nil	Nil	26	23
First week	1	2	24	20
Second week	2	5	21	19
Fourth week	8	6	16	18
Sixth week	7	8	20	16
Twelfth week	1	3	3	2

Table 2: Statistical results

P value	Infection	Lip numbness
First week	0.559	0.458
Fourth week	0.571	0.627
Sixth week	0.784	0.770
Twelfth week	0.310	0.648

DISCUSSION

The incidence of infection is the most predominant and by far above that of other posttraumatic complications. Infection is considered one of the major predisposing factors for non-union and for some is the main reason for plate removal in the postoperative period¹¹. Several studies conducted to estimate risk factors have proved that early and proper immobilization followed by antibiotic prophylaxis can significantly diminish infection rates¹¹. The patients who presented in the group A (single plate) with infection were 8(12.30%) and group B (double plate) had 10(15.30%) patients. Siddiqui et al. in his study recorded infection rates single and double plate patients as 11% and 15% respectively which is comparable to our study¹⁰. Ellis et al. in his study came across an infection rate of 13.5% in patients treated with single non-compression miniplate and the patients he treated with two non-compression miniplates had an alarmingly high rate of infection amounting to 25%. This disparity in infection rates between the current study and that of Ellis et al. in two plate patient group can be explained by the fact that the inferior border plate that we applied in our study was secured with mono-cortical screws whilst the Ellis used bi-cortical screws to anchor his plates on the inferior border¹². Danda et al. found out that single plate patients suffered from 3.7% of the time and double

Peak incidence was noted between 15 to 40 years of age. In group A there were 60 (92.3%) males and 5(7.69%) females and in group B there were 57(87.69%) males and 8(12.30%) females.

In group A 8(12.30%) patients suffered from infection and in group B 10(15.38%) of patients reported with infection. Not any patient in either group was infected on first day therefore p value was not applicable.

In group A 26(40%) patients suffered from lip numbness and in group B 23(35.38%) suffered from lip numbness on comparative analysis with help of Chi square test.

4(6.1%) patients in group A and 1(1.5%) patient in Group B had both infection and lip numbness. No statistically significant p value for association of infection and lip numbness was obtained for single plate and double plate. Hence there is no association of infection and lip numbness with single or double plate use.

plate patients were 7.4% of the time infected¹³. This infection rate in both groups is very low which is explained in part by the fact that Danda was dealing with a very small sample size of twenty-seven patients in each group and by the fact that postoperatively he placed patients in both groups in rigid MMF for one week and then elastic MMF for a further one week whereas we did not keep any of our patients in MMF following the end of their operative procedure. This MMF for one week negates the basic principle of "functionally stable fixation" which Ellis et al. and other advocates of single plate modality form the basis of their treatment¹². Furthermore supporters of double plate that in absence of a second plate there is inferior distraction of lower mandibular border under functional loading and there is splaying of lower border leading to complications like lateral displacement of the fragment at the inferior mandibular border, posterior open bite on the fracture side, infection and lip numbness^{6,9,10}, thus establishing a second line of osteosynthesis by application of a second plate at the lower border will make the fixation rigid and shield the patients from potential complications.

The second variable we monitored was neurosensory deficits of the inferior alveolar nerve which presents in the form of lip numbness. Previously published studies include fractures that do and those that do not involve the mandibular canal or reported sensory disturbances in

relation to specific methods of fracture reduction. The overall rate of neurosensory deficits of 37.69% was recorded in our sample of 130 patients. Ellis has reported 58% neurosensory deficit rates at the time of injury presentation and post op 22% patients who suffered from neurosensory deficits but he has included 15(8%) patients who were anesthetic in pretreatment phase a number that we have excluded from our study¹². Siddiqui et al. has reported lip numbness as 38% in his study which is comparable with rate exhibited in our study¹⁰. Razukevikus et al¹⁴. has grouped degree of nerve injury as mild moderate and severe, his mild and moderate patients are comparable with the patient nerve injury dysfunction grading (grade III) that we have used to segregate our patients for this study and in his mild and moderate group the rate of inferior alveolar nerve involvement of 39.92% is comparable to the results in our study. In the individual groups, group A (single plate) had 26(40%) patients and group B(double plate) had 23(35.38%) patients who on objective assessment with help of clinical neurosensory testing were labeled as having lip numbness.

We should be mindful of the limitations we came across while comparing our study with literature available first of all the pattern of trauma was not recorded as most foreign studies list altercations as major cause of angle fractures whilst we deal more with RTA associated injuries , furthermore our choice to entertain concomitant fractures of the mandible might act as confounders for infection and Ellis method of injecting his patients with depot form of penicillin on discharge to control antibiotic noncompliance by patients¹² was ingenious but sadly we were dependent on patient compliance in their antibiotic use. When it comes to neurosensory deficits we should have measured and recorded fracture displacement pre-operatively as was done by Laverick et al. to get a better insight in to correlations between fracture displacements and neurosensory paresis¹⁵. Marchena et al.¹⁶ recorded an overall inferior alveolar nerve deficit of over 50%, this result is higher because of the fact that the author was testing for sensory deficits of both mental and inferior alveolar nerve. Seeman et al.¹⁸ has quoted a 20% rate of neurosensory dysfunction which is quite lower than the current study but his data is retrospective and he is not included the transient hypesthesia after open reduction on the grounds that it is fairly common and therefore he has not assessed it. Vineeth et al. ¹⁷ has reported a rate of 30% for neurosensory deficits but his patient pool is of 40 patients and he has assessed it subjectively without testing it with objective methods. We should have measured and recorded fracture displacement pre operatively to get a better insight in to correlations between fracture displacements and neurosensory paresis.

CONCLUSION

Single plate was easier to perform and there was no association between single plate and two plates regarding postoperative infection and neurosensory deficit.

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