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TO COMPARE 2MM LOCKING PLATES WITH STANDARD OR CONVENTIONAL 2 MM MINIPLATES IN THE TREATMENT OF MANDIBULAR FRACTURES

Dental Science

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ABSTRACT

The sheer pace of modern life with high speed travel as well as an increasingly violent and intolerant society have made facial trauma a form of social disease from which no one is immune. Seemingly divergent shifts in society may be responsible for recent changes in patterns of facial injuries, extent and clinical features etc. resulting in massive disfigurement of maxillofacial skeleton. Various methods of bone plating have been developed to provide stable fixation for mandibular fractures and osteotomies. Miniplate system either locking or non-locking has revolutionarised the fixation of mandible fractures. The introduction of locking plate/screw system has certain theoretical advantages over conventional plates and screws which makes them superior to conventional miniplates. This study was undertaken with an aim to compare 2 mm locking plates with 2 mm conventional miniplates in fixation of mandibular fractures on the basis of ease of technique and postoperative results.

KEYWORDS

Maxillofacial Skeleton, Mandibular Fractures, Locking Miniplates, Conventional Miniplates

INTRODUCTION

The majority of facial fractures are found between the age of 16 to 30 years. Mandibular fractures out-number zygomatic and maxillary fractures by a ratio of 6:2:1.1 Motor vehicle accidents and assaults are the most frequent causes of facial fractures. Falls and sports injuries are other common causes of mandibular fractures. Mandible fractures if not identified or inappropriately treated may lead to severe consequence both cosmetic and functional.

The aim of mandibular fracture treatment is to restore anatomical form and function, with particular care to re-establish the occlusion. Traditionally, fracture fragments have been reduced to satisfactory occlusion by various methods of closed reduction like direct or indirect interdental wiring and were immobilized in that position by Maxillo-mandibular fixation. The disadvantages of these methods are inconvenience to the patient and possible obstruction of airway. Other problems are loss of weight, late recovery of normal mouth opening and possible periodontal damage to the ligated teeth in patients with less number of teeth present or periodontally compromised teeth. These indirect methods of dental wiring may be inadequate to achieve good immobilization. In the past two decades the aim of treatment is a more directed towards immediate return of normal jaw function by using different methods of open reduction and internal fixation. The advantages of these methods are convenience to the patient and for secondary reasons such as to maintain normal joint function and avoid the complications of immobilization.

The introduction of locking plate/screw system has certain theoretical advantages over conventional plates and screws which makes them superior to conventional miniplates.

MATERIAL AND METHOD:

20 Consecutive Patients presenting with mandible fracture attending the OPD of Department of Oral and Maxillofacial Surgery, Career Post Graduate Institute of Dental Sciences and Hospital, Lucknow requiring open reduction and internal fixation as treatment of choice were included in this study. All patients were randomly categorized into two groups with 10 patients each .Group 1: Conventional or standard 2 mm Non-Locking Miniplate system.

Group 2: 2 mm Locking Miniplate plate/screw system

Detailed information consisting of age, sex, chief complaint, history of present illness, past medical history, etiology and associated injuries were recorded on a specially designed history sheet for this purpose.Non comminuted mandibular fractures & Patients requiring open reduction and internal fixation were taken as inclusion criteria whereas Infected fractures, Completely edentulous patients & Medically compromised patients were included in exclusion criteria

STATISTICAL ANALYSIS

The data was statistically analyzed using SPSS Statistical Analysis Software. Mean has been used as an indicator to show the central tendency of the parametric variables before and after the procedure or at different follow up intervals. Mean is the arithmetic average of all the values of a series. Standard deviation gives an idea of the range and deflection of the values contributing to the mean. A higher standard deviation dilutes the strength of mean as the central tendency while a lower standard deviation strengthens it. It gives an idea about how the individual values in a series are scattered around the mean value. Chi-square test was used to test the significance of incidence at different time interval. Paired "t" test has been used to see the significance of differences in a pre – post design. In present study the Paired Student "t" Test was used to test significance of change. The study has been carried out keeping the confidence limit of 95% hence a p value less than 0.05 denotes a statistically significant difference.

RESULTS

The most common etiology for trauma leading to fracture mandible was road traffic accident (80%) followed by fall from height (10%) and 5% assault. Out of the sample Group 85% patients were Male and 15% Female. 40% patients were between the age Group 11-20 years which was the most common age group of these patients of fracture mandible attending our OPD, followed by 35% patients in 21-30 years age group and 25% in 31-40 Age Groups. Parasymphysis (38.71%) was the most common fracture site in this study followed by Body (32.26%) with equal incidence of single and multiple fractures. Operating time was less in Group II than Group I, but this difference was insignificant (Figure 1). Incidence of swelling was less in Group-II than Group-I at different time intervals. No incidence of swelling was found in Group-

II at 3rd Week and 6th Week. But in Group-I Swelling were present in 2 patients (20%) at 3rd and 6th Week. This difference was not statistically significant (Figure 2). Pain reduction was more in Group-II than Group-I at 2nd Day, 3rd week and 6th week, but it was not statistically significant. In Group-I and Group-II incidence of Deranged Occlusion was present in 10 patients (100%) preoperatively. Intact Occlusion was achieved in 100% cases in Group II at 2nd Day, 3rd and 6th week while deranged occlusion was present in one patient (10%) at 2nd day in Group-I which later resolved at 3rd and 6th Week (Table 1). There was non-significant difference in the incidence of the Deranged Occlusion (Figure 3). There was non-significant difference in Bite Force in Group-I and Group-II for different reference points at different time intervals. Bite Force was slightly more in right side molar region in Group-II than Group-I at different time intervals.

Infection was present in 2 patients (20%) of group-I while no patient reported with infection in Group-II. Mild occlusion discrepancy was present in one patient (10%) in Group-I (Table 2). In Group-I 7 patients (70%) had no complication and in contrast to Group-II which was 100% complication free. In postoperative sequele plate removal were present in two patients (20%) in Group-I and none was in Group-II. IMF required in one patient (10%) in Group-I and none in Group-II. Uneventful healing was present 7 patients (70%) in Group-I and in Group-II, it was present in 100% patients. (Table 3).Postoperative sequel was more in Group-I than Group-II and uneventful healing was more in Group-II than Group-I but the difference was non-significant.

Figure1: Comparison of Operating Time in Group I and Group II (n = 10)

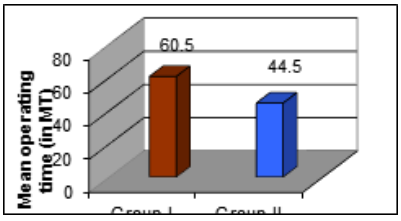

Figure 2: Comparison Incidence of Swelling in Group-I & Group-II at Different Time Interval

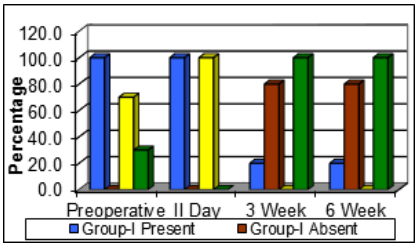

Table 1: Comparison of Occlusion in Group-I and Group-II at Different Time Interval

Comparison of Occlusion	Group I				Group II				x2	p
	Deranged		Intact		Deranged		Intact			
	n	%	N	%	n	%	n	%		
Preoperative	10	100	–	–	10	100	–	–	1.05	0.30 NS
2nd Day	01	10	–	–	–	–	10	100	–	–
3th Week	–	–	10	100	–	–	10	100	–	–
6th Week	–	–	10	100	–	–	10	100	–	–

Figure 3: Comparison of Occlusion in Group-I and Group-II at Different Time Interval

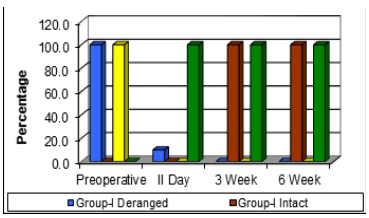

Table 2: Comparison of Incidence of Complications in Group-I and Group-II

Comparison of Incidence of Complications	Group-I		Group-II	
	No.	Percentage	No.	Percentage
Infection	02	20	–	–
Mild Occlusal Discrepancy	01	10	–	–
None	07	70	10	100
Total	10	100	10	100

Table 3: Comparison of Incidence of Complication of Post-Operative sequels in Group-I and Group-II

Postoperative sequel	Group-I		Group-II	
	No.	Percentage	No.	Percentage
Plate Removal	02	20	–	–
IMF Required	01	10	–	–
Uneventful Healing	07	70	10	100
Total	10	100	10	100

DISCUSSION:

The Treatment of mandibular fractures has evolved significantly in the past few decades as rigid internal fixation has become increasingly popular with both patients and surgeons. Two general treatment philosophies emerged for plate and screw fixation of mandibular fractures in the 1970s and 1980s. The AO/ASIF (Arbeitgemeinshaft fur Osteosynthesefragen /Association for the Study of Internal Fixation) philosophy, which promote sufficient rigidity at the fracture site to prevent interfragmentary mobility during mandibular function, has traditionally been accomplished using large rigid plates and bicortical screws placed through an extra oral approach. A second philosophy, popularized by Champy et al2, emphasized "The Ideal Lines of Osteosynthesis" in the mandible. This technique uses non-compression monocortical miniplates placed through transoral incision in the region of optimal stress to neutralize tension.

In our study the Operating Time was less in Group-II as compared to Group-I which could be due to the fact that Non-Locking Miniplates requires precise adaptation of plate to the bone across the fracture line for achieving good stability while Locking Miniplates requires less precise adaptation. This is well supported by Chad. P. Collins (2004)3, Ayman Chritah et.al. (2005)[4].

Two cases presented with Swelling at 3rd and 6th week while no such cases were reported in Group-II. This is supported by John Graham (2002)5, Ayman Chritah(2005)4, Chandan Prabhakar (2011)[6].

The Locking Miniplates requiring less precise adaptation thereby decreasing the chance of screw stripping with associated inflammation, moreover they do not disrupt the underlying cortical bone perfusion as much as the conventional plates which compresses the under surface of bone plates to the cortical bone.

The other reason for swelling could be loosening of screw in Conventional Miniplates in contrast to the fact that even if screw is inserted into the fracture line the loosening of screw will not occur in Locking Miniplates. Loosening of hardware sets in the inflammatory reaction resulting in swelling.

As the Conventional Bone Plate/Screw system requires precise adaptation of the plate to the underlying bone.Without this intimate contact, tightening of the screws with the bone segments towards the plate resulting in alterations in the position of osseous segments and the occlusal relationship. In case of locking plate/screw system, precise adaptation of the plate to the underlying bone becomes unnecessary. As the screws are tightened, they lock to the plate, thus stabilizing the segments without compressing the bone to the plate. This is supported by Feller (2003)7, Chandan Prabhakar (2011)6. Table 2 depicts incidence of complication in Group-I and II. There were 3 patients reported with Complication in Group-I of which 2 had Infection while 1 reported with mild occlusal discrepancy while no incidence of infection reported in Group-II. This is in contrast to studies of Edward Ellis and Jon Graham (2002)5, Sebastian (2010)8,

Verma A (2011)9 who reported the incidence of infection in patients treated with Locking Miniplates while no incidence of infection in patients treated with Non-Locking Miniplates was reported by Bolourian (2002).[10]

Patients with infection were re-operated and fracture site was exposed to explore the cause of infection. One screw near the fracture line was found loose, but there was no mobility at fracture site and fracture has been united, so plate was removed.

CONCLUSION:

The art of surgery demands that we evaluate the risk and benefits of each treatment modality and apply appropriately for each patient. As treatment options expand, it remains imperative that we consider the anatomic, physiologic and biomechanical factors associated with managing these injuries.

From the advent of osteosynthesis in maxillofacial surgery, different systems have been designed to overcome the shortcomings of existing devices. The following conclusions have been drawn from the foregoing study:

1. The highest percentage of fracture was found in 11-20 years of age (40%), followed by 21-30 years age (35%).
2. The mandibular fractures were more common in males (84%) than females (15%).
3. Road traffic accidents were the most common cause of fracture followed by fall from height.
4. 55% fractures were unilateral fractures and 45% were isolated fractures of mandible.
5. Parasymphysis (38.71%) was the most common site of fracture in mandible followed by body (32.26%).
6. Mean Operating Time required for treatment of mandibular fracture was less in Locking Miniplate Group.
7. There was uneventful healing seen in 70% cases of Non- Locking group while in all cases of Locking Group.
8. No post-operative mobility was found in either group at various stages of follow up.
9. Bite force recordings showed increasing values at subsequent follow up, corresponding to healing of fracture in both groups.

Results suggest that locking plate/screw system fulfills the treatment goals of adequate stabilization and fixation of mandible fractures. The locking plate/screw system showed more promising results in terms of postoperative sequel, complication rates, operating time and occlusion status compared with the conventional mini plate/screw system.

Further studies with a larger sample size eliminating confounding factors are required to ascertain the clinical benefits of the theoretical advantages of this system; over that of miniplates.

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