

ORIGINAL ARTICLE

A Comparison of Clinical Outcomes of Single Versus Two Miniplate Fixation of Parasymphysis Fracture

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ABSTRACT

Background: Many methods have been discovered to treat the fracture of parasymphysis region of mandible i.e., using miniplates. However not many studies have been done to prove the good clinical outcomes of one miniplate versus two miniplates.**Aim:** The purpose of the study is to compare the clinical results of one miniplate vs two miniplate for the parasymphysis of mandible.**Material and Methods:** 20 patients were treated with single miniplate and 20 for 2 miniplates. Many outcomes variable after surgery such as post-surgical scar, mental nerve paresthesia, need for plate removal and interincisal opening were calculated and interpreted using chi square test.**Results:** All outcome variables such as post-surgical scar, mental nerve paresthesia, need for plate removal and interincisal opening did not show any statistically significant relation with both groups (P value >0.05).**Conclusion:** Both types of miniplate ensure osseous healing but depending upon the individual factors such as mandible height and bio mechanics pattern should be considered before deciding scheme of treatment for an individual.**Keywords:** miniplate fixation, parasymphysis mandible, osteosynthesis.

INTRODUCTION

Craniofacial fractures have become common due to the increase in road traffic accidents and industrial accidents. As indicated the vehicular accidents (29%) and physical altercations (50%) in United States and all around the world⁽¹⁾. However, with the advancement in technology it is highly possible to treat mandibular parasymphysis fracture. The objectives of the ideal treatment have been perfect anatomic reduction, stable fixation, and painless mobilization of the injured region⁽²⁾. Fractures unbalances the tension forces acting on superior border, compression forces at the inferior border and torsional forces acting on mandibular parasymphysis⁽³⁾. To manage and treat the parasymphysis fracture of mandible the method of miniplate osteosynthesis has been discovered, which follow the Champy's lines of osteosynthesis to place miniplates to counteract the forces acting on it⁽⁴⁾. This method supports to place two miniplates along the parasymphysis region of mandible to balance the torsional forces acting on it⁽⁵⁾. However, when the miniplates are placed at the superior margin of canine premolar root region in mandible, it may lead to injure the inferior alveolar canal and its contents, mental nerve and the corresponding roots as there is small space present in between⁽⁶⁾. To overcome this, it could be preferred to place the only miniplate along the inferior border to minimize the chances of injury to nerve⁽⁶⁾. But to balance the forces and achieve stable fixation, an arch bar to serve as tension band is used⁽⁵⁾. This study compares two methods to determine their clinical outcomes as there is limited literature comparing use of single versus two miniplates.

MATERIALS AND METHODS:

This prospective and comparative study was approved by oral and maxillofacial department of Nishtar Institute of Dentistry Multan. The study involved 40 patients who presented to the Oral and Maxillofacial Surgery Department with mandibular fractures spanning the time period of January 2020 to January 2022.

Inclusion criteria: Patients between 20-40 years of age who were healthy and dentate. Both genders were included in the study that came with a liner (non-comminuted) fracture of parasymphyseal area of mandible and there were no previous signs and symptoms of mental nerve injury (pre-operatively) were considered in the study.

Exclusion criteria: This study excluded all the patients who came to department with grossly comminuted and infected fractures, the patients with additional condylar fractures of both sides treated with closed reduction. The patients who presented with associated midface fractures with deranged occlusion and were medically compromised were not added to the study

All the considered patients were classified randomly into two group (each group having 20 patients) marked as Group 1 and Group 2. All the Group 1 patients were managed with a single 2.0×5-hole miniplate with screws of diameter of 2mm. All the Group 2 patients were managed with two 2.0×5-hole miniplates and screws of diameter of 2mm. Ethical standards of the concerned committee on human experimentation are followed in the procedures. Maxillo-mandibular fixation was maintained for a week after the operation

Surgical procedure: The patients were referred for surgery after taking an informed consent. Dilute solution of povidone-iodine was used to paint face of the patients. To apply local anesthesia 2% lignocaine with 1:200000 adrenaline was used. Archbars were placed in both the upper and lower jaws. Intraoral mandibular incision was used to expose the fracture site on both sides⁽⁷⁾. The mentalis muscle was cut and a dissection below the periosteum was made reaching inferior border of mandible. The location of the fracture was identified and realigned. The alignment was maintained by establishing occlusion using maxilla-mandibular fixation. In group 1 the fractured pieces were aligned by using a single 2.0×5-hole miniplate and five screws of diameter of 2mm along the lower border. In Group II, two 2.0 × 5-hole miniplates and ten screws of diameter of 2mm were used to fix the fractured fragments

Figure 2): The fixation was done along the base of the mandible/inferior border and at the base of the alveolar ridge, specifically 2 mm below the apices of dental roots. The mouth opening and occlusion was rechecked, and the surgical area was cleaned using saline before being closed using 3-0 vicryl and 3-0 silk. An external pressure was applied using crepe bandage. To prevent infection, all patients received antibiotics (beta-lactams/ceftriaxone, amoxicillin) and metronidazole for a week.



Figure 1: Reduction of fracture line before plating



Figure 2: Reduction and fixation of Paraersymphysis fracture in group 1 using two 2.0x5-hole miniplate and screws of diameter of 2mm

All the patients were advised to follow an absolute liquid diet for the first seven days and then transition to soft diet for the subsequent twenty eight days. Patients were counselled to perform regular oral rinses with chlorhexidine mouthwash and strictly maintain oral hygiene. The patients of both the group of patients underwent maxillo-mandibular fixation after the surgery, which was released after one week. If there were concurrent unilateral condylar fractures, the maxillomandibular fixation duration was increased to three weeks with conservative management of the condylar fractures. On the seventh post operation day, the sutures were removed and patients were scheduled for routine follow-up visits.

Follow-up observations: All the patients were regularly followed up and examined at one-week gap during the initial five weeks and then one time in a month for the next six month duration. The radiographs and photographs were taken on the second day after the surgery, at the end of five weeks, and at the end of six months. Various factors such as fracture healing (clinically and radiographically), wound infection, wound dehiscence, plate exposure, the need for plate removal (indicated by pain, pus discharge, swelling, or radiographic loosening of screws), dental injuries caused during the procedure (identified in postoperative radiographs), anesthesia or paresthesia resulting from mental nerve injury (evaluated using different sensory tests such as two point discrimination and pin pressure methods etc.), and intraoperative time were assessed(8). The collected data was analyzed to statistical analysis using Chi square test of significance.

RESULTS

In the sample size of 40, the population of male was 39(97.5%) and female were 1(2.5%). In group 1 there were 19(95%) male and 1(5%) female. In group 2 20(100%) males were present. Evaluation of post-surgical scar at the end of fifteen weeks showed that 5 (25%) patients in group 1 and 3(15%) patients in group 2

showed post-surgical scar. However, the relation between them was not statistically significant (P value=0.429) (Figure 3).

3(15%) patients in group 1 and 3(15%) in group 2 presented with mental nerve paresthesia. However, this relation was not significant(P value= 1.000)(Figure 4). After an observation period 3(15%) in Group 1 and 3(15%) in Group 2 need plate removal due to infections or the problems in screws. However, this relation with group type was also not significant(P value=1.000)(Figure 5). In group 1 17(85%) patients had interincisal opening of 40 mm while 3(15%) had interincisal opening of 35-37mm. In group 2 18(90%) patients had interincisal opening of 40mm while 2(10%) patients had interincisal opening of 35-37mm(Figure 6).

Table 1: Outcome variable after the surgery

outcome	Group 1		Group 2		P value
	No of patients	Percentage	No of patients	Percentage	
Total	20	100	20	100	
Post surgical scar	5	25%	3	15%	0.429
Mental nerve paresthesia	3	15%	3	15%	1.000
Need for plate removal	3	15%	3	15%	1.000
Interincisal opening	40mm	17	85%	18	0.633
	36-37mm	3	15%	2	

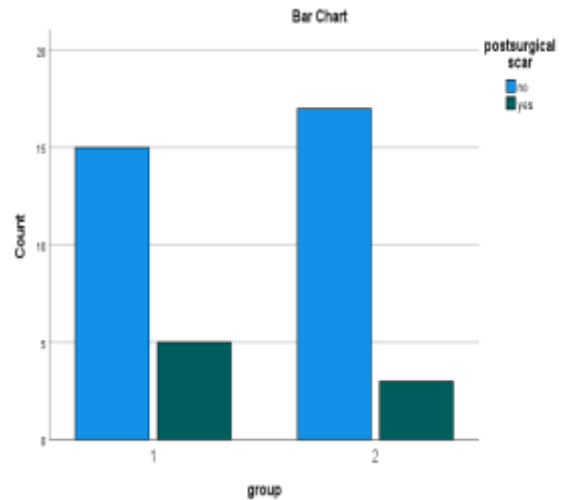


Figure 3: presence of surgical scar in group 1 and 2

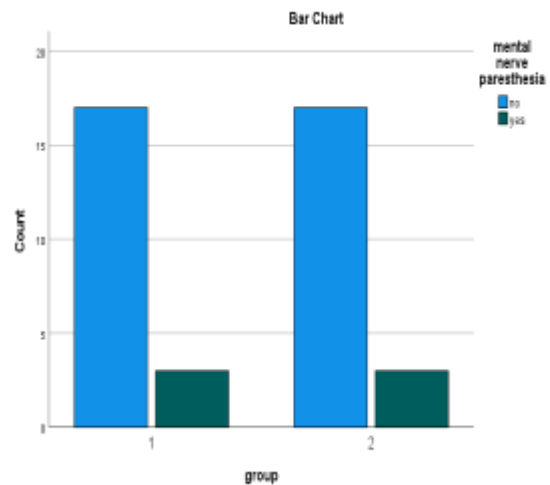


Figure 4: presence of mental nerve paresthesia in group 1 and 2

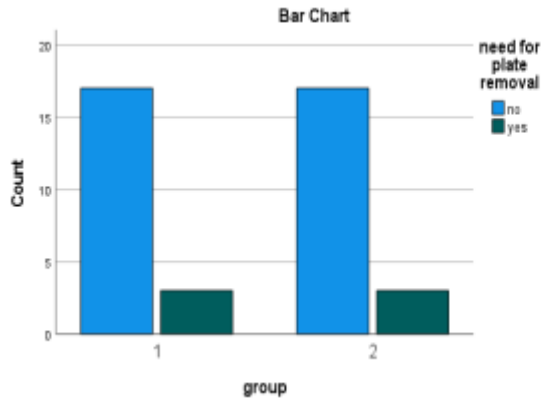


Figure 5: need for plate removal in group 1 and 2

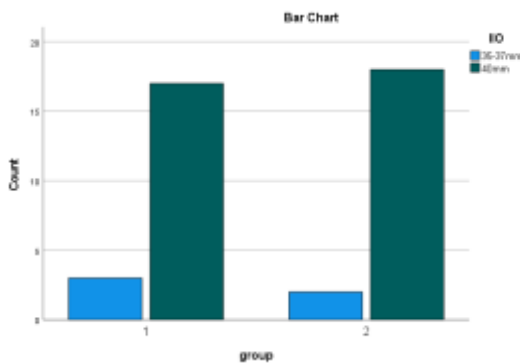


Figure 6: interincisal opening in group 1 and 2

DISCUSSION

Due to mandible unique location in the lower part of face cause its frequent fractures in trauma incidents. The primary goal of management to maintain its original anatomy and function along with the face esthetic. For the management of maxillofacial trauma, Michelet et al. invented use of miniplates in treatment of midface fractures(4). However, in 1978 Champy et al used miniplates for treatment of the mandibular fractures(4). Mandible performs variety of movements involved in speech and mastication so it has to balance tension forces acting on its superior border, compression forces along lower border. The method which Champy discovered was to concentrate on mono-cortical juxta-alveolar and sub-apical fixation without compression and inter-maxillary fixation(9). The torsional forces produced at parasymphysis region of mandible in midline were balanced by two miniplates.

Due to presence of mental nerve in subapical region, the placement of miniplates in this region risks injury of the nerve. More ever placement of two miniplate may injure the roots of teeth and may cause infection. Champy did not advised the placement of arch bars but Rix et al. placed one plate at foramen and used loop wiring instead of second plate and result were satisfactory(10). In another study done conventional treatment of 6 weeks maxilla-mandibular fixation was replaced with 2 weeks treatment of maxilla-mandibular fixation using an arch bar and result were significant(11). Hence it is more appropriate to use one miniplate at inferior border and an arch bar at the alveolar border.

97.5% male while 2.5% female presented with mandibular fractures in our studies indicating male predominance. In a study, it was seen that men have fourfold higher incidence of mandibular fractures(12). In a study in USA the mean age for adult fracture was 18-24 years(12). As we did retrospective study the commonly occurring fracture were between the age 20-40 years. The mean age of patients in Group 1 was 29.4 years and in group 2 it was 29.27 years.

The causes of fracture differ with place to place. In USA most of the adult mandibular fracture occur due to interpersonal violence(12). In another study conducted in India the primary cause were road traffic accidents(68.8%), falls(16.8%) and then assaults(11%)(13). In our studies 100% of the patients who presented with fracture reported of traffic accidents.

Appearance of post-surgical scar is due to the surgery. It may be due to the incisions made to increase the visibility of area. The process post-surgical scarring can be reduced by usage of subcutaneous/fascial tensile reduction sutures(14). Evaluation of post-surgical scar at the end of fifteen weeks showed that 5 (25%)patients in group 1 and 3(15%) patients in group 2 showed post-surgical scar (Figure 7). Upon inquiry the reason of scar appearance was due to occurrence of infection plus some tissue trauma.



Figure 7 presence of post-surgical scar

A study showed that 27% of its sample size showed mental nerve paresthesia after the surgery(15). In our study 3(15%) patients in group 1 and 3(15%) patients in group 2 presented with mental nerve paresthesia. The reason was compression of nerve due to inflammation after the infection and idiopathic.

One study showed that plates of the 32 patients were removed. Due to infection, 10(3.6%) plates were removed, due to patient discomfort 9 plates(3.2%)(16). In our study after an observation period 3(15%) in Group 1 and 3(15%) in Group 2 need plate removal due to infections or the problems in screws.

One study revealed the mean interincisal opening of 42.50±9.92mm(17). in our study. In group 1 17(85%) patients had interincisal opening of 40 mm while 3(15%) had interincisal opening of 35-37mm. In group 2 18(90%) patients had interincisal opening of 40mm while 2(10%) patients had interincisal opening of 35-37mm(Figure 8).



Figure 8: Interincisal opening of 40mm

CONCLUSIONS

Biomechanics, patient's cooperation, and individual factors are needed to be considered to decide which method of internal fixation should be used. In our opinion both methods are suitable to achieve pre-injury condition of mandible. But when miniplate is placed along the alveolar border it causes injury to the mental nerve plus its position just below the incision line increases the chances of wound infection and exposure of the plate. The costs can be decreased by placement of one miniplate but it increases risks of other complications such as the fracture nonunion due to lack of patient cooperation. However, it is advisable to place one miniplate with an arch bar in case of minimum mandible height to achieve the treatment followed by less complication and better healing. Further clinical trials are necessary to further investigate about the usefulness of both methods to improve clinical outcomes of management of parasymphysis region fracture of mandible.

Additional details:

Consent: Informed consent was taken from the presenting patients in their respective language and they were informed of the questions and confidently of their information.

Conflict of interest statement: No conflict-of-interest statement was found in between authors.

Funds: no financial aid was received for the project.

Other relationships: there was no personal relationship between the authors that could affect the studies.

Animal subject: nothing tissue or animal model was used in the study.

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