



Content available at: <https://www.ipinnovative.com/open-access-journals>

Journal of Oral Medicine, Oral Surgery, Oral Pathology and Oral Radiology

Journal homepage: www.joooo.org



Original Research Article

Efficacy of the titanium double ‘Y’- shaped mini plate compared with conventional mini plates in fixation of anterior mandibular fractures: A prospective clinical study

Gouthami G¹, Nandakishore Donepudi¹, Vinayak Gourish Naik^{1*},
Kirthi Kumar Rai¹, Shiva Kumar H R¹

¹Dept. of Oral & Maxillofacial Surgery, Bapuji Dental College and Hospital, Karnataka, India



ARTICLE INFO

Article history:

Received 04-09-2023

Accepted 09-11-2023

Available online 14-12-2023

Keywords:

Mini- plates

Anterior mandibular fracture

Osteosynthesis

Double Y mini plate

ABSTRACT

Objective: Anterior mandibular fracture management is commonly dealt in oral and maxillofacial surgery and most accepted treatment modality is open reduction and internal fixation with miniplates. With ongoing research, various shapes of miniplates were tried for osteosynthesis and biomechanical properties tested in invitro studies, but they lack testing in clinical scenarios. The present study was conducted to compare clinically and radio graphically, the efficacy of double Y-shaped mini plate with two conventional 4 hole mini plates in management of anterior mandibular fractures.

Materials and Methods: Study consisted of 20 patients, 10 in each group with anterior mandibular fractures. 10 patients (group 1) were treated with double ‘Y’ shaped miniplate with bar and 10 patients (group 2) with conventional 4 hole two miniplates. Clinically post-operative Pain, edema, occlusion, neurosensory deficit and wound healing were assessed. Clinical evaluation was done at 1st postop day, 1st week, and 1st and 3rd month postoperatively. Radiographic evaluation was done to record fracture gap in both the groups and timing for plate adaptation and fixation was recorded intra-operatively. The data was recorded and statistical analysis was done.

Results: Clinical and radiographic evaluation done for each group did not show any statistical difference at 3 months postoperatively. However significant difference was noted in time taken for adaptation and fixation of plates and screws. Double ‘Y’ shaped miniplate was found to be easier to place and required less time to adapt and fix to bone compared to 4-hole miniplates.

Conclusion: The study concluded that the double ‘Y’ miniplate and conventional 4-hole miniplates are found to be equally effective for clinical use in treatment of anterior mandibular fractures. The double ‘Y’ miniplate were found to be superior in terms of handling characteristics, less hardware and better radiographic outcome when compared to conventional 4-hole miniplates.

This is an Open Access (OA) journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License](https://creativecommons.org/licenses/by-nc-sa/4.0/), which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprint@ipinnovative.com

1. Introduction

Maxillofacial fracture management has always been an area of interest for most of the researchers and surgeons across worldwide. Among which, mandibular fractures constitute 55.9% of facial fractures due to its exquisite

shape. Road traffic accidents and Interpersonal violence has been the most common cause of trauma comprising 14-19% of anterior mandibular fractures.¹ The anterior mandible comprehend symphysis and parasymphysis regions. It has greater amount of trabecular bone density, which corresponds to its greater elastic modulus and compressive strength compared to other regions of mandible.² This stipulates the need for appropriate stabilization and

* Corresponding author.

E-mail address: drvinayakgn@gmail.com (V. G. Naik).

management of mandibular fracture to restore patient's function, esthetics and reinstate strength. Conventional mode of fracture management heads back to years, ranging from maxilla-mandibular fixation (MMF) with combinations of wire osteosynthesis, lag screws and reconstruction using miniplates to recent contriving of resorbable plates.² With continuing researches, unwieldy compression plating systems are replaced by noncompression plating system. Despite the fact that ideal fixation technique is still debated, Open reduction and internal fixation of anterior mandibular fractures using mini plates gained wide popularity which follows Champy's principle of osteosynthesis.^{3,4} Owing to the fact that, Champy's study considered only bending and torsional forces. The recent studies proven the fact that, 3 forces viz bending, torsional and shear act on mandible at a given point. Also use of two Conventional miniplates demand excess armamentarium with increased chances of injury to adjacent vital structures. This lead to a breakthrough in management of anterior mandibular fractures by 3 dimensional miniplates. The utilization of 3 dimensional (3D) plate system has been one of the efficient modality challenging the champy's principle of osteosynthesis. The 3D plates can act as a 2-plate system with 2 miniplates joined using interconnecting crossbars. This helps in resisting the twisting and bending movements of plate on the long axis. This enables the adequate stabilization of compression and tension zones.⁴ But, it was found that, there was a little difficulty in adapting 3D plates in symphysis region of mandible because of its extreme curvature.⁵ The size and the amount of osteosynthesis material should be kept minimum, which also helps in withstanding the rotational and torsional forces in anterior mandible.⁶ Biomechanical studies done on various shapes of miniplates, has revealed that double 'Y' shaped miniplate similar to 3D plates offers large surface area which delivers the result of double miniplates with a single construct.⁴ The present study aimed to evaluate the clinical and radiological outcome by comparing the double 'Y' shaped miniplate with two 4 hole miniplates in treatment of anterior mandibular fractures by traditional way of open reduction and internal fixation. It also proposes to assess and compare the ease of placement and time taken in placement of double 'Y' shaped miniplate with conventional miniplates.

2. Materials and Methods

The study was conducted in the department of Oral, Maxillofacial and Reconstructive Surgery, Bapuji Dental College and Hospital, Davangere after getting ethical approval by the institutional review board (IRB), Bapuji Dental College and Hospital, Davangere, Karnataka, INDIA met on 23rd November 2018. A total of 20 cases who had sustained fractures in maxillofacial region, reporting to the institute were assessed and included in the study.

The inclusion criteria for the study was patients with recent mandibular fractures, adult patients with age ranging from 18-60 years of age & dentate or partially edentulous patients. Previous operated case of fracture in same site, adult patients above 60 years of age, edentulous patients, Patients with systemic disorders and immune compromised patients, Comminuted fractures & Patients with prior infection at the fracture site were excluded from the study. All the patients were explained about procedures involved and were provided with written informed consent. Case pro forma was made to record the history in detail and the associated fractures, signs and symptoms. Routine clinical examination of the patient was done intraorally and extraorally. After determining the proper diagnosis, radiographic confirmation was obtained using digital Orthopantomogram, Occlusal view of mandible and other necessary radiographs. Preoperative clinical assessment included the presence or absence of displacement of fracture fragment & segmental mobility and were recorded. Routine preoperative laboratory investigations were done and physician's consent was obtained for all the patients. Prophylactic antibiotics was started. The selected patients were randomly allocated into two groups, through block randomization to ensure equality in groups. Group 1 - Patients to be treated with titanium double 'Y' shaped mini plate (Figure 1) & Group 2 - Patient to be treated with two titanium 4 hole straight mini plates (Figure 1). The surgery was carried out under general anaesthesia with nasal intubation. The use of upper and lower arch bars or eyelets or combination of both were considered as per need and inter maxillary fixation [IMF] was achieved. Standard intraoral lower vestibular approach was used for the symphysis or parasymphysis region of mandible. Sub periosteal dissection was done to reach the fracture site. Fracture segments were reduced and occlusion was obtained with IMF. For fractures falling in the mental foramen region, mental nerve was retracted and secured before the starting of fixation. For group 1 patients osteosynthesis was performed by applying one titanium double 'Y' shaped mini plate. The plate was placed at neutral zone to buccal cortical surface, to fix the upper and lower borders of double 'Y' plate in compression and tension zones. The upper border of miniplate was fixed with 2 x 6 mm monocortical titanium screws to prevent the tooth root injury. The lower border was fixed with 2 x 8 mm monocortical titanium screws at inferior border. (Figure 2). For group 2, two titanium 4 hole straight mini plates were used to achieve stable osteosynthesis, following champy's principle. The lower plate was fixed with 2 x 8 mm monocortical titanium screws at inferior border. The superior plate was fixed with 2 x 6 mm monocortical titanium screws, 5mm above the lower plate (Figure 3). IMF released and occlusion was checked. Incisions were closed. Concomitant fractures requiring internal fixation were treated and standardization of body,

angle and condylar fractures done. Arch bar with IMF was maintained postoperatively for 7-14 days depending on concomitant fractures in both the groups. Severity of pain before and after surgery was measured by visual analogue scale.⁷ Pre and postoperatively Edema,⁸ Occlusal discrepancy,⁹ maximum inter incisal mouth opening,¹⁰ wound infection and dehiscence⁴ were assessed until 3 months. Presence of neurosensory deficit⁴ was assessed by performing mechanosensory tests for mental nerve and inferior alveolar nerve preoperatively and postoperatively till 3 months. Clinical assessment and comparison of outcome of treatment was carried out in all the patients on the 1st day of surgery followed by 1 week, 1 month and on 3rd month postoperatively.

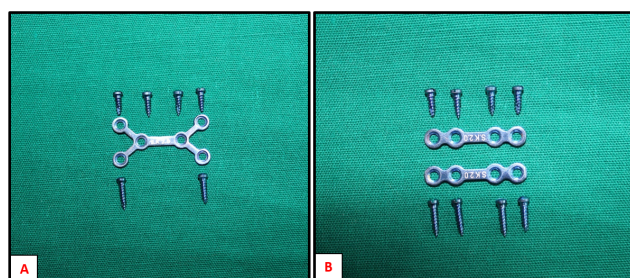


Figure 1: Photograph showing A): Titanium 2mm double 'Y' shaped mini plate with 2 x 6mm mono-cortical titanium screws & B): Titanium 2mm straight 4-hole mini plates with 2 x 6mm and 2 x 8mm monocortical titanium screws

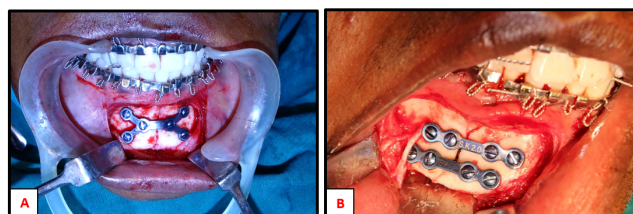


Figure 2: A): Intraoperative photograph showing fixation of symphysis fracture with titanium 2mm double 'Y' shaped mini plate with 2 x 6mm monocortical titanium screws; B): Intraoperative photograph showing fixation of left para symphysis fracture with titanium 2mm straight 4-hole miniplates with 2 x 6mm monocortical titanium screws at superior border and 2x 8mm monocortical titanium screws at inferior border of mandible

Intraoperative evaluation was carried out by measuring the total time taken for surgery & ease of placement of plates and screws. Plate adaptation and fixation time was compared between both the groups by recording the total time taken for reduction and fixation of the plates and screws, ease of placement of the plates while operating^{11,12} and difficulty in repositioning and reduction¹³ were measured by considering the opinion of operating or main surgeon, according to likert scale as a. Very

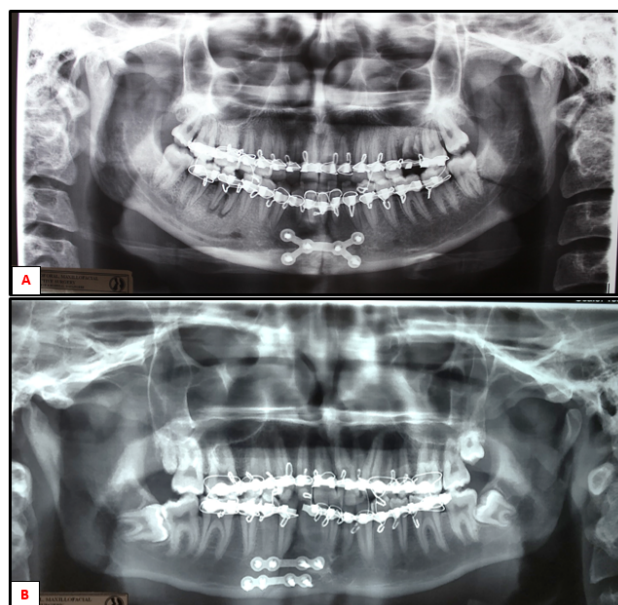


Figure 3: A): Immediate postoperative Digital Orthopantomogram radiograph showing reduction and fixation of symphysis fracture with titanium 2mm double 'Y' shaped mini plate; B): Immediate postoperative Digital Orthopantomogram radiograph showing reduction and fixation of symphysis fracture with titanium 2mm straight 4-hole mini plates

difficult, b. Difficult, c. Neutral, d. Easy & e. Very easy. Three main surgeon's opinions were taken into account and were double blinded throughout the study. Radiographic assessment was carried out on the first day after the surgery. All patients underwent a radiological examination through Orthopantomogram and Occlusal view of mandible, which was repeated at 3 months postoperatively for follow-up. The radiographs served to analyze the quality of the fragment reduction and fixation,¹⁴ tooth root injury,⁴ fracture healing, signs of infection, fracture gap between fragments.¹⁵ The gap between the fracture fragments in anterior mandible was assessed using digital Orthopantomogram preoperatively and immediate postoperatively. To assess the gap, a line was drawn on the radiograph along the fracture line and was divided into 2 equal parts. A line was drawn from the cranial to the caudal point along the fracture and adjacent to the fracture site along the long axis of 2nd premolar of the fracture quadrant. Later, 3 measuring points were produced by perpendicular projection from the line drawn to the fracture line/ gap. The gap was recorded with digital vernier caliper at 3 measuring points obtained along the fracture line. Statistical evaluation was done using proper test.¹⁵ Radiological reduction and fixation was assessed by a senior oral surgeon¹⁴ and was double blinded. The stability of plate, adaptability of plates and stability of fracture fragments were assessed and recorded by evaluating clinically and radiologically at the end

of 3 months of follow up. For the Data Analysis and Interpretation, The primary end point was considered to compare the proportion of good adaptability between two groups. Descriptive statistics such as mean and standard deviation (SD) for continuous variables, frequencies and percentages were calculated for categorical variables were determined. Association between variables was analyzed by using Chi-Square test for categorical variables. Unpaired t test was used to compare mean between groups. Bar charts were used for visual representation of the analyzed data. Level of significance was set at 0.05.

3. Results

A total of 20 patients were enrolled in the study under two treatment groups. Double 'Y' shaped miniplate (Group 1) and conventional 4 hole straight miniplates (Group 2) each had 10 patients assigned through random allocation. In both the groups, patient's age was in range of 18-45 years. Predominantly within 30 years of age group. 18 patients were male and 2 were female. The predominant cause of fracture was road traffic accident (RTA) followed by fall and assault. Among all the anterior mandibular fractures, right parasymphysis fracture predominated in both the groups. One symphysis fracture was enrolled. In conventional 4 hole two miniplates group among, 8 patients were associated with other fractures like sub condylar, ramal, angle and zygomaticomaxillary complex fracture. Whereas 4 patients in Double 'Y' group were associated with sub condylar and angle fractures. Pain was measured using visual analogue score at pre op, immediate post op, 1st week, and 1st and 3rd month postoperative period. Preoperatively highest number of patients were reported with VAS score of 5 and 6. Immediate postoperatively score decreased in both the groups. The VAS highest score of 7 and 5 was reported by two individuals each in double 'Y' group and conventional 4 hole miniplates group respectively. At 1 month postoperative period VAS score was found to be 0 in all patients in group 2 & one patient gave a highest score of 2 in Double 'Y' group. In group 1 at the end of 3 months none of the patients complained of pain. One patient in miniplates group complained of pain while opening mouth in left preauricular region. Statistically significant difference was found only in immediate postoperative period with p value of 0.018.(Table 1).

In preoperative assessment of maximal interincisal mouth opening (MIO), for both groups mean MIO was 23.30 mm. In immediate postoperative period, the mean MIO for conventional miniplates was 19.83 mm and double 'Y' plate was 19.20 mm. Most of the patients in both the groups were kept on wire IMF immediately following surgery. The mean MIO was improved to 33.50 mm and 32.00 mm in conventional and double 'Y' groups respectively. At 1 month postoperatively, the mean MIO in conventional miniplate group was 29.50 mm and in double

'Y' group was 33.67 mm. The MIO was found to be 34.60 mm in conventional miniplate and 40.30 mm in double 'Y' group at the end of 3 months postoperatively. Difference in the values of MIO was not statistically significant at any time (Table 2).

Fracture gap was measured using panoramic radiograph at pre op and immediate post op period by a technique suggested for mandibular angle fracture by Heidrun Schaaf et al.¹⁵ The average value was obtained & designated as good, fair and poor. Most of the patients in both the study groups were categorised as good with fracture gap within 1 mm. 4 patients in conventional group and 2 patients in double 'Y' group were classified as fair with fracture gap in range of 1- 2mm. Whereas 1 patient in conventional miniplate group was grouped as poor, with fracture gap in between 2-3mm. No statistical significance was found between fracture gap following osteosynthesis techniques with p value 0.307 (Table 3). Radiographic evidence of reduction and fixation immediately after surgery and 3 months postoperatively was found to be satisfactory in both osteosynthesis techniques.

Ease of placement of plate was evaluated intra-operatively in both groups. 1 case in conventional miniplate group and 5 cases out of 10 cases in double 'Y' group, placement of plate was marked very easy according to operating surgeon. Most of the cases in group 2 and 4 cases in double 'Y' group were marked as easy. 2 cases in conventional miniplate group and 1 case in double 'Y' plate were marked as neutral. Statically it was found to be insignificant with p value 0.148 (Table 4). Difficulty in repositioning and reduction of fracture segments were evaluated intra-operatively to categorize them to assess overriding of fracture segments or entrapment of adjacent soft tissue during reduction and fixation of plates and screws by the operating surgeon. None of the patients had difficulty in repositioning of fracture segments and reduction in both the groups. The mean plate fixation time was 39.20 in conventional 4 hole miniplate group and 30.70 in double 'Y' miniplate group. It was found that less time required for adaptation & fixation of double 'Y' miniplate compared to conventional miniplates, which was statistically significant with p value of 0.022 (Table 5). Post-operatively at 3 months, stability of fracture segments was assessed and found to be present in all patients. Adaptability of plates & stability of fracture segments were evaluated radiographically in panoramic view, and found to be good in both study groups.

4. Discussion

Mandible has always been the site of interest among maxillofacial surgeons till date and fractures of anterior mandible constitute of 14-19% among maxillofacial fractures. The devices for immobilization and fixation of fracture fragments evolved over a period of time,¹⁶ but there

Table 1: Comparison of vas score between study groups (N=20)

VAS Score	Group		P Value
	Conventional Miniplate (n=10) Mean (SD)	Double Y Miniplate (n=10) Mean (SD)	
Preoperative	5.40 (0.69)	6.00 (1.41)	0.245
Immediate	3.80 (0.78)	5.40 (1.77)	0.018*
Post-operative			
1 week	0.50 (1.08)	1.40 (1.43)	0.130
1 month	0.00 (0.0)	0.20 (0.63)	0.331
3 months	0.20 (0.63)	0.00 (0.0)	0.331

Unpaired t/Mann Whitney test, P value *Significant

Table 2: Comparison of maximum interincisal mouth opening (n=20)

MIO	Group		P Value
	Conventional Miniplate (n=10) Mean (SD)	Double Y Miniplate (n=10) Mean (SD)	
Preoperative	23.30 (8.73)	23.30 (5.67)	1.000
Immediate	19.83 (2.85)	19.20 (3.03)	0.730
Post-operative			
1 week	33.50 (2.12)	32.00 (6.32)	0.767
1 month	29.50 (10.46)	33.67 (7.53)	0.357
3 months	34.60 (8.08)	40.30 (7.02)	0.110

Unpaired t/Mann whitney test, P value not significant

Table 3: Comparison of fracture gap between study groups (n=20)

Fracture Gap	Group	
	Conventional Miniplate (n=10) n (%)	Double Y Miniplate (n=10) n (%)
Good	5 (50.0)	8 (80.0)
Fair	4 (40.0)	2 (20.0)
Poor	1 (10.0)	-

Chi-square test, P Value = 0.307, Not Significant

Table 4: Comparison of ease of placement of miniplate (n=20)

Ease of Placement	Group	
	Conventional Miniplate (n=10) n (%)	Double Y Miniplate (n=10) n (%)
Very easy	1 (10.0)	5 (50.0)
Easy	7 (70.0)	4 (40.0)
Neutral	2 (20.0)	1 (10.0)

Chi-square test, P value = 0.148, Not significant

Table 5: Comparison of plate fixation time between study groups (n=20)

Plate Fixation Time	Group	
	Conventional Miniplate (n=10) Mean (SD)	Double Y Miniplate (n=10) Mean (SD)
	39.20 (6.23)	30.70 (8.71)

Unpaired t test, P value = 0.022, Significant

seems to be a continuing controverseries about the optimal rigid fixation techniques.³ In recent days different types of plating systems are considered for mandibular fractures. These includes thicker load-bearing reconstruction plates, locking plates and resorbable plates to miniplates and microplates.³ The most recognized method surgically for anterior mandibular fracture fixation is miniplates as they can stabilize the fractured bony segments. Among all the traditional means of maxillofacial fracture fixation, miniplates are preferred because of easy handling and effortless plate contouring and adaptation to bone. Miniplate osteosynthesis provides proper stability to fracture segments and improves healing of bone and minimizes the period of immobilization.¹

The 3D plates can act as a 2-plate system with 2 miniplates joined using interconnecting crossbars. This helps in resisting the twisting and bending movements of plate on the long axis, which in turn enables the adequate stabilization of compression and tension zones.⁴ But, it was found that, there was a little difficulty in adapting 3D plates in symphysis region of mandible because of its extreme curvature.⁵ Double 'Y' shaped miniplate similar to 3D plate offers large surface area with ease of adapting, delivers the result of double miniplates with a single construct.⁴ This further decreases the incidence of wound infection, tooth root injury, injury to mental nerve and decrease the chances of wound dehiscence.³ Ergun et al. in his biomechanical experimental invitro study, compared six different shapes of titanium miniplates in mandibular corpus. He found that double 'Y' shaped titanium miniplate offered greatest resistance to displacement and showed most favourable biomechanical behavior when compared to other 5 groups in fixation of fractures of mandibular corpus.¹ Only a few clinical follow up series are presented in the literature, with limited number of studies emphasizing the hardware related advantages of 3D plates and easy adaptation to bone. No studies were done regarding the double 'Y' shaped miniplate except the study of Khairi M S. He stated that double 'Y' shaped miniplate can be used as an effective alternative method in fixation of anterior mandibular fractures.⁴ It also been found to have same stabilization as conventional 4-hole miniplates due to its construct^{1,4} and reduces the operating time due to easy manipulation.⁴

The predominant gender was males in this study & cause of injuries was road traffic accident (RTA), being the most common etiology. In the present study, Double 'Y' miniplate group had 9 patients presented with parasymphysis fractures and 1 patient had a fracture of symphysis. Whereas in conventional miniplate group, all patients sustained fracture in parasymphysis region. Most of the cases reported with a moderate intensity pain preoperatively. 1 patient in double 'Y' group reported highest score of 9, as it was associated with bilateral condylar fracture. Immediate postoperatively, pain score was found to be reduced in both the groups due to fixation and was statistically significant. VAS score recorded in both the groups postoperatively revealed that, at 1 month all the patients were devoid of pain in conventional miniplates group and one patient complained of mild pain in Double 'Y' group. In immediate postoperative period all the patients in both the groups had mild edema and were under antibiotic coverage. At 1 week postoperative period, there was significant reduction in edema noted in both the groups. In immediate postoperative period, most of the patients in conventional miniplate group had satisfactory occlusion except 1 patient who had additional ramal fracture, whereas 3 patients in double 'Y' group had unsatisfactory occlusion, who also presented with additional subcondylar fracture of mandible. Occlusion was achieved in these patients using elastics and intermaxillary fixation for 12-14 days. Immediate postoperatively mean MIO was 23.30 mm in conventional miniplate group and 19.20 mm in double 'Y' miniplate group. The reduction in mean MIO was due to the fact that most of the patients were placed with elastics and intermaxillary fixation to settle the deranged occlusion for a period of 12-14 days. In this study on an average there was increase in MIO in both the groups at the end of 3 months postoperatively. However the mouth opening was found to be better in double 'Y' miniplate group compared to conventional 4 hole miniplate group.

In immediate postoperative period, standard antibiotic protocol was followed for all the patients. None of the patient in both the groups had signs of wound infection or dehiscence at the end of 1 and 3 months postoperatively. Anterior mandibular fractures are confined to small zone between mental foramen in mandible which allows mental nerves and vessels. This may lead to neurosensory alteration in the region of lower lip and chin. In immediate postop period 1 patient each in both the group had developed transient mental nerve weakness which lead to altered sensation in chin region. At 1 week postoperatively, 1 patient noted with sensory alteration in double 'Y' miniplate group, which subsided by the end of 3 months. Displacement of fracture fragments was found to be statistically significant factor and directly correlates with the additional fractures

Tooth root injury was assessed radio graphically and 1 patient in double 'Y' miniplate group had injury to tooth, which was seen preoperatively due to impact to the anterior teeth. Extraction of tooth was done and infection was treated with antibiotic course. It was stated that in view of thicker compact bone of mandible, the chances of damaging the teeth is three times more in mandible compared to maxilla.¹⁷ One patient in conventional 4 hole miniplate group had mild signs of infection immediately following fixation, which subsided by the end of 1 week postoperatively. Theoretically Gutwald and Ellis in their study stated that the primary risk of increased rates of infection in non-locking miniplate system was due to screw and plate loosening at the site. Authors in various studies found that pain and swelling postoperatively was independent of the method of fixation used.¹⁸

Only 1 patient in conventional miniplate group was grouped as poor, with fracture gap in between 2-3 mm. It was stated by Kroon et al that, under clinical conditions, when seen radio graphically a small gap is often found at the lower border of mandible, even after good manual reduction of fracture fragments is achieved.¹⁹ Similar evidences were recorded by Heintl and Neumayer in their paper, of practical differences between proper fracture adaptation followed by anatomical reduction, when seen in radiographic records.¹⁹ In the present study, it was found that 10% of cases in conventional miniplate group and 50% in double 'Y' group, placement of plate and easy adaptability was marked very easy by operating surgeon. Whereas 70% in conventional miniplate group and 40% in double 'Y' group were marked as easy and remaining were marked as neutral, which was evaluated intraoperatively. This favours the ease of placement of double 'Y' plate as compared to conventional plates. Double 'Y' plate was found to be superior in terms of handling characteristics like ease of adaptation and time required for adaptation as it is a one plate and 6 screws are required as compared to conventional 4 hole miniplates, which are 2 plates and 8 screws are required. Khairi MS in comparison of double 'Y' miniplate with conventional 4 hole miniplates, found to have same stabilization as conventional 4-hole miniplates due to its construct.^{1,4} In order to avoid the difficulty in fixation of more oblique fractures, double 'Y' mini plate was customized by increasing the inter-hole bar length by 9mm.

Time taken for fixation of plate directly reflects the difficulty in placement of particular plate. The time taken from beginning of adaptation of plate till the placement of last screw gives the plate fixation time.⁴ In this study, the total time taken for reduction of fracture & fixation of plates and screws was calculated for every case. The mean plate fixation time was 39.20 mins in conventional miniplate group and 30.70 mins in double 'Y' miniplate group. It was found to be statistically significant with less time required

for double ‘Y’ plate. The mean values were found to be more because of associated fractures in both the groups.

5. Conclusion

Within the limits of the study, it can be concluded that Double ‘Y’ shaped miniplate and conventional 4-hole miniplates are equally effective for clinical use in the management of anterior mandibular fractures and have similar radiological outcome. The double ‘Y’ miniplate was found to be superior in terms of handling characteristics because of its similarity to 3D geometrical single construct. The double ‘Y’ miniplate offers better handling properties like plate adaptation without compromising on stability of osteosynthesis and in terms of wound healing. The shape of the double ‘Y’ miniplate can provide sufficient resistance required to avoid the displacement of fracture fragments from the high torsional forces in anterior mandibular region. However additional clinical trials on larger samples are required.

6. Source of Funding

None.


7. Conflict of Interest

None.

References


- Ergun S, Ofluoglu D, Saruhanoglu A, Karatasli B, Deniz E, Özel S, et al. Comparative evaluation of various miniplate systems for the repair of mandibular corpus fractures. *Dent Mater J*. 2014;33(3):368–72.
- Wong RC, Tideman H, Kin L, Merckx MAW. Biomechanics of mandibular reconstruction: a review. *Int J Oral Maxillofac Surg*. 2010;39(4):313–9.
- Lee T, Sawhney R, Yadrankoducic. Miniplate Fixation of Fractures of the Symphyseal and Parasymphyseal Regions of the Mandible: A Review of 218 Patients. *JAMA Facial Plast Surg*. 2013;15(2):121–5.
- Khairi MS, Elprince N, Fahmy MH. The use of double Y-shaped versus conventional titanium miniplates in fixation of anterior mandibular fractures. *Int J Sci Res*. 2016;5(7):1–8.
- Gupte SH, Chaddva S, Jethwani Y, Mohandas A, Kumavat DP, Jhaveri N. Evaluation of Efficacy of Three-dimensional Stainless Steel Mini-Plates in the Treatment of Fractures of the Mandible: A Prospective Study. *J Orthop Case Rep*. 2016;6(5):35–40.
- Saluja H, Dehane V, Kini Y, Mahindra U. Use of Miniplates in Parasymphyseal Fractures: A Survey Conducted among Oral and Maxillofacial Surgeons of India. *Int J Head Neck Surg*. 2012;3(1):8–10.
- Price DD, McGrath PA, Rafi A, Buckingham B. The validation of visual analogue scales as ratio scale measures for chronic and experimental pain. *Pain*. 1983;17(1):45–56.
- Kindermann M, Meyer T, Kindermann W, Nickenig G. Exercise training in heart failure. *Herz*. 2003;28:153–65.
- Vineeth K, Lalitha RM, Prasad K, Ranganath K, Shwetha V, Singh J. A comparative evaluation between single noncompression titanium miniplate and three dimensional titanium miniplate in treatment of mandibular angle fracture”- A randomized prospective study. *J Craniomaxillofac Surg*. 2013;41(2):103–9.
- Rieder CE. Maximum mandibular opening in patients with and without a history of TMJ dysfunction. *J Prosthet Dent*. 1978;39(4):441–6.
- Feledy J, Caterson EJ, Steger S, Stal S, Hollier L. Treatment of mandibular angle fractures with a matrix miniplate: a preliminary report. *Plast Reconstr Surg*. 2004;114(7):1711–6.
- Hughes P. 3D plate versus the lag screw technique for treatment of fractures of the anterior mandible. *J Oral Maxillofac Surg*. 2000;58:23.
- Shankar DP, Manodh P, Devadoss P, Thomas TK. Mandibular fracture scoring system: for prediction of complications. *Oral Maxillofac Surg*. 2012;16(4):355–60.
- Jain MK, Manjunath KS, Bhagwan BK, Shah DK. Comparison of 3- dimensional and standard mini plate fixation in the management of mandibular fractures. *J Oral Maxillofac Surg*. 2010;68(7):1568–72.
- Schaaf H, Kaubuegge S, Streckbein P, Wilbrand J, Kerkmann H, Howaldt HP. Comparison of mini plate versus lag-screw osteosynthesis for fractures of the mandibular angle. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2011;111(1):34–40.
- Rudderman RH, Mullen RL, Phillips JH. The biophysics of mandibular fractures: an evolution toward understanding. *Plast Reconstr Surg*. 2008;121(2):596–607.
- Fellar KU, Richter G, Schneider M, Eckelt U. Combination of microplate and miniplate for osteosynthesis of mandibular fractures: an experimental study. *Int J Oral Maxillofac Surg*. 2002;31(1):78–83.
- Bandyopadhyay R, Ray A, Ghorui T. Comparative Evaluation Between 2mm Locking and 2mm Non-Locking Miniplate System for Open Reduction and Internal Fixation of Mandibular Parasymphysis Fracture. *Arch Clin Med Case Rep*. 2020;4:369–83.
- Kroon FH, Mathisson M, Cordey JR, Rahn BA. The use of miniplates in mandibular fractures. An in vitro study. *J Craniomaxillofac Surg*. 1991;19(5):199–204.


Author biography

Gouthami G, Senior Lecturer  <https://orcid.org/0000-0003-0148-584X>

Nandakishore Donepudi, Professor  <https://orcid.org/0000-0002-1406-3198>

Vinayak Gourish Naik, Reader  <https://orcid.org/0000-0002-0323-8589>

Kirthi Kumar Rai, Professor and HOD  <https://orcid.org/0000-0001-9745-177X>

Shiva Kumar H R, Professor  <https://orcid.org/0000-0002-0210-9590>

Cite this article: Gouthami G, Donepudi N, Naik VG, Rai KK, Kumar H R S. Efficacy of the titanium double ‘Y’- shaped mini plate compared with conventional mini plates in fixation of anterior mandibular fractures: A prospective clinical study. *J Oral Med, Oral Surg, Oral Pathol, Oral Radiol* 2023;9(4):207–213.