Acta Scientific Dental Sciences (ISSN: 2581-4893)

Volume 8 Issue 4 April 2024

Review Article

Comparative Evaluation of the Efficacy of Double Y-Shaped Miniplate Versus Conventional Miniplates for the Treatment of Mandibular Anterior Fractures

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DOI: 10.31080/ASDS.2024.08.1807

Received: February 14, 2024

Published: March 07, 2024

Abstract

Introduction: Open reduction and internal fixation are generally the treatment of choice for symphysis and parasymphysis fractures of the mandible, although closed reduction is still an acceptable alternative for select patients with simple nondisplaced fractures. Conventionally, two miniplate are used for the fracture fixation in the anterior region of the mandible, but one larger plate, with or without arch bar, is the accepted alternative to the conventional two miniplates system.

Objectives: To evaluate and compare the efficacy and clinical outcome in the treatment of mandibular anterior region fractures with double Y-Shaped miniplate and Conventional miniplates.

Materials and methods: Patients were randomly divided into Group A (ten patients) and Group B (ten patients) by using table of random numbers. Patients between the age group of 18 – 60 years were selected after fulfilling the inclusion and exclusion criteria and obtaining written consent. In group A, fracture fixation was done with conventional two miniplates and in group B, fracture fixation was done with Double Y shaped miniplate.

Results: Intraoperatively, ease of plate handling and the duration of fixation were evaluated. Post operatively, the stability of the fracture fragments, occlusion, maximum mouth opening and post operative complications were assessed at immediate post operative period, one month, three months and six months. There was no statistically significant difference among the groups with constant P value of 1. None of the patients in both the groups had complications of non-union, mal-union, hardware failure and wound dehiscence.

Conclusion: This study showed that both the conventional miniplates and the double Y shaped miniplate are successful in the treatment of anterior mandible fractures. Both plates exhibited excellent fracture stability, which is necessary for seamless fracture healing.

Keywords: Mandibular Anterior Fracture; Double Y Shaped Miniplate; Open Reduction and Internal Fixation

Abbreviations

ASIF: Association for the study of internal fixation, CT: Computed Tomography, ORIF: Open Reduction and Internal Fixation, et al: Et alia: Latin observation for 'and others', 3D: 3 Dimensional, OPG: Orthopantomogram, MD: Mean Difference, SD: Standard Deviation, IMF: Intermaxillary fixation, Mm: millimetre, RTA: Road Traffic Accident, MIMO: Maximum Interincisal Mouth Opening, POD: Post Operative Days, ASA: American society of anaesthesiologist

Introduction

Mandibular fractures are one of the most common facial skeletal injuries. They can be caused by road traffic accidents, assaults, industrial injuries, falls or sports injuries, but the relative number of each, varies considerably between countries and areas. The body of the mandible is one of the most common fracture sites, followed by fractures at the condyle, angle, symphysis, ramus, and coronoid process [2]. Fractures through the mandible at the level of the symphysis and/or parasymphysis are relatively common and account for approximately 20% of mandibular fractures [6]. A mandibular fracture treatment depends on the arrangement of bone fragments in their anatomical position, and its goals are to stabilize the fracture and restore normal function with least morbidity [2]. Movement at the fracture site is a known predisposing factor for both infection and non-union. It has been reported that the site of most non-union was in the mandibular body [2]. In the ancient time also, fractures were treated by segments been reduced, stabilized, and immobilized. As time proceeded, techniques got modified for better results, conserving time and to increase the ease of work, to make it convenient also [6]. Miniplates have been used to facilitate stability between bony fragments in the maxillofacial region and are currently the preferred surgical method for the fixation of fractures and osteotomies. The advantages of using

miniplates include easy handling and easy plate contouring and adaptation to the bone [2]. Miniplate osteosynthesis ensures adequate fracture stability, improves bone healing, and allows early functional mobilization [2]. During fracture treatment planning, important decisions that must be made include determining the best position, orientation, and plate type and material. The first and foremost consideration is the rigidity of the repaired fracture section, and the second pertains to the level of stress generated in the miniplates under bite forces [2]. Internal fixation of mandibular fractures with miniplates (in conformity with the tension band principle) was first introduced in 1973. The use of two miniplates in the anterior region, one at the inferior border and the second 5mm above the lower plate [9]. Champy's principle is still followed, but the need for two miniplates in the parasymphysis region is questioned when a mandibular arch bar is additionally placed simultaneously for intra- or postoperative intermaxillary fixation (IMF). The arch bar placed for intraoperative or postoperative IMF itself acts as a tension band, and the subapical plate (tension band plate) can be eliminated. Because a single miniplate is used instead of two plates, the approach is economical, will reduce the incidence of infection, will reduce the incidence of mental nerve injury, may reduce injury to the roots of the anterior teeth, and will diminish wound dehiscence [1]. In the original Champy version, a four-hole miniplate without centre space was used. Today, although this type of plate is still applicable, alternatives that provide similar or incrementally higher stability have emerged [2]. The 3D plating system also been used for the fixation of mandibular fractures. Simultaneous stabilization of the tension and compression zones, making 3D plates a time saving alternative to conventional miniplates [1]. The *in vitro* study confirms that the single miniplate is not able to provide stability to the fractured segments in this highly dynamic region and one more plate is required that acts as tension band [5]. In the present study, we have selected a novel shape of the miniplate that follows the exact configuration of the Champy osteosynthesis lines for better stability and osteosynthesis. Double Y-shaped miniplate is most stable plate under both compression and tension load in mandibular fractures [1]. This double Y shaped miniplate has two upper arms that acts as a tension band and two lower arms as the compression arm. Both the arms of each side are connected to a single horizontal arm. Double Y-shaped mini plate with six holes and 8mm spacing had greater resistance to displacement and provided more favorable strength behaviour than the other types of miniplates in the repair of mandibular body fractures [1]. As the double Y-Shaped mini plate is a single plate, less screws are used in fixation (six screws) compared to using two conventional plates which will consume between eight to ten screws, hence increasing the time spent to adapt the plates and complete fixation [1]. Since a modified single miniplate is used instead of two plates, it reduces the risk of infection and reduces wound dehiscence. Therefore, the aim of the study was to compare the efficacy of double Y-shaped miniplate over conventional miniplates for treatment of fractures in the mandibular anterior region using various clinical parameters.

Materials and Methods

Method of collection of data

Patients diagnosed clinically and radiographically reported to the Department of Oral and Maxillofacial Surgery at Al-Ameen Dental College and Hospital, Vijayapura between Feb 2021 to Jan 2023 period with the fracture in the anterior region of mandible requiring open reduction and rigid internal fixation under local/general anaesthesia were selected for the study as per inclusion and exclusion criteria. All the patients were explained about proposed surgical procedure and its potential complications. Written informed consent was obtained from each patient. A total of twenty patients who were willing to participate in the study with the clinical and radiographic diagnosis of the fracture in the anterior region of mandible were selected for the study.

Inclusion criteria

Patients between the age of 18 to 60 years, patients diagnosed clinically and radiographically with the fracture in the anterior region of mandible, isolated parasymphysis/symphysis fracture or associated with fractures in the body, angle, condyle, ramus region, patients who consented to participate in the study were included in this study.

Exclusion criteria

Medically compromised patients such as ASA classification III,IV,V,VI, more than two weeks old fracture, comminuted fracture, presence of active infection at the site of fracture, presence of any pathology at the site of fracture, complete edentulous patients, patients with underlying systemic disease, history of radiation therapy to head and neck region, history of bisphosphonate exposure were excluded in this study.

Study design

This was a prospective comparative study conducted in the Department of Oral and Maxillofacial Surgery at Al-Ameen Dental College and Hospital, Vijayapura. A prospective cohort of twenty patients were randomly assigned to Group A and Group B using a table of random numbers after meeting the inclusion criteria.

Group A (Conventional two miniplate system)

It included ten patients, in which fractures were plated with a 2mm, four holes miniplate in the lower border and a 2mm, two or four holes miniplate subapically, secured with monocortical screws.

Group B (Double Y shaped miniplate)

It included ten patients, in which fractures were plated with double Y shaped miniplate and secured with monocortical screws.

The following parameters were evaluated pre operatively, intra operatively and post operatively.

Pre operative evaluation

- Age and Gender of the patient
- Etiology - Radiographic assessment included
- Fracture types - Isolated, Combined
- Displacement of fracture - Orthopantomograph (OPG) evaluation,
- Occlusion - Standardized photographs of patient's occlusion were obtained. Eichner classification (questionnaire) was used, which considers and concentrates on the antagonistic contact between the molars and premolars, while anterior teeth remain in the occlusive supportive view unconsidered. The occlusion was assessed as carefully as possible by the same investigator. Malocclusion was considered only if the patient complained of occlusal deficiencies postoperatively. However, no attempt was made to quantify any malocclusion.

Questionnaire regarding occlusion for the patient:

Is your current bite as same as it was before the accident? (Yes/No)

Do you feel when you close your mouth, that the teeth touch them on one side rather than on the other side? (Yes/No)

Is there any difference or difficulty in the movement of the lower jaw? (Yes/No)

Intra-operative evaluation

- Plate Handling Time - Plate handling time includes the time taken from manipulation of plate to the fracture site till the final tightening of last screw. The time was recorded with a digital stopwatch.
- Ease of plate adaptation and handling (Surgeon's evaluation) - The adaptation of plate to the contour of mandible was observed and scored by a surgeon who was not related to the study. The plate adaptation was scored by the observer as Good and Satisfactory based upon the complete contact.

Post operative evaluation

- The maximum interincisal mouth opening - The maximum interincisal mouth opening (MIMO) was measured using calipers. The results were grouped according to the following scale for trismus

  Severe Trismus MIMO = 15 mm

  Moderate Trismus 15 mm MIMO 30 mm

  Mild Trismus 30 mm MIMO 45 mm

  Normal MIMO 45 mm
- Presence of complications (Infection, Neurosensory disturbances, Wound dehiscence, Non-union, Mal union, Hardware failure)
- Occlusion: By clinical examination

  Satisfactory: No gap between upper and lower first molars

  Mildly deranged: Gap of 1–2mm between upper and lower first molar

  Deranged: Gap more than 2mm between upper and lower first molars
- Stability of Fracture segments: By bimanual palpation method using thumb finger and index finger of both hands. Pressure is applied alternatively to assess the stability of fracture segments

  Stable: No movement of fracture fragments

  Unstable: Movement of fracture fragments

Materials and armamentarium:

The following standardized materials and armamentarium were used for the study:

Standard Diagnostic Instruments: Surgical gloves, mouth mirror, periodontal probe, cheek retractor, tongue depressor, curettes, tissue holding forceps, tweezers, and bowls.

Disinfectants: Swab holder, povidone iodine solution, sterile surgical drapes.

Anaesthetic Equipment: Boyle's apparatus, endotracheal tube, hypotensive anesthetic.

Local Anesthetic Tools: Syringe, injectable local anaesthesia (2% lignocaine with 1:80,000 adrenaline), bard parker blade number 15 and handle, gauze piece, suction tip & high-volume suction apparatus.

Dissection Instruments: Dissecting scissors, straight & curved haemostats, electrocautery, periosteal elevators

Retraction: Cat's paw retractors, langenbeck's retractor, reverse langenbeck's retractor, lower border channel retractor.

Maxillo-Mandibular Fixation Tools: 2 mm Double Y shaped miniplate, 2 mm two and four holes with gap miniplate, monocortical screws (2.0 mm X 8.00 mm), handpiece, screw holder & screw driver, pre-stretched (10%) 26 gauge round stainless-steel wire, wire twister, mosquito forceps, artery forceps, periosteal elevators, and wire cutter were used.

Suturing Instruments: Needle holder, suture cutting scissor, adson's toothed and non-toothed tissue holding forceps, 3-0 Vicryl.

Irrigation solution: Betadine, normal saline 0.9%

Surgical procedure:

After routine blood examinations and radiographic assessment, patients were prepared for surgery. Prophylactic antibiotic was given to all patients an hour before the procedure. All operations were performed under General anaesthesia or Local anaesthesia according to convenience. Erich arch bar was applied to the maxillary and mandibular dentition if needed. Depending on the location of fracture, the fracture site was exposed either through intra oral lower vestibular incision or existing extra oral laceration. After exposure, the flap was raised carefully followed by muscle dissection keeping

the surrounding neurovascular bundle intact. When the bone surface is reached, the periosteum is elevated and the fracture is identified and reduced. Fracture was reduced anatomically under direct vision. Stopwatch was started to record time in minutes. This was followed by fixation. In Group A, fracture fixation was done with conventional miniplates by using 2mm four holes miniplate in the lower border of the mandible and 2mm two holes miniplate sub apically and secured with monocortical screws. In Group B, fracture fixation was done with 2mm double Y shaped miniplate and secured with six monocortical screws. Following fixation of the screws, stopwatch was stopped, time in minutes was recorded, occlusion was reassessed. Hemostasis was achieved, surgical site was irrigated with betadine solution. Wound closure was done in layers using 3-0 Vicryl. Pressure dressing was placed using dynaplast. Throat pack was removed, hypotensive deliberate anaesthesia was reversed. Patient was extubated and shifted to post operative care.

Follow up:

Patients were followed up radiographically on the immediate post-operative day, and then after three months, six months and one-year intervals to assess the adequate fracture reduction and fracture healing.

Statistical Analysis:

The anticipated Mean±SD of mouth opening (in mm) at one month after operation in group A, conventional two miniplates 41.2±1.39 and in group B, double Y shaped miniplate 40.9±0.738 resp.(1) the required minimum sample size is 10 per group (i.e., a total sample size of 20, assuming equal group sizes) to achieve a power of 80% and a level of significance of 5% (two sided), for detecting a true difference in means between two groups. (Statulator Software was used to calculate sample size. http://statulator.com/SampleSize/ss2M.html)

$N=2[(Z\propto+z\beta)*Sd]2$

$Z\propto$ Level of significance=95%

$Z\beta$--power of the study=80%

d=clinically significant difference between two parameters

SD= Common standard deviation

The data obtained were entered in a Microsoft Excel sheet, and statistical analysis was performed using statistical package for the social sciences (Version 20). Results were presented as Mean±SD, counts and percentages and diagrams. Normally distributed continuous variables between two groups were compared using independent t test Categorical variables between two groups will be compared using chi square test.

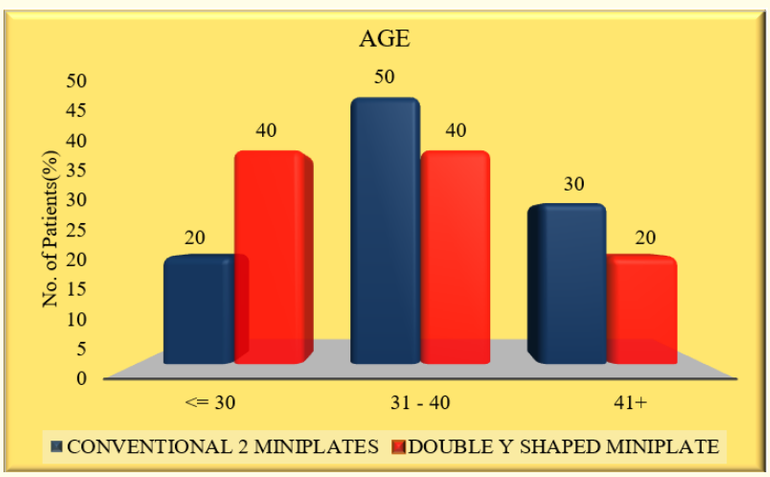
Results and Discussion

This study was conducted on twenty patients suffering from fracture in the anterior region of mandible. Among twenty patients, fifteen patients were male and five patients were female. The patients were randomly divided into two groups. The mean age of the patients was 36.60 (Group A) and 33.20 (Group B) (Table 2, Graph 2). Group A (Conventional two miniplates) included ten patients, in which fractures were plated with 2mm four holes miniplate in the lower border and 2mm two holes miniplate sub apically which were secured with monocortical screws. Group B (Double Y shaped miniplate) included ten patients, in which fractures were plated with double Y shaped miniplate and secured with six monocortical screws. The data obtained were entered in a Microsoft Excel sheet, and statistical analysis was performed using statistical package for the social sciences (Version 20). Results were presented as Mean ± SD, counts and percentages and diagrams. Normally distributed continuous variables between two groups were compared using independent t test. Categorical variables between two groups were compared using chi square test.

While assessing time taken for the fracture fixation, the mean value of plate handling time for Group A and Group B were 10.40 min and 6.70 min respectively (Table 4, Graph 4). Adaptability of conventional miniplates (100%) and double Y shaped miniplate (90%) to the anterior region of mandible was found to be good (Table 5, Graph 5). In Group A, Occlusion was satisfactory for all the patients on all post operative assessment days. In Group B, one patent was noted with mildly deranged occlusion on immediate post operative day. Which was corrected by placing elastic traction for four weeks (Table 8, Graph 8). In both the groups, fracture segments were stable for all the patients on all post operative assessment days. There was no statistically significant difference among the groups with constant P value of 1 (Table 9, Graph 9). In Group A, one patient had infection and in Group B, none. The infection was treated with antibiotics and resolved uneventfully (Table 7, Graph 7). None of the patients in both the groups had complications of non-union, malunion, hardware failure and wound dehiscence. No radiolucency was seen in any of the radiographs of both the groups.

Age (Years)	Conventional 2 Miniplates (GROUP A)		Double Y Shaped Miniplate (GROUP B)	
	No. of Patients	Percentage	No. of Patients	Percentage
<= 30	2	20.0	4	40.0
31 - 40	5	50.0	4	40.0
41+	3	30.0	2	20.0
Total	10	100.0	10	100.0

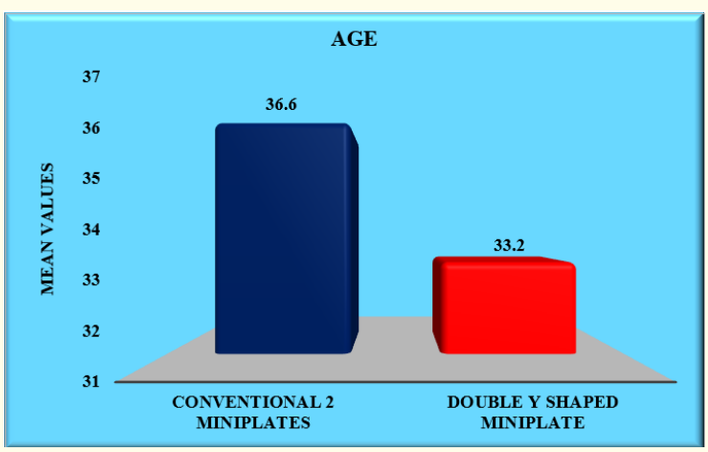
Table 1: Age distribution of patients.



Graph 1: Age distribution of patients.

Age (Years)	Conventional 2 miniplates (Group A)		Double Y Shaped Miniplate (Group B)		Independent samples t test	P value
	Mean	Std. Deviation	Mean	Std. Deviation		
Age	36.60	7.806	33.20	9.211	t=0.890	P=0.385
Statistically Insignificant						

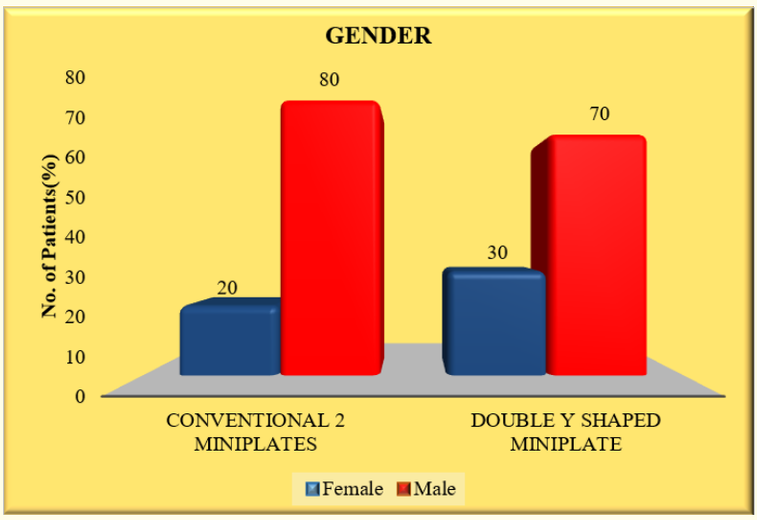
Table 2: Age (Mean).



Graph 2: Age (Mean).

Gender	Conventional 2 miniplates (Group A)		Double y shaped miniplate (Group B)		Chi square test	P Value
	No. of Patients	Percentage	No. of Patients	Percentage		
Female	2	20.0	3	30.0	0.2667	0.6056
Male	8	80.0	7	70.0		
Total	10	100.0	10	100.0		
Statistically Insignificant						

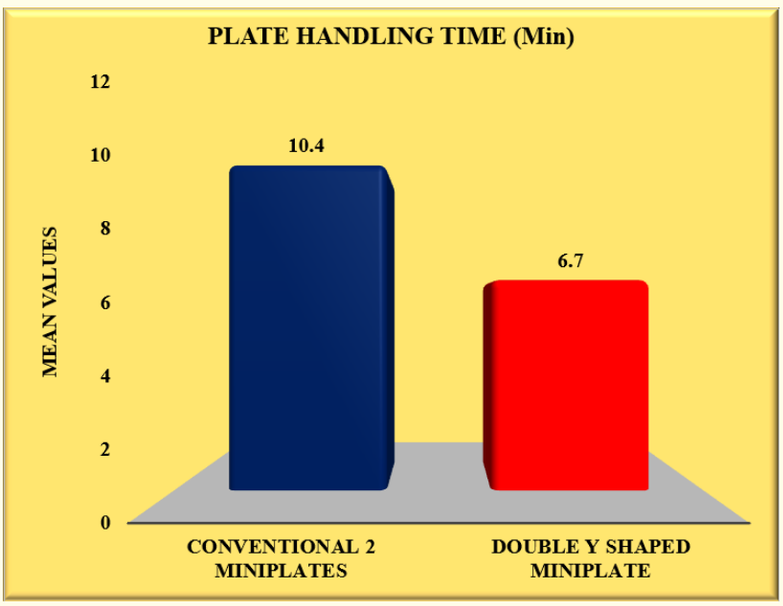
Table 3: Gender.



Graph 3: Gender.

Plate handling time (Min)	Conventional 2 miniplates (GROUP A)		Double y shaped miniplate (GROUP B)		Independent samples T test	P Value
	Mean	Std. Deviation	Mean	Std. Deviation		
Plate handling time (Min)	10.40	.966	6.70	1.059	t = 8.161	P = 0.0001*
*: Statistically significant						

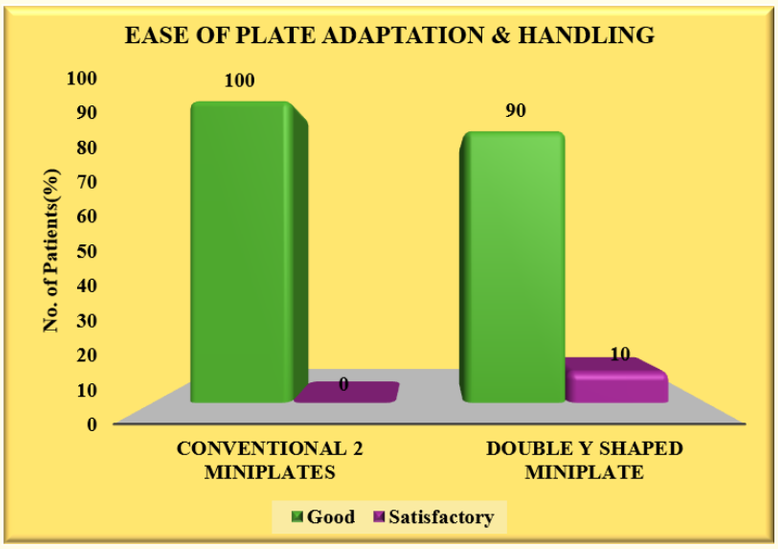
Table 4: Plate handling time (Min).



Graph 4: Plate handling time (min).

Ease of plate adaptation and handling	Conventional 2 miniplates (GROUP A)		Double y shaped miniplate (GROUP B)		Chi square test	P Value
	No. of Patients	Percentage	No. of Patients	Percentage		
Good	10	100.0	9	90.0	1.053	0.3049
Satisfactory	0	0	1	10.0		
Total	10	100.0	10	100.0		
Statistically Insignificant						

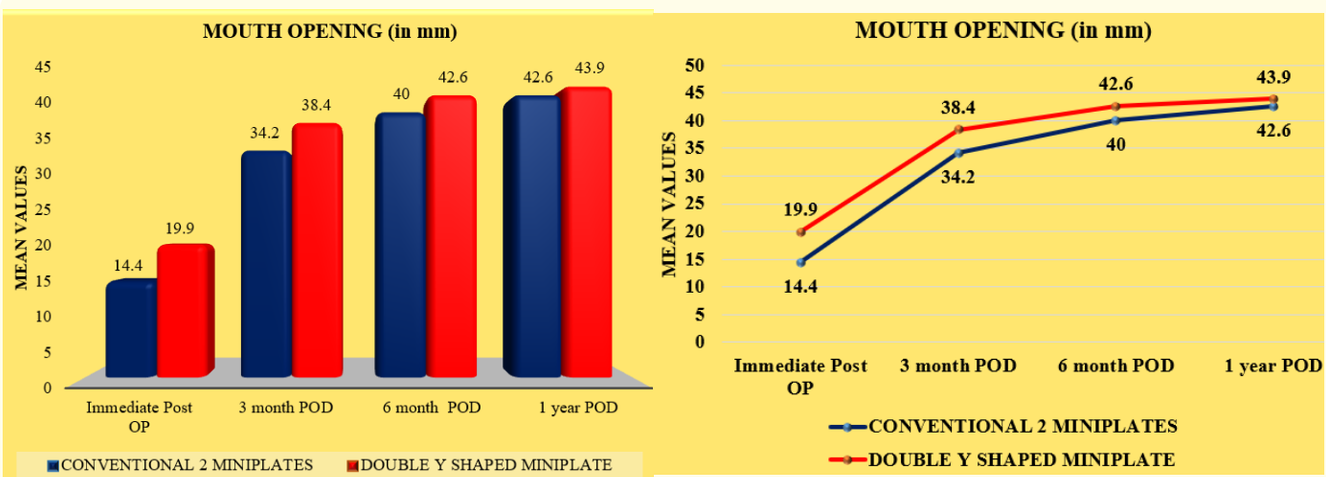
Table 5: Ease of plate adaptation and handling.



Graph 5: Ease of plate adaptation and handling.

Mouth opening (in mm)	Conventional 2 miniplates (Group A)		Double y shaped miniplate (Group B)		Independent Samples t Test	P Value
	Mean	Std. Deviation	Mean	Std. Deviation		
Immediate Post OP	14.40	0.966	19.90	1.663	t = 9.042	P = 0.0001*
3 Month POD	34.20	1.033	38.40	1.265	t = 8.133	P = 0.0001*
6 Month POD	40.00	.816	42.60	.966	t = 6.500	P = 0.0001*
1 Year POD	42.60	.966	43.90	.876	t = 3.153	P = 0.006*
*: Statistically significant						

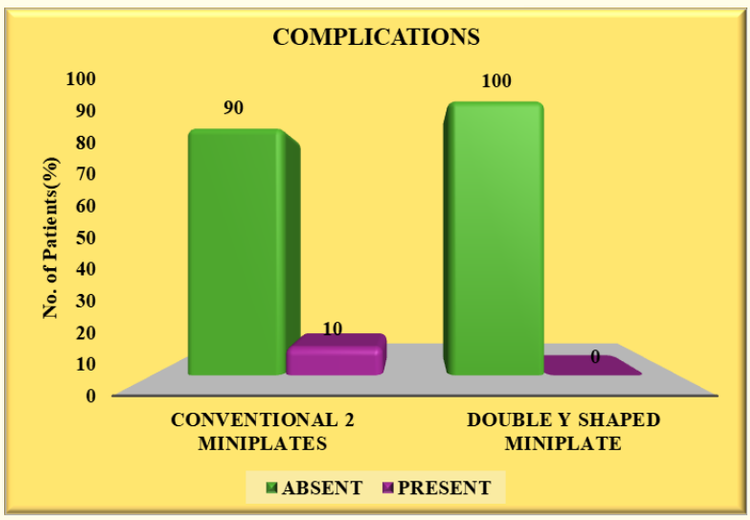
Table 6: Mouth Opening (In Mm).



Graph 6: Mouth opening (in mm).

Complications	Conventional 2 miniplates (Group A)		Double y shaped miniplate (Group b)		Chi square test	P Value
	No. of Patients	Percentage	No. of Patients	Percentage		
Absent	9	90.0	10	100.0	1.053	0.3049
Present	1	10.0	0	0		
Total	10	100.0	10	100.0		
Statistically Insignificant						

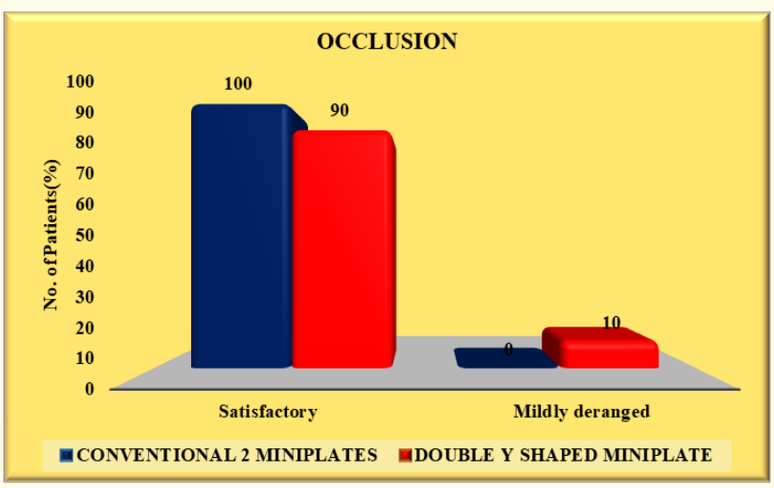
Table 7: Complications.



Graph 7: Complications.

Occlusion	Conventional 2 miniplates (Group A)		Double y shaped miniplate (Group B)		Chi square test	P Value
	No. of Patients	Percentage	No. of Patients	Percentage		
Satisfactory	10	100.0	9	90.0	1.053	0.3049
Mildly deranged	0	0	1	10.0		
Total	10	100.0	10	100.0		
Statistically Insignificant						

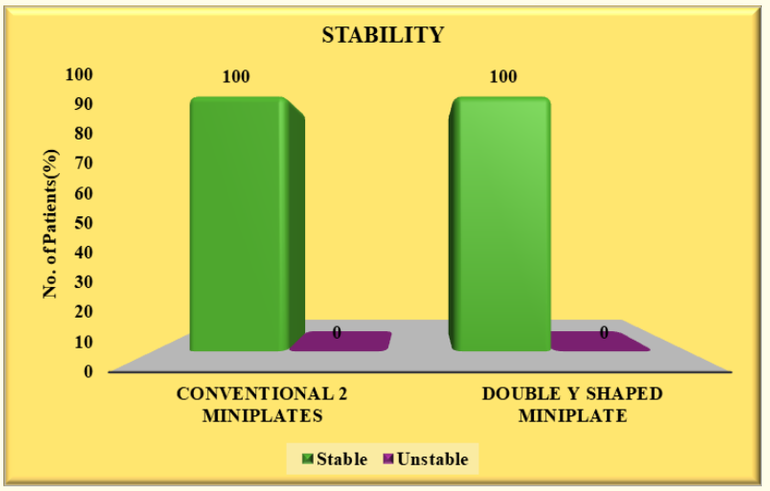
Table 8: Post operative occlusion.



Graph 8: Post operative occlusion.

Stability	Conventional 2 miniplates (Group A)		Double y shaped miniplate (Group B)		Chi square test	P Value
	No. of Patients	Percentage	No. of Patients	Percentage		
Stable	10	100.0	10	100.0	NA	
Unstable	0	0	0	0		
Total	10	100.0	10	100.0		
NA: Not Applicable						

Table 9: Stability.



Graph 9: Stability.

The current understanding of the biomechanics and fracture healing of the mandible has influenced the modern approach to the open reduction and internal fixation of these fractures.6 The mandible is a complex bony structure involving unique cranial and dental articulations, a network of opposing and specialized muscles, and supporting functions of respiration, speech, deglutition, swelling, and facial expression.4 Mandibular fractures constitute a significant proportion of facial trauma with mental foramen, the third molar angle area, and the mandibular canine sites particularly susceptible to fracture owing to the bone density at these locations. As a result, parasymphysis and angle fractures constitute the majority of fracture sites [11]. Patients between the ages of 20 and 29 years had the greatest number of mandibular fractures.27 The greatest incidence of mandibular fracture was in the 21 to 30 years of age group [29]. The age distribution of the patients in the present study corresponds to the findings of the aforementioned authors. In most research, male predominance of mandibular fractures is a reasonably consistent result. In the Indian scenario, males are more active in outdoor activities in comparison to females. In our study gender distribution showed a strong predominance of males (70-80%) as per with the studies in literature. Fractures through the mandible at the level of the symphysis and parasymphysis are relatively common and account for approximately 20% of mandibular fractures [30]. In our study, twenty patients with isolated fracture with respect to symphysis or parasymphysis region had selected. The diagnosis of mandibular symphysis or parasymphysis fracture were made on the basis of a thorough clinical examination supplemented by preliminary imaging tests. In our study, all the patients were subjected to orthopantomogram (OPG) preoperatively to visualize the fracture pattern, associated mandibular fractures and to establish a proper treatment plan. The treatment goal of mandible fractures allows the patient to have mandibular function and to achieve a normal diet earlier. Open reduction and internal fixation (ORIF) of fracture segments in an anatomic bony union is necessary for optional healing. Various approaches for the visualization and the reduction of the mandibular para symphysis and symphysis fractures are used including existing laceration, extra-oral and intra-oral approaches. Each of these approaches has its own advantages and disadvantages, but the main goal based on which the approach is chosen includes good accessibility, minimal complications and inconspicuous facial scar. In our study, the most commonly used approaches were the intra-oral vestibular approach. The main principle in management of fractures is anatomic reduction, but in order to maintain the reduction, suitable fixing materials are required. They have to be sufficiently stable to fulfil the principles of functionally stable osteosynthesis as stated by Champy et al. [9]. In literature there are number of osteosynthesis material used for the reduction and fixation in the anterior region of the mandible, including compressional plates, reconstruction plates, locking reconstruction plates, lag screws, miniplates, micro miniplates, bioresorbable plates and 3D plates. All the osteosynthesis devices have their own

advantages and disadvantages and the skeleton of the hardware is done based on the fracture pattern and also based on the affordability of the patient. Advanced osteosynthesis designs were introduced to overcome drawbacks noted with use of single four/six-hole miniplate and double miniplates. This led to the inception of various shaped plates such as delta, lambda, trapezoidal, V shaped, X shaped, Double Y shaped plate etc. These plates were designed in such a way that they occupied less space while maintaining the stress distribution along the zones of tension and compression. These evolving osteosynthesis materials provide resistance to force in three directions, namely bending, shearing and torsion [31]. This stability is attributed to its configuration and not by thickness or length, and the large free areas between the plate arms. But shaped plates are not always easily adaptable [32]. The have opiniated that such a geometric plate is much larger in size and requires bending in 3-dimensions, whereas a linear plate has to be bent only in 2-dimensions [32]. A meta-analysis with aim to compare various fixation techniques including lag screws, 3-dimensional plates, one plate, and two miniplates in the management of anterior mandibular fracture [33]. They concluded that use of both lag screws and one plate plus an arch bar was superior to using two miniplates in reducing the incidence of post operative complications in the management of anterior mandibular fractures [33]. In addition, they found lower complication rates with the use of the 3D plate compared with the use of two miniplates in the management of anterior mandibular fractures [33]. They also noted that operative times with lag screws and 3D miniplates was significantly shorter in comparison with placing two miniplates [33].

In the present study, the plate handling time for group A patients with mean value of 10.4 minutes and for group B patients, the mean value of 6.7 minutes. The comparison showed statistically significant difference with p value of 0.0001. Plate handling time for double Y shaped miniplate was lesser due to the reason of geometrical configuration of this plate. Whereas for conventional miniplates, there is a need of two plates to bring about stabilization of fracture site. Thus, double Y shaped miniplate fixation saves operation time.

In the present study, good plate adaptation was scored to ten patients in group A. In group B, good plate adaptation was scored to nine patients and satisfactory plate adaptation was scored to one patient. There was no statistically significant difference among the groups with the p value of 0.3049. The reason for slightly less good adaptation of 3D plate to the fracture site was contributed to the much broader geometric configuration of 3D plate. The broad geometric shape of 3D plates tries to adapt a "plane" rather than a "line" to the curved contour of the mandible [26].

Occlusion serves as one of the key indicators of appropriate reduction and fixation. The occlusal disturbances were scored clinically, preoperatively as well as postoperatively and on the follow up. In the present study, preoperative occlusion was deranged for all the patients in both the groups. As per the evaluation, during immediate post operative period showed only one case of minor occlusal derangements. The occlusion evaluated at three months, six months, and one year post operative period.

Reduced mouth opening is a prominent clinical finding in almost all the cases of mandibular fractures. Many factors can affect mouth opening, including the period of postsurgical IMF, severity of displacement before management, surgery of the fracture side, and patient cooperation during rehabilitation. In the present series, the evaluation of mean maximal mouth opening was found to be equal to or more than 40mm at the one year follow up.

The infection rate in our series was 10% at the second follow-up with one patient in group A presenting with infection which was not statistically significant (p=0.305). The reason for presence of post operative infection was poor oral hygiene and infected tooth in line of fracture as possible causes.25 In the event of post operative infection, the management includes conservatively by local irrigation, pus drainage, wound debridement and antibiotics for five days.6 Rigidity of fractured segments enhances vascularity of that area thereby promoting soft tissue growth.4 Also, rigidity of fractured segments also prevents entry of bacteria through the fracture site, thereby reducing chances of osteitis. Thus, greater chance of infection lies with more mobility of fracture site [25].

The 3D plating system provides definite advantages over conventional miniplates. It works on the principles of stability against vertical displacement, torsion, bending and shearing forces. Thus, it provides stability in all the three dimensions. It uses lesser foreign material, and reduces operation time. A prospective randomized clinical trial, performed on sixteen patients with anterior mandibular fractures. They conducted that both lag screws and double Y shaped miniplate provide favourable means of fixation for mandibular fractures in the anterior region [10]. A prospective study on a total number of fourteen adult patients, who are suffering from mandibular fractures including (Symphysis and Parasymphyseal fractures).1 It has shown that Double Y shaped miniplates have same stabilization due to its configuration as conventional mini plates in fixation of anterior mandibular fracture.1 Our study showed that conventional miniplates and double Y shaped miniplate have good anatomic reduction which was assessed by using OPG taken at three months, six months, and one year post operatively. Fracture fixation with conventional miniplate done with two miniplates and secured using six/eight screws, whereas Double Y shaped miniplate was secured with six screws which provide option of using less implant material compared to conventional miniplate without obscuring stability. Hence Double Y shaped miniplate can be used as a viable alternative to conventional miniplate for the management of fracture in the anterior region of mandible. Our overall results correspond to the results of other studies done by different authors.

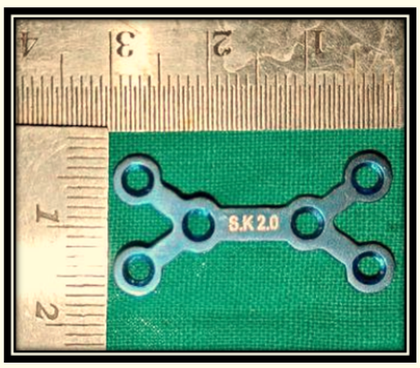


Figure 1: Double y shaped miniplate.

Figure 2: Conventional miniplate.

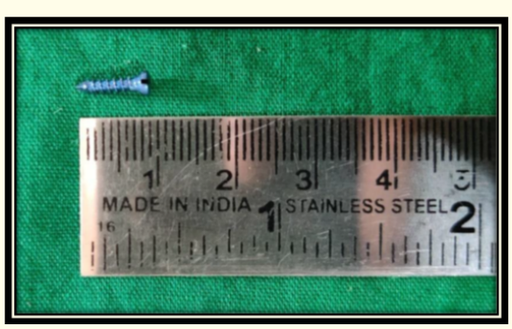


Figure 3: Screw size.

Figure 4: Deranged occlusion.

Figure 5: Arch bar is placed.

Figure 6: Fracture site is exposed.

Figure 7: Fixation done with double y shaped miniplate.

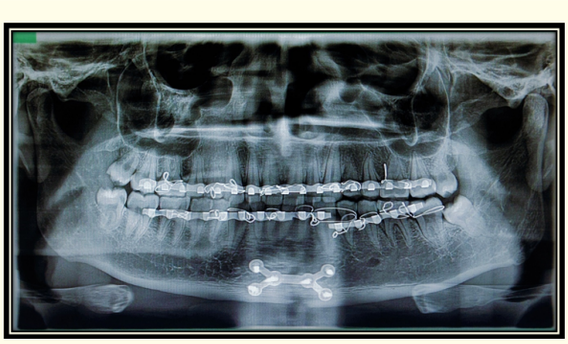


Figure 8: Post operative opg (double y shaped miniplate).

Figure 9: Deranged occlusion.

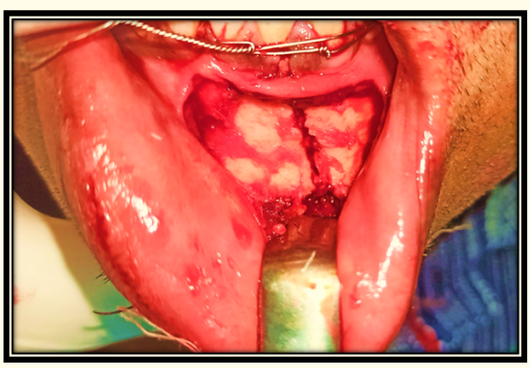


Figure 10: Fracture site is exposed.

Figure 11: Post operative opg (conventional 2 miniplates).

Conclusion

This study showed both the conventional miniplate and the double Y shaped miniplate were successful in the treatment of anterior mandible fractures. Intraoperatively, conventional miniplate is easier to adapt and handle than a double Y shaped miniplate. This could be due to anterior mandible's architecture, which makes double Y shaped miniplate adaptation difficult. Fracture fixation done with conventional two miniplates required six to eight monocortical screws, whereas double Y shaped plate can be secured with six monocortical screws which provide option of using less implant material compared to conventional miniplates without obscuring stability. Both plating systems exhibited excellent fracture stability, which is necessary for seamless fracture healing. When radiographs were used to examine fracture reduction, both plating systems were shown to be equally successful. To recapitulate, within the limitations of this study both the conventional miniplates and the double Y shaped miniplate are equally effective in the management of fracture in the anterior region of the mandible and are a feasible alternative to the traditional plating without compromising the results. Our overall results correspond to the results of other studies done by different authors. Further study of double Y shaped miniplate will aim to prospectively examine outcomes with its use in order to better define its efficacy and indications with regard to fracture type and presence of other facial fractures, as well as with a larger sample size to allow for a more powered analysis.

Acknowledgements

First and foremost, I thank ALLAH, The Almighty, for the immense blessings and enormous grace in all aspects and in every circumstance of my life.

I would like to express my sincere gratitude to my mentor, guide, advisor, preceptor and teacher Dr. Sameer Choudhari, Professor and HOD, Department of Oral and Maxillofacial surgery, Al Ameen Dental College, Vijayapura, Dr. Saleem Mujawar, Professor, co-guide, Dr. Shakeel Mamdapur, Assistant Professor, Dr. Neelamma, Senior Lecturer, Dr. Neelakanth M Warad, former Professor and HOD, Department of Oral and Maxillofacial surgery, Al Ameen Dental College and hospital, Vijayapura, for rendering the constant support in my dissertation study and research and guiding me throughout with patience, motivation, enthusiasm and enlightening me with his immense knowledge.

My heartfelt thank goes to my colleague Dr. Ravi S, my seniors Dr. Tahura, Dr. Maruti, Dr. Kiran, Dr. Shahid, my junior colleagues Dr. Nainashree, Dr. Muzamil, Dr. Vasudev and Dr. Ashwini for their constant support and encouragement throughout the course of study.

Most important, no words will suffice to thank the members of my family, I would like to thank MY PARENTS AND SIBLINGS for their unconditional love, support, blessings and passionate encouragement in making this possible.

Conflict of interest

All authors declare that they have no conflict of interest.

Bibliography

1. Mohamed S Khairi., *et al*. "The Use of Double Y - Shaped versus Conventional Titanum Miniplates in Fixation of Anterior Mandibular Fractures". *International Journal of Science and Research (IJSR)* 5.7 (2016).

2. Ergun S., *et al*. "Comparative evaluation of various miniplate systems for the repair of mandibular corpus fractures". *Dental Materials Journal* 33.3 (2014): 368-372.

3. Hasanein AM and Alfakhrany A. "Biomechanical evaluation of double Y-shaped versus conventional straight titanium miniplates for the treatment of mandibular angle fractures". *Egyptian Dental Journal* 64 (2018): 3231-3235.

4. Raut R., *et al*. "Single miniplate fixation for mandibular symphysis and parasymphysis fracture as a viable alternative to conventional plating based on Champy's principles: a prospective comparative clinical study". *Journal of Maxillofacial and Oral Surgery* 16.1 (2017): 113-117.

5. Kroon FH., *et al*. "The use of miniplates in mandibular fractures: An *in vitro* study". *Journal of Cranio-Maxillofacial Surgery* 19.5 (1991): 199-204.

6. Khalifa ME., *et al*. "Titanium three dimensional miniplate versus conventional titanium miniplate in fixation of anterior mandibular fractures". *Life Science Journal* 9.2 (2012): 1006-1010.

7. Ali R Patel M., *et al*. "Comparison of 2D vs 3D miniplates in the management of anterior mandibular fractures – a comparative study". *RGUHS Journal of Medical Sciences* 6.2 (2016).

8. Al-Moraissi EA and Ellis E. "Surgical management of anterior mandibular fractures: a systematic review and meta-analysis". *Journal of Oral and Maxillofacial Surgery* 72.12 (2014): 2507.e1-11.

9. Champy M., *et al*. "Mandibular osteosynthesis by miniature screwed plates via a buccal approach". *Journal of Oral and Maxillofacial Surgery* 6.1 (1978): 14-21.

10. Melek L. "Comparison of lag screws and double Y-shaped miniplates in the fixation of anterior mandibular fractures". *World Journal of Methodology* 11.3 (2021): 88-94.

11. Ongodia David., *et al*. "Comparative analysis of trends in the treatment of mandibular fractures". *Journal of Oral and Maxillofacial Surgery, Medicine, and Pathology* 26 (2014): 276–279.

12. Ergun S., *et al*. "Comparative evaluation of various miniplate systems for the repair of mandibular corpus fractures". *Dental Materials Journal* 33.3 (2014): 368-372.

13. Michelet FX., *et al*. "Osteosynthesis with miniaturized screwed plates in maxillo-facial surgery". *Journal of Oral and Maxillofacial Surgery* 1.2 (1973): 79-84.

14. Saluja H., *et al*. "A comparative evaluation of different treatment modalities for parasymphysis fractures: a pilot study". *International Journal of Oral and Maxillofacial Surgery* 41.8 (2012): 906-911.

15. Arbag H., *et al*. "Comparative evaluation of different miniplates for internal fixation of mandible fractures using finite element analysis". *Journal of Oral and Maxillofacial Surgery* 66.6 (2008): 1225-1232.

16. Wang H., *et al*. "Three-dimensional finite element analysis of mechanical stress in symphyseal fractured human mandible reduced with miniplates during mastication". *Journal of Oral and Maxillofacial Surgery* 68.7 (2010): 1585-1592.

17. Saluja H., *et al*. "Use of miniplates in parasymphysis fractures : a survey conducted among oral and maxillofacial surgeons of India". *Journal of Oral and Maxillofacial Surgery* 12.3 (2013): 312-314.

18. Korkmaz HH. "Evaluation of different miniplates in fixation of fractured human mandible with the finite element method". *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontics* 103.6 (2007): e1-13.

19. Jain MK., *et al*. "Comparison of 3-dimensional and standard miniplate fixation in the management of mandibular fractures". *Journal of Oral and Maxillofacial Surgery* 68.7 (2010): 1568-1572.

20. Schortinghuis J., *et al*. "Complications of internal fixation of maxillofacial fractures with microplates". *Journal of Oral and Maxillofacial Surgery* 57.2 (1999): 130-134.

21. Rix L., *et al*. "An analysis of 80 cases of mandibular fractures treated with miniplate osteosynthesis". *International Journal of Oral and Maxillofacial Surgery* 20.6 (1991): 337-341.

22. Madsen MJ., *et al*. "A biomechanical evaluation of plating techniques used for reconstructing mandibular symphysis/parasymphysis fractures". *Journal of Oral and Maxillofacial Surgery* 66.10 (2008): 2012-2019.

23. Renton TF and Wiesenfeld D. "Mandibular fracture osteosynthesis: a comparison of three techniques". *British Journal of Oral and Maxillofacial Surgery* 34.2 (1996): 166-173.

24. Sehgal S., *et al*. "Three-dimensional v/s standard titanium miniplate fixation in the management of mandibular fractures--a randomized clinical study". *J Craniomaxillofac Surg* 42.7 (2014): 1292-1299.

25. Iizuka T and Lindqvist C. "Rigid internal fixation of mandibular fractures. An analysis of 270 fractures treated using the AO/ASIF method". *International Journal of Oral and Maxillofacial Surgery* 21.2 (1992): 65-69.

26. Agarwal M., *et al*. "A Prospective Randomized Clinical Trial Comparing 3D and Standard Miniplates in Treatment of Mandibular Symphysis and Parasymphysis Fractures". *Journal of Maxillofacial and Oral Surgery* 13.2 (2014): 79-83.

27. Melmed EP and Koonin AJ. "Fractures of the mandible. A review of 909 cases". *Plastic and Reconstructive Surgery* 56.3 (1975): 323-327.

28. Berggren., *et al*. "Mandibular fractures: a review of 185 fractures in 111 patients". *The Journal of Trauma* 7 3 (1967): 357-366.

29. Berstein L and McClurg FL. "Mandibular fractures: a review of 156 consecutive cases". *Laryngoscope* 87.6 (1977): 957-961.

30. Farwell D. "Management of symphyseal and parasymphyseal mandibular fractures. *Operative Techniques in Otolaryngology-head and Neck Surgery* 19 (2010): 108-112.

31. Prasad R., *et al*. "The role of 3D plating system in mandibular fractures: A prospective study". *Journal of Pharmacy and Bioallied Sciences* 5.1 (2013): S10-13.

32. Jain Manoj Kumar., *et al*. "Comparison of 3-Dimensional and Standard Miniplate Fixation in the Management of Mandibular Fractures". *Journal of Oral and Maxillofacial Surgery: Official Journal of the American Association of Oral and Maxillofacial Surgeons* 68 (2010): 1568-1572.

33. Al-Moraissi Essam and Ellis Edward. "Surgical Management of Anterior Mandibular Fractures: A Systematic Review and Meta-Analysis". *Journal of Oral and Maxillofacial Surgery* 72 (2014). 10.