Comparative Study Evaluating the Clinical Efficacy of 2mm Three Dimensional (3d) Miniplates Versus 2mm Locking Miniplates in the Management of Mandibular Anterior Fractures - A Retrospective Clinical Study

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Abstract

Objectives: To compare the effect of three dimensional (3D) miniplates in the management of anterior mandibular fracture by occlusion stability, neurosensory deficit, duration of surgery, postoperative occlusion, segmental mobility and post op neurosensory deficit, other complications (infection, wound dehiscence and fracture of plate) were compared with that of locking miniplate.

Material and Method: A total of 30 patients were included in this study and divided randomly into 2 groups having 15 patients each. Two plates has been used for fixation of fractures of anterior mandibular region. Patients under Group 1, 2mm locking plate/screw system has been used and in Group 2, 2mm 3 Dimensional Miniplate has been used postoperatively all the patients were evaluated for Postoperative occlusion, segmental mobility, postoperative neurosensory deficit and other complications.

Results: There was no statistically significant difference noted in the treatment outcome between both the groups.

Conclusion: The operative experience gained with the use of Locking miniplates suggests that it is an easy and effective treatment modality in cases of moderately displaced anterior mandibular fractures. 2.0mm locking miniplates provide more rigid fixation compared to 2.0mm 3 dimensional miniplates in fracture of mandible often avoiding /decreasing the need for IMF.

Keywords: Locking miniplates, 3 Dimensional miniplates, Mandible fractures, IMF

INTRODUCTION

Fractures of Mandible occurs more frequently than that of any other Facial skeleton. It is one of the serious facial injury that the average practicing dental surgeon may expect to encounter, albeit on rare occasions, at is surgery. Trauma to the facial skeleton commonly results in injuries to the soft tissues, teeth and major skeleton component of the face including the mandible, maxilla, zygoma, naso-orbitoethmoid complex and supraorbital structures[1]. The management and rehabilitation of the patient with facial trauma demands a thorough understanding of facial fractures. Mandible, due to its anatomical position in the facial skeleton is very vulnerable to trauma[2]. Most cases of maxillofacial trauma present with a blow to the chin making the condyle and the parasymphysis area the most common site of fracture (Malmstrom;1969).

The aim of mandibular fracture treatment is restoration of anatomical form and function for which the fractured bone fragments need to be held in stable close apposition to promote uneventful healing[3]. These objectives of fracture management can be achieved by closed reduction and intermaxillary fixation (IMF) but, unfavorable and displaced fractures require open reduction and internal fixation (ORIF) and also, conditions wherein IMF is contraindicated or undesirable ORIF is preferred[4].

AIM

The purpose of this study is to evaluate the clinical efficacy of three dimensional (3D) plates and locking plates in the management of anterior mandibular fractures.

MATERIALS AND METHODS:

The study was approved by the institutional ethics board (Approval Id: NIMSUR/IEC/2021/160)

The present study is to evaluate "The clinical efficacy of Three dimensional (3D) plates and locking plates in the management of anterior mandibular fractures" in the Department of Oral and Maxillofacial Surgery of NIMS Dental College and Hospital, Jaipur. Patients were selected irrespective of gender, caste and socioeconomic status. Informed consent for the procedure was obtained from all the patients enrolled for the study.

Criteria for selection of patients

Inclusion criteria

1. All Dentate patients with mandibular fracture from 18 to 60 years of age.
2. Symphysis and para symphysis fractures.
3. All patients with non-comminuted fractures of mandible.
4. Patient willing to give written consent for the surgical procedure.

Exclusion criteria

1. Edentulous patients
2. Patients having Primary and Mixed dentition.
3. ASA classification type IV and V.
4. Patients who are unfit for GA

METHODOLOGY

This study was carried out between Jan 2022 to Apr 2023. A standard proforma was used to collect necessary information regarding each case after inclusion. Preoperatively, all patients were informed about the surgical procedure, postoperative instructions, possible complications and written consent was taken.

In the present study, 30 patients were randomly divided into two groups and were treated for anterior mandibular fracture using Locking miniplate (Group 1) and 3D miniplate (Group 2). Post operative evaluation was done by the same observers under the following criteria: occlusion stability, neurosensory deficit, duration of surgery, postoperative occlusion, segmental mobility and post op neurosensory deficit, other complications (infection, wound dehiscence and fracture of plate).

PROCEDURE

After intubation, eye ointment was applied to both the eyes and sterile gauze pads were placed over the eyes, a throat pack was placed in all patients. Patients were painted with 10% povidone iodine and draped as per standard protocol. Irrigation of the oral cavity was done with Normal saline and povidone iodine solution. Surgical approach for the fractures was through the intra oral and extra oral incisions and through pre-existing laceration. Surgical Site infiltrated with 2% Lignocaine Hydrochloride with 1:80,000 adrenaline.

The lip is then retracted, and a curvilinear incision is made perpendicular to mucosal surface. The incision is carried out into the lip so as to leave at least 1cm of attached gingiva. This incision extended anteriorly into the lower lip, leaving 10 to 15 mm of mucosa attached to the gingiva. The dissection is then carried subperiosteally to identify the mental neurovascular bundle and identify the line of lesion within the mandible at the site of fracture. After exposing the fracture site, fracture segments were reduced either using intermaxillary fixation (IMF) with upper and lower Erich's arch bars/ eyelet wiring or by manual approximation of the visible fracture segments by holding the dentition into occlusion.

Internal fixation was done in group A patients using a 2.0mm SS Locking plates, whereas in group B the fractures were fixed using a 2.0mm SS 3-D miniplate. According to the Champy's principle , firstly a 2.0mm SS Locking plate was adapted to the lower border of the mandible with the help of the

bending pliers. It was then fixed using 2.0 mm locking screws of 8mm length. Then a second plate was similarly adapted in the subapical region and fixed using 2.0 mm screw of 8 mm length.

The 3-D SS miniplate was firstly adapted to the mandibular contour taking care of the neurovascular canal with the help of bending pliers. It was fixed with 2.0 mm locking screws of 8mm length. The screw holes were drilled using a slow speed drill after attaching guiding sleeve to each hole of the plate and copious irrigation to prevent any thermal bone injury. The drill holes were secured with monocortical screws with a self-holding screw driver.

After reduction and fixation of the fracture, the area was irrigated with povidone iodine and normal saline. Intra- operative stability of fracture segments after fixation was checked by clinical manipulation in three directions. The maxillomandibular fixation released in all the patients. After achieving adequate hemostasis, the wound was closed in two layers using 3-0 vicryl for deeper layers and 4-0 silk /(Ethilon) for skin and mucosa. Adhesive bandage was applied to chin to support the mentalis muscle and prevent its drooping. Extubation done ,throat pack removed. Recovery was uneventful. Patient shifted to ICU.

POST OPERATIVE CARE

All patients were kept post-operatively on the following regimen.

1. Injection Cefotaxime 1 gm / B.D / Intravenous for 3 days.
2. Injection Metronidazole 500mg /T.I.D / Intravenous for 3 days.
3. Injection Pantoprazole /O.D/Intravenous for3 days.
4. Injection Diclofenac sodium 75mg /B.D /infusion with 100ml NS .
5. Injection Dexamethasone 8mg / T.I.D / Intravenous tapering dose.
6. Injection Ondansetron 4mg / Intravenous / S.O.S
7. 0.2% Chlorhexidine gluconate mouthwash for 30 days.

FOLLOW UP DESIGN

All the patients were followed for a period of 3 months at the intervals of 1st week, 2nd week, 6th week and 12th week and evaluated for:

1. Postoperative occlusal
2. Segmental mobility
3. Post operative neurosensory deficit
4. Other complications such as infection, wound dehiscence and fracture of plate.

POSTOPERATIVE ASSESSMENT

Postoperative assessment was carried out both clinically on 1st week, 1 Month and 3 Months.

OBSERVATION AND RESULTS

In the present study, 30 patients were randomly divided into two groups and were treated for anterior mandibular fracture using Locking miniplate (Group 1) and 3D miniplate (Group 2). There were 7 females and 23 males included in the study. The age ranged from 18 to 60 years. The present study was conducted in 30 patients to compare the locking miniplate and 3-D miniplates in management of symphysis and parasymphysis fracture of mandible. The patients were evaluated preoperatively, postoperatively for different parameters.

Following parameters were assessed:

Preoperatively

- Age
- Gender of patient
- Fracture site
- Type of fracture
- Mode of injury

Postoperatively

- Postoperative Occlusion
- Segmental mobility
- Postoperative neurosensory deficit
- Postoperative infection

Postoperatively these parameters are evaluated at regular intervals at 1st week, 2nd week, 6th week, and 12th week.

DISCUSSION

An ideal plate-screw system must be strong and rigid enough to withstand functional loads and enable undisturbed fracture healing[5]. In fixation of mandibular fractures, the results are influenced by both; the mechanics at the fracture site and the mechanical properties of implant. The load across fracture is carried partially by fragments and partially by implant. The forces and moments acting on every single fragment have to be zero. If sum of moments is not zero, fragments tend to rotate.

From a biomechanical point of view, the mechanical properties of implant such as strength and stiffness also play an important role in stabilizing the load across fracture site[6]. It should contain these forces but should not be so rigid that stress shielding occurs and delays treatment[7]. Champy et al studied the moments of flexion and torsion produced in mandible during jaw function. Anteriorly, it is complicated due to a combination of sharp curvature of bone and the muscle attachments, each pulling in different directions. Posterior to canine, mylohyoid muscle pulls medially, whereas anteriorly, genial muscles and digastric tend to pull posteriorly, resulting in additional rotational forces.

Such displacing forces need to be well controlled if a small plating system is to work. Taking into account the anatomy of mandible, with the location of dental apices and the thickness of the cortical layer Champy et al determined an ideal line of

osteosynthesis that corresponds to the course of a line of tension at the base of alveolar process which is biomechanically the most favorable site for placement of monocortical plates to neutralize tension forces causing distraction[7].

Based on the biomechanical studies of Champy et al, torsion moments were thought to be the most important load across fracture in symphysis region. But, Tams et al in a three-dimensional study of load across fracture for different sites of mandible found that torsion moments are not of utmost importance. They indeed are high but the maximum torsion moments are 1.5 times smaller than the maximum negative moments for symphysis, canine and anterior body fractures.

In their study, Tams et al divided mandibular fractures roughly into two groups. One group formed by angle and posterior body fracture, having high positive bending moments. Another group formed by symphysis, canine and anterior body fractures, having high negative bending and high torsion moments. Considering this unique biomechanical behavior of anterior mandibular fractures, a single miniplate would not provide adequate fixation and two plates are required to overcome these displacing forces. First plate is placed along the inferior border of mandible along ideal line of osteosynthesis. Two screws are placed on each side of fracture site.

The second plate is placed approximately 4-5mm above the first plate (below root apices) with two screws on each side of the fracture site[8]. In 1913, Lambotte recommended aluminum geometrically closed quadrangular plate secured with bone screws at the lower border of mandible for treatment of mandibular fracture via an extra oral approach. However, this method did not gain further popularity because of the lower biocompatibility of the material and because treatment methods using closed reductions were preferred at that time. The first biomechanical study of 3- D miniplates was conducted by Farmand in 1992.

Wittenberg et al (1997) in an in-vitro biomechanical study found that a Leibinger 8-hole 3-D plate which was formed by joining two four-hole miniplates with interconnecting cross bars provided adequate torsional resistance and plate deformation occurred at load levels >230N[9]. Based on these studies, authors have established that Locking plates have improved biomechanical stability compared with 3D miniplates. However, majority of the studies on 3-D plates were in-vitro biomechanical studies.

The clinical application of these plates in the treatment of fractures is relatively new. Guimond et al (2005) in their retrospective evaluation of angle fracture cases treated with strut plates stated that the geometry of 3-D strut plate conceptually allows for an increased number of screws, stability in three dimensions and resistance against torque forces while maintaining a low profile and malleability. In 3-D plate, because the screws are placed in a box configuration on both sides of fracture rather than on a single line, broad platforms are created that may increase resistance to torsional forces along the axis of plate[10].

In osteosynthesis, the requirement of minimum implant material with maximum stability should always be considered[11]. The structure of bone itself gives an insight into the ideal design of osteosynthesis device to heal bone fractures. Wolff stated that living bones will change, grow and resorb according to changing stress and strain to which they are subjected. Roux gave the principle of maximum-minimum design which holds that maximum strength in bone is achieved with minimum quantity of material. Accepting the optimal design theory of structure of bone, it would seem appropriate for any foreign device to, at minimum, not impede the natural internal evolution of living tissues.

The main goal of osteosynthesis plate design should be to provide adequate stability in the bone fracture region with a minimal amount of implanted material[12]. The Locking miniplates seem to fulfill this requirement ideally than 3D miniplates. Minimum amount of surgical exposure is necessary for placement of plates and screws. Periosteal stripping is minimal, when compared to other conventional miniplate osteosynthesis technique.

The mandible is in the most esthetically sensitive part of the body, where scars and deformities are less tolerated and it is also involved in activities such as mastication and speech. In treating mandibular fractures, there is need to restore a normal (pretrauma) occlusion, maintenance of facial symmetry and balance, and complex movements of the temporomandibular joint. Alterations of mandible secondary to trauma or trauma management are readily apparent, measurable and less forgiving.

Even a slight malocclusion is readily apparent to the patient, as is a numb lip and chin or inability to open mouth adequately. Malocclusion resulting from fractures outside the condylar region, which are fractures related to tooth bearing areas of mandible, usually result from failure to gain or maintain reduction of fracture. Ideally, anatomic reduction of bone should result in an anatomic relationship of dental arches[13].In the present study, 30 patients were randomly divided into two groups and were treated for anterior mandibular fracture using Locking miniplate (Group 1) and 3D miniplate (Group 2).

The incidence of fracture was 76.7% in males (23patients). In our study, the age group most commonly affected was in the range of 20-40 year

with a mean age of 33-34 year. Also, it was observed that majority of the symphysis/parasymphysis fractures (60%) had a concomitant condylar or angle fracture. The studies have shown that modes of displacement at symphyseal fracture site would be similar with or without a concomitant fracture.

The principal cause of fracture was road traffic accident (RTA) with a frequency of 43.3% followed by self-fall, accounting for 40% of the cases. It was found that majority of cases of self-fall were under the influence of alcohol. Studies do recognize importance of alcohol consumption, not only because of its etiologic implications but also because it contributes to certain complications such as delay in post-surgical healing or infection.

In this study, the mean duration of surgery for Group 1 cases was 10.34 minutes lesser than Group 2 cases. In a similar study conducted by Jain et al (2010) an average time difference of 12 minutes was noted in the duration of surgery between 3-D and Locking plating techniques. This difference in time can be attributed to simultaneous stabilization of a Locking plate which also increases resistance to torque. But with the use of 3D, the bending of plates in 3-dimensional plane makes difficult to adapt.

To achieve accurate fixation, the bone plate must be meticulously conformed to the contours of bone. Bone plating is an exacting and technically demanding method of restoration of occlusion; a high degree of accuracy is required. If plate is not bent properly, the bone will conform to the plate instead. Every discrepancy before plate fixation will result in permanent malocclusion which is more commonly experienced during 3D plate adaptation.

Whenever a post-operative infection occurs with a mandibular fracture, numerous factors are involved. These include patient's general characteristics such as pre-existing medical disorders, smoking and chronic alcohol abuse, poor oral hygiene, and poor dental status, type of fracture, kind of treatment used and the time of treatment. Delayed treatment is associated with high rate of infection i.e. chances of infection increase when time span between time of fracture and the time of treatment. When treating a mandibular fracture, it should always be borne in mind that reduction of fracture does not equal stabilization and fixation does not strengthen bone; aftercare is just as important.

CONCLUSION

In conclusion, the results of our clinical study suggest that the Locking plating system is a suitable method for fixation of anterior mandibular fractures. We have made an attempt to compare the efficacy of 2.0mm locking miniplate with that of 2.0 mm 3 dimensional miniplate under the following parameters such as Postoperative occlusion, segmental mobility, postoperative neurosensory deficit and other complications (infection, fracture of plate and wound dehiscence).

Both 2.0 mm locking miniplate as well as 2.0 mm 3 dimensional miniplates achieved success in restoration of oral functions for fractured jaw. The difference in time can be attributed to simultaneous stabilization of a Locking plate which also increases resistance to torque. But with the use of 3D, the bending of plates in 3-dimensional plane makes difficult to adapt.

To achieve accurate fixation, the bone plate must be meticulously conformed to the contours of bone. Bone plating is an exacting and technically demanding method of restoration of occlusion; a high degree of accuracy is required. If plate is not bent properly, the bone will conform to the plate instead. Every discrepancy before plate fixation will result in permanent malocclusion which is more commonly experienced during 3D plate adaptation. 2.0 mm locking miniplates give more rigid fixation compared to 2.0 mm 3 Dimensional mini plates because of that the duration of IMF can be reduced or sometimes IMF can be avoided postoperatively.

Finally, we can conclude that 2.0 mm locking miniplates provide more rigid fixation compare to 2.0mm conventional 3D miniplates in symphysis, parasymphysis fracture of mandible often avoiding /decreasing the need for IMF. However, IMF is a useful method & is still practiced successfully to correct the minor occlusal discrepancies.

So, our study suggests the use of locking miniplates in preference to 3 Dimensional miniplates to achieve early mobility with assured stability in case of mandibular fractures. However, in cases of oblique fractures and severely displaced fractures, especially near the mental foramina area, where bending a quadrangular geometric plate can be difficult, standard plates can be a better option.

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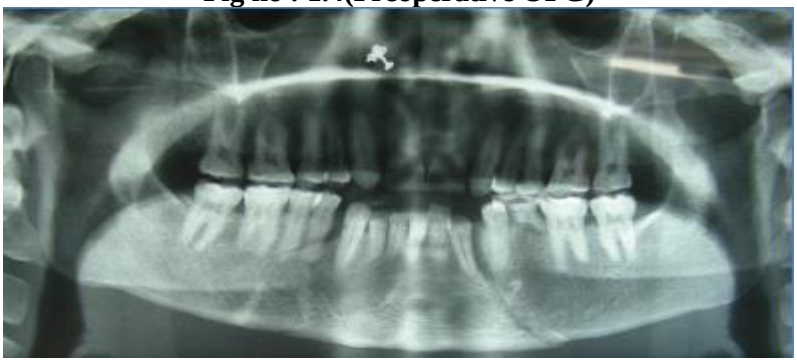


Fig no : 1.5(Post operative follow up (Week 1)

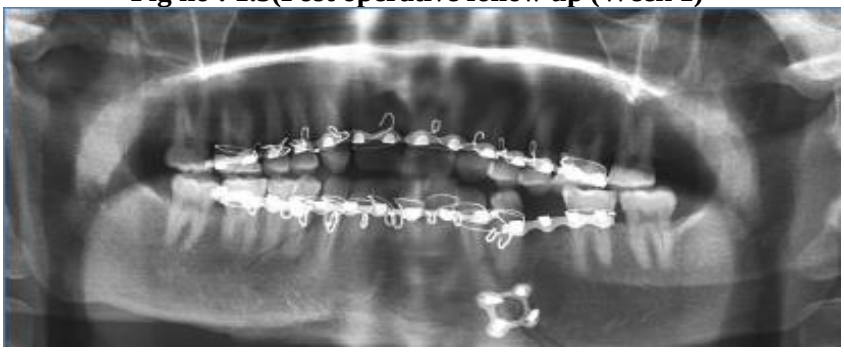
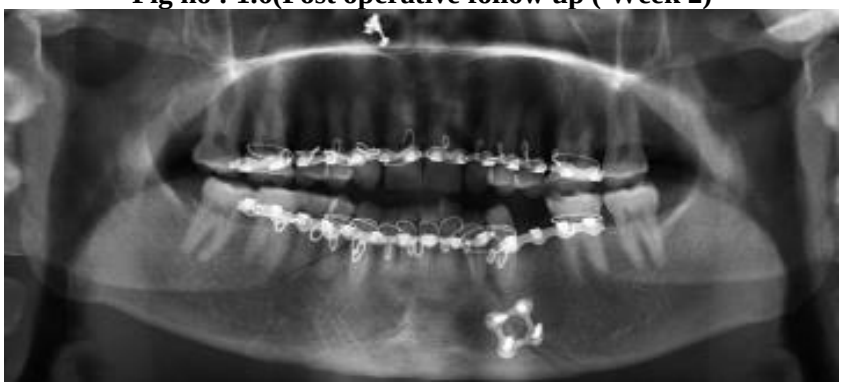


Fig no : 1.6(Post operative follow up (Week 2)



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LOCKING PLATES AND SCREWS

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Fig no. 2.2 (Intra operative)

Fig no. 2.3(Post operative)

Fig no. 2.4(Preoperative OPG)

Fig no. 2.5(Post operative Week 1)

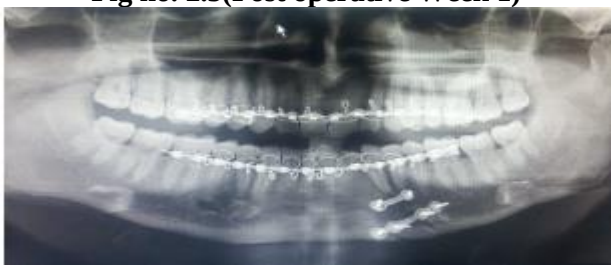

Fig no. 2.6(Post operative Week 2)

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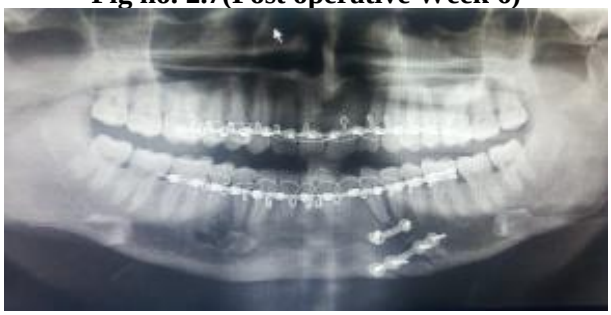

Fig no. 2.8(Post operative Week 12)

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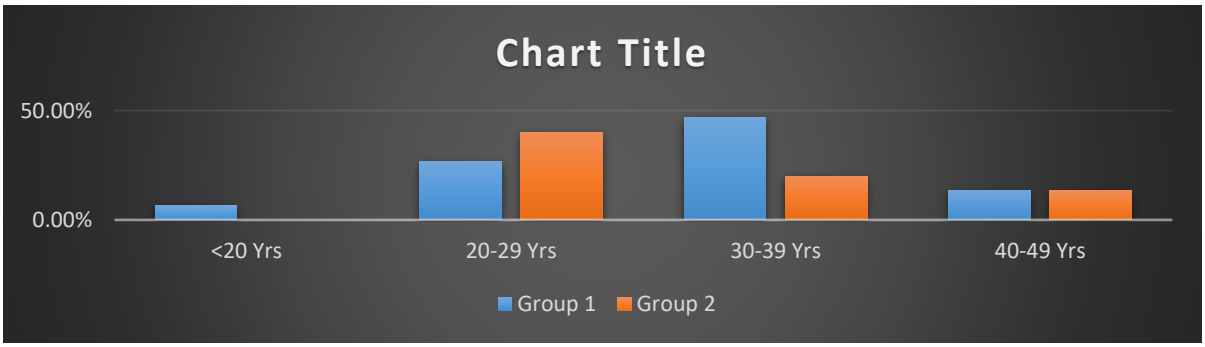
Table 1: Age Distribution in Group 1 & 2 patients

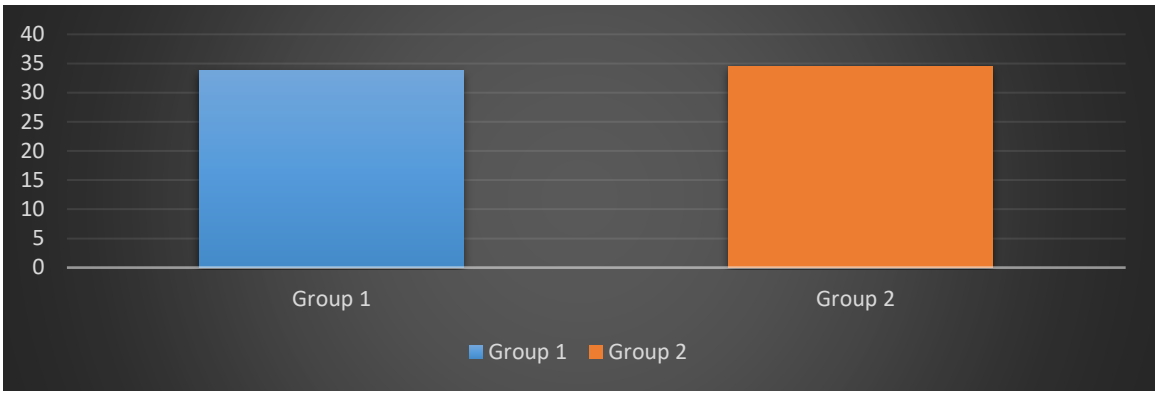
MINIPLATE	AGE					TOTAL	X2 VALUE	P VALUE
	<20yrs	20-29 yrs	30-39 yrs	40-49 yrs	>50 yrs			
2mm Locking	1	4	7	2	1	15	6.974	0.137
	6.7%	26.7%	46.7%	13.3%	6.7%	100.0%		
2mm Three Dimensional	0	6	3	2	4	15		
	.0%	40.0%	20.0%	13.3%	26.7%	100.0%		
Total	1	10	10	4	5	30		
	3.3%	33.3%	33.3%	13.3%	16.7%	100.0%		



In Group 1, the most common age group noted was 30–39 years. In Group 2, the most common age group noted was 20–29 years. Taking both the groups together, the common age group observed was in range of 20-40 years.

Table 2: Mean Age Distribution in Group 1 & 2 patients

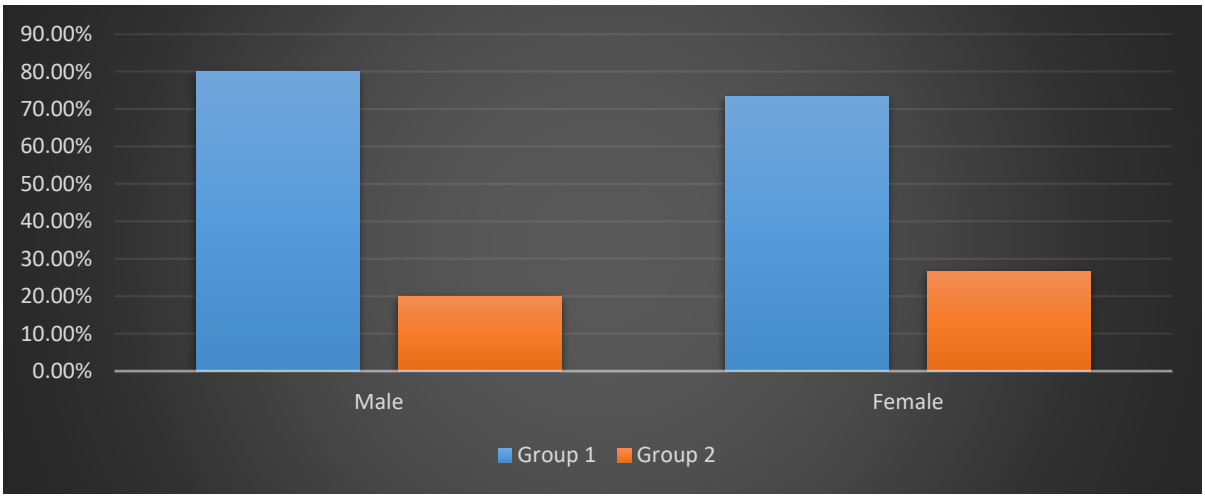
Miniplate	N	Mean Age(years)	SD	Min	Max	T value	P Value
2mm Locking	15	33.73	11.253	18	60	0.033	0.856
2mm 3 Dimensional	15	34.53	12.660	20	55		



The mean age sector recorded in Group 1 patient was 33.73 and the mean age sector recorded in Group 2 was 34.53. There was no significant difference in the distribution of mean age between the two groups.

Table 3: Gender Distribution in Group 1 & 2 patients

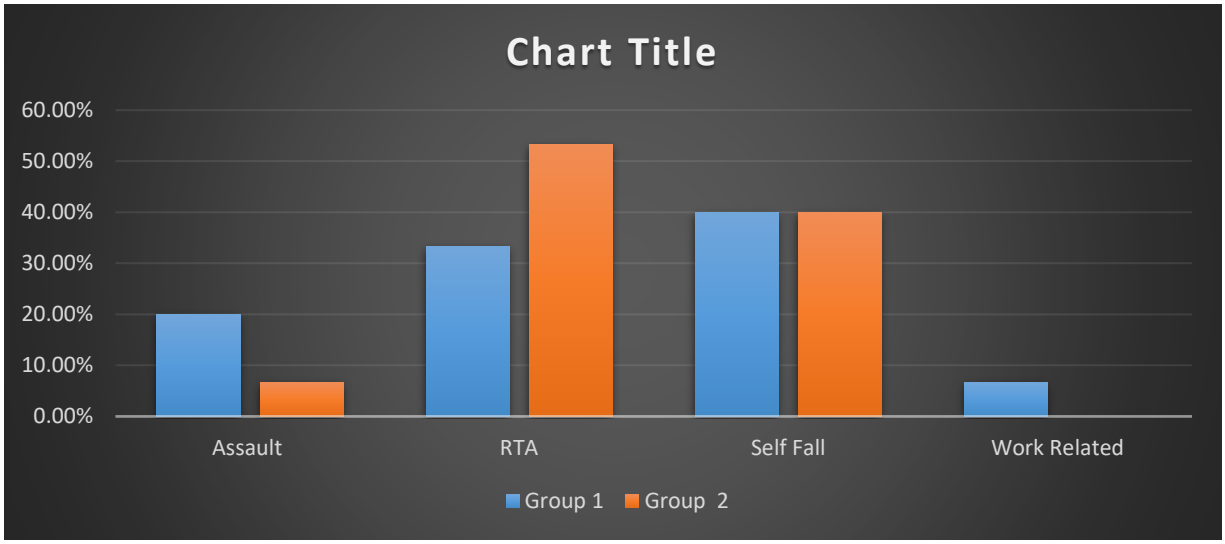
Miniplate	Gender		Total	X2 Value	P Value
	Male	Female			
2mm Locking	12	3	15	0.186	0.666
	80.0%	20.0%	100.0%		
2mm 3Dimensional	11	4	15		
	73.3%	26.7%	100.0%		
Total	23	7	30		
	76.7%	23.3%	100.0%		



Amongst 15 patients in Group 1, 12 (80%) were male and 3 (20%) were female. In Group 2 out of 15, 11 (73.3%) were male and 4 (26.7%) were female. There was no significant difference in the distribution of sex between Group 1 and Group 2. Overall, a male preponderance was noted for the mandibular fracture

Table 4: Etiology of Fracture in Group 1 & 2 patients

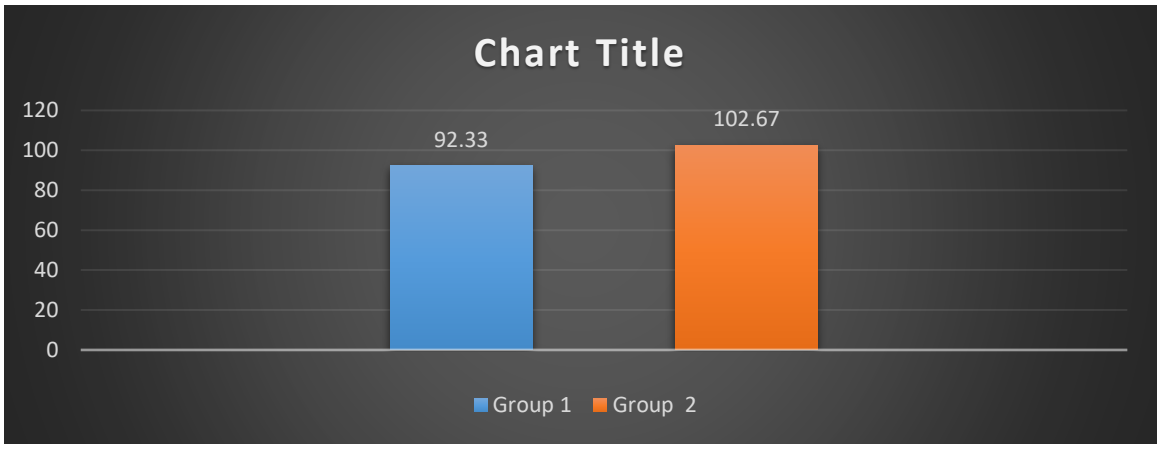
	Etiology				Total	X2 Value	p value
	Assault	RTA	Self-fall	Work related			
2mm Locking	3	5	6	1	15	2.692	0.442
	20.0%	33.3%	40.0%	6.7%	100.0%		
2mm 3 Dimensional	1	8	6	0	15		
	6.7%	53.3%	40.0%	.0%	100.0%		
Total	4	13	12	1	30		
	13.3%	43.3%	40.0%	3.3%	100.0%		



Etiological factors for fracture were mainly divided into four groups. Overall, RTA emerged as the most common etiological factor comprising 13 (43.3%) patients from both the groups, followed by self fall, which included 12 (40%) patients from both groups and then assault including 4 (13.3%) patients of the total. Only 1 (6.7%) patient in Group 1 had a work related fracture.

Table 5: Mean Duration of Surgery in Group 1 & 2 patients

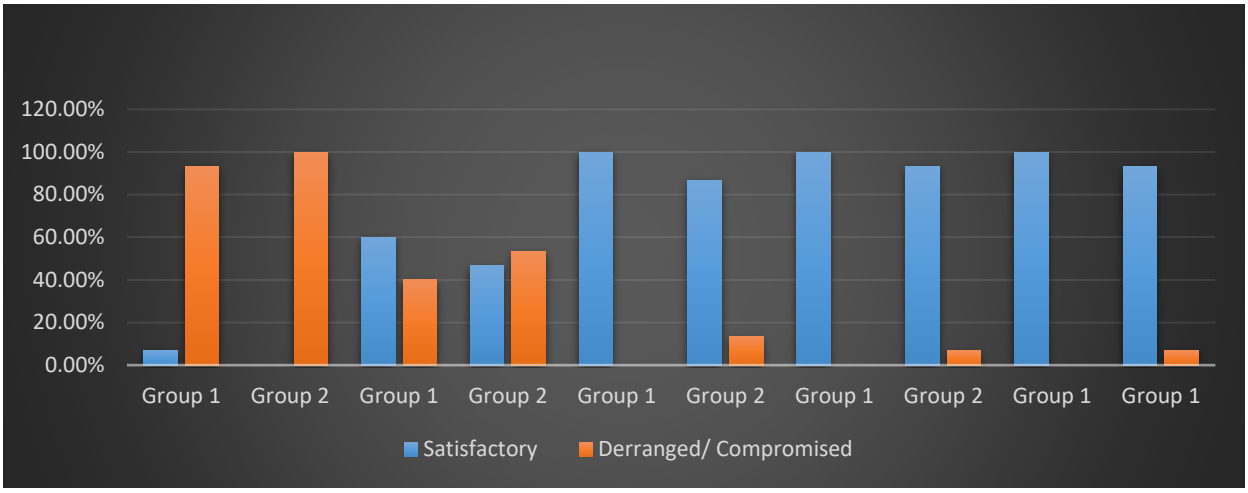
Miniplate		N	Mean	SD	Min	Max	t Value	P Value
2mm Locking		15	92.33	36.098	60	180	0.601	0.445
2mm 3 Dimensional		15	102.67	36.930	60	180		



The mean duration of surgery observed in Group 1 was 92.33 minutes whereas in Group 2 it was 102.67 minutes. Group 1 required 10.34 minutes less for surgery as compared to the time taken for surgery in Group 2. However, the difference in duration of surgery was not statistically significant.

Table 6: Occlusal Discrepancy during Follow-Up Visits in Group 1 & 2 patients

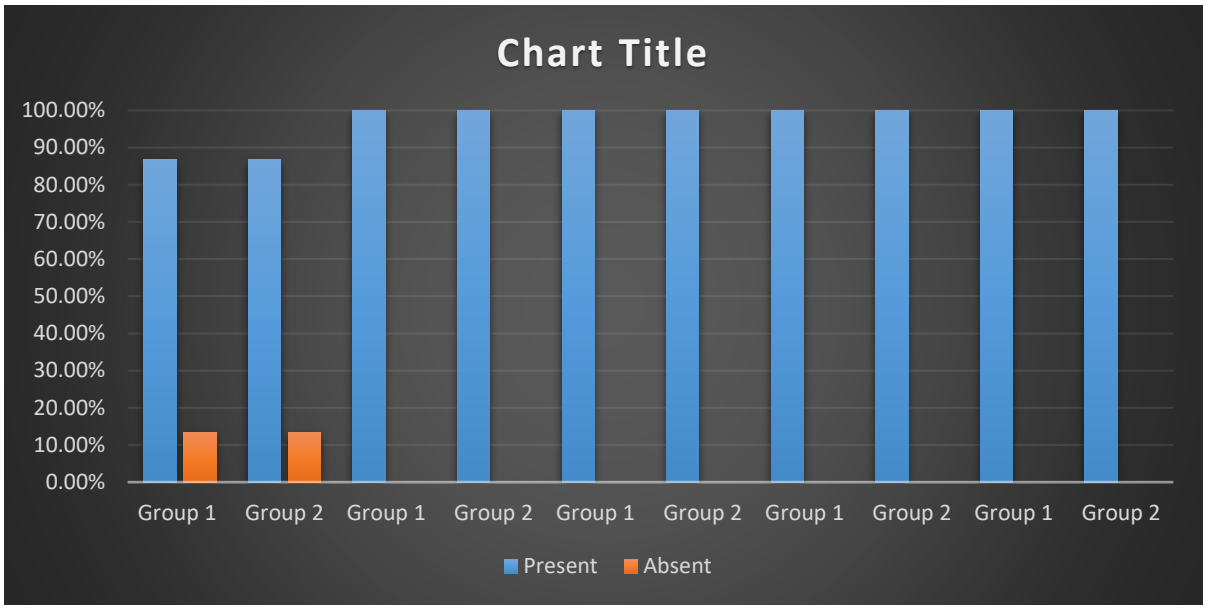
Visit	Miniplate	Occlusion		Total	χ^2 Value	p Value
		Satisfactory	Deranged / Compromised			
Pre Op	2mm Locking	1	14	15	1.034	1.000
		6.7%	93.3%	100.0%		
	2mm 3D	0	15	15		
		0.0%	100.0%	100.0%		
1 Week	2mm Locking	9	6	15	0.536	0.715
		60.0%	40.0%	100.0%		
	2mm 3D	7	8	15		
		46.7%	53.3%	100.0%		
2 Week	2mm Locking	15	0	15	2.143	0.483
		100.0%	0.0%	100.0%		
	2mm 3D	13	2	15		
		86.7%	13.3%	100.0%		
6 Week	2mm Locking	15	0	15	1.034	1.000
		100.0%	0.0%	100.0%		
	2mm 3D	14	1	15		
		93.3%	6.7%	100.0%		
12 Week	2mm Locking	15	0	15	1.034	1.000
		100.0%	0.0%	100.0%		
	2mm 3D	14	1	15		
		93.3%	6.7%	100.0%		



In the study Group 1, six patients (40%) had minor occlusion discrepancy in the immediate post-operative period but, with IMF, at the end of 2nd week all 15 patients attained satisfactory occlusion. In the study Group 2, eight patients (53.3%) had occlusal discrepancy in the immediate post-operative period. With IMF, satisfactory occlusion was attained in 13 patients (86.7%) at the end of 2nd week. However, one patient in Group 2 had persistent occlusion discrepancy till the end of follow-up period.

Table 7: Segmental Mobility during Follow -Up Visits in Group 1 & 2 patients

Visit	Miniplate	Segment Mobility		Total	χ 2 Value	p Value
		Present	Absent			
Preop	2mm Locking	13	2	15	0.000	1.000
		86.7%	13.3%	100.0%		
	2mm 3D	13	2	15		
		86.7%	13.3%	100.0%		
1 Week	2mm Locking		15	15	-	-
			100.0%	100.0%		
	2mm 3D		15	15		
			100.0%	100.0%		
2 Week	2mm Locking		15	15	-	-
			100.0%	100.0%		
	2mm 3D		15	15		
			100.0%	100.0%		
6 Week	2mm Locking		15	15	-	-
			100.0%	100.0%		
	2mm 3D		15	15		
			100.0%	100.0%		
12 Week	2mm Locking		15	15	-	-
			100.0%	100.0%		
	2mm3D		15	15		
			100.0%	100.0%		

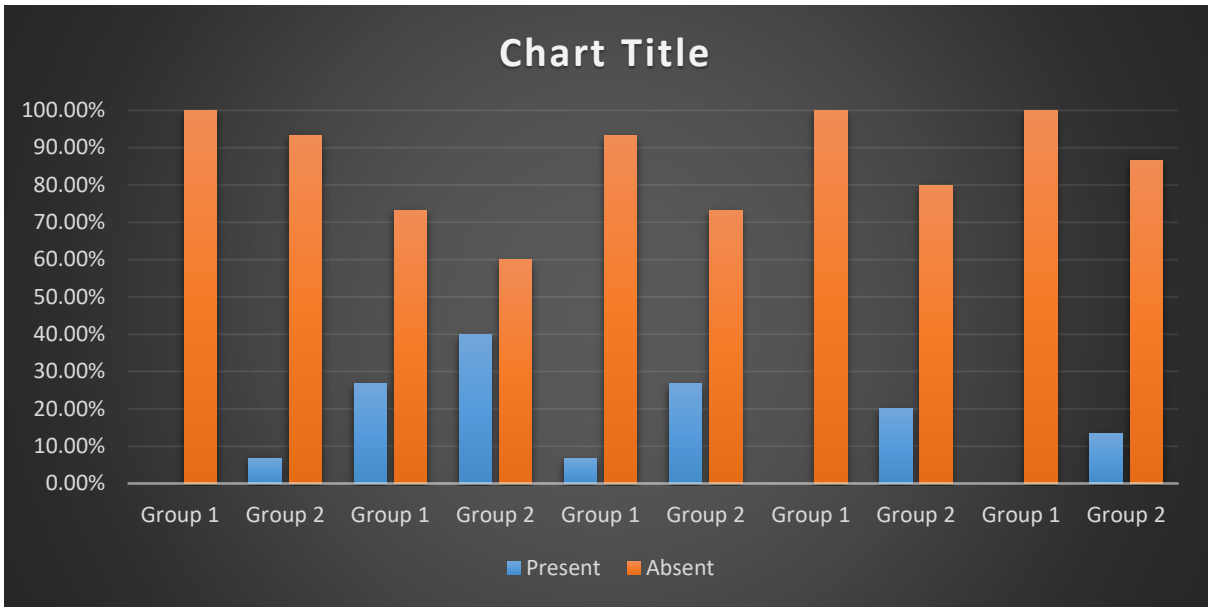


Graph 7: Segmental Mobility during Follow -Up Visits in Group 1 & 2 patients

Both the plating techniques provided adequate stability of fracture fragments and there was no segmental mobility elicited in any of the patients during follow-up visits in both the groups.

Table 8 : Neurosensory Deficit during Follow-Up Visit in Group 1 & 2 Patients

Visit	Miniplate	Neurosensory Deficit		Total	χ 2 Value	p Value
		Present	Absent			
Preop	2mm Locking	0	15	15	1.034	1.000
		0.0%	100.0%	100.0%		
	2mm 3D	1	14	15		
		6.7%	93.3%	100.0%		
1 Week	2mm Locking	4	11	15	0.600	0.700
		26.7%	73.3%	100.0%		
	2mm 3D	6	9	15		
		40.0%	60.0%	100.0%		
2 Week	2mm Locking	1	14	15	2.160	0.330
		67.7%	93.3%	100.0%		
	2mm 3D	4	11	15		
		26.7%	73.3%	100.0%		
6 Week	2mm Locking	0	15	15	3.333	0.224
		0.0%	100.0%	100.0%		
	2mm 3D	3	12	15		
		20.0%	80.0%	100.0%		
12 Week	2mm Locking	0	15	15	2.143	0.483
		0.0%	100.0%	100.0%		
	2mm3D	2	13	15		
		13.3%	86.7%	100.0%		

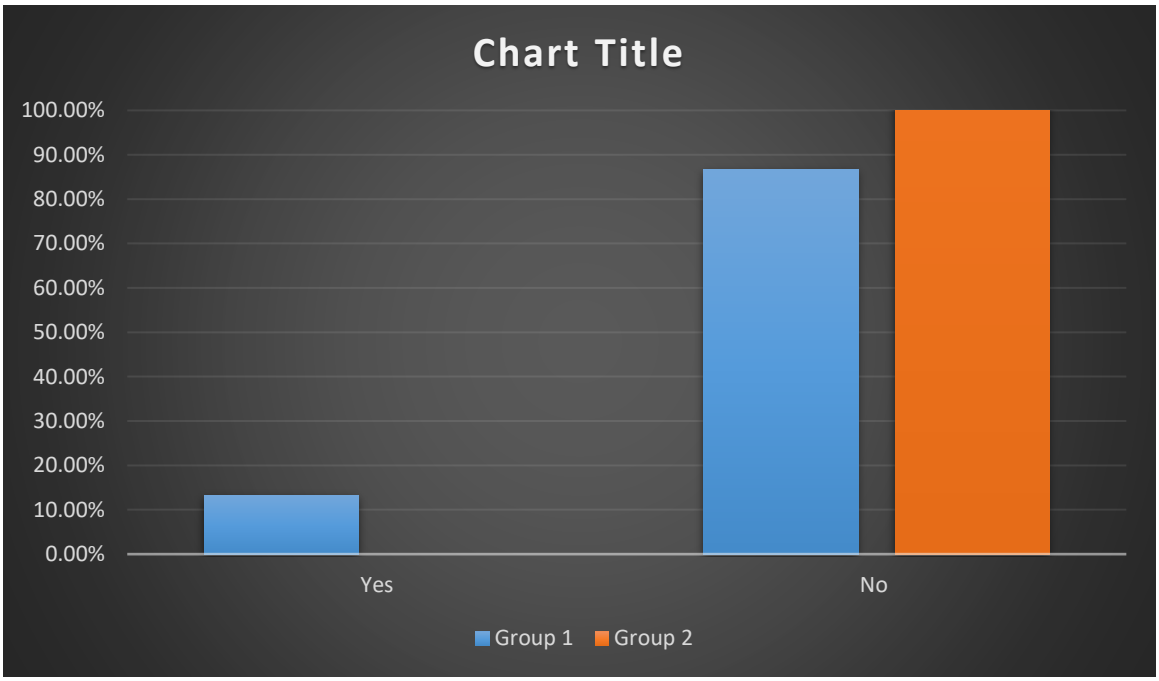


Graph 8 : Neurosensory Deficit during Follow-Up Visit in Group 1 & 2 Patients

Pre-operatively one patient in Group 2 had paresthesia. Post-operatively there was transient neurosensory deficit noted in four patients (26.7%) from Group 1 which recovered gradually and returned to normal at the end of 12 week. In Group 2, six patients (40%) had neurosensory deficit in immediate post-operative period which returned to normal in 4 patients but two patients (13.3%) had mild paresthesia till the end of 12 week

Table 9: Presence of Other Complications in Group 1 & 2 patients

Miniplate	Other complications		Total	χ 2 Value	p Value
	Yes	No			
2mm Locking	2	13	15	2.143	0.143
	13.3%	86.7%	100.0%		
2mm 3D	0	15	15		
	0.0%	100.0%	100.0%		
Total	2	28	30		
	6.7%	93.3%	100.0%		



Graph 9 : Presence of Other Complications in Group 1 & 2 patients

Out of all the patients, only 2 patients (13.3%) in Group 1 developed soft tissue infection/wound dehiscence which was managed conservatively and resolved gradually.