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Comparison of the efficiency of intermaxillary fixation (IMF) screws over Erich arch bar in achieving maxillo mandibular fixation in unilateral condylar fractures.

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Abstract

Background/Aim: Condylar fractures account for 29 to 52 % of all mandibular fractures. They are treated by either closed treatment by maxillomandibular fixation (MMF) or open reduction with internal fixation (ORIF). The commonly used methods for closed reduction are Ivy eyelets and Erich arch bar, but they their own disadvantages. The aim of this study was to compare the efficiency of Intermaxillary fixation (IMF) screws over Erich arch bars in achieving MMF in unilateral condylar fractures.

Method: Patients with unilateral condylar fractures were divided into two groups using a simple randomization method, 10 patients in each group. Patients in the first group were treated with MMF by IMF screws and patients in the second group were treated by Erich arch bar. The duration required for both techniques was evaluated. Patients were followed up clinically and radio logically1 week, 1month and 3 months postoperatively

and evaluated for oral hygiene status, Gingival status, Occlusal stability and Patient compliance.

Results: The oral hygiene status, Gingival status, Occlusal stability and Patient compliance was found to be better in patients with IMF screws with lesser operating time compared with Erich arch bar group.

Conclusion: In the treatment of unilateral condylar fractures with closed reduction by MMF, IMF screws was found to be a better option when compared with the Erich arch bar.

Practical implication: The efficiency of IMF screws was better than Erich arch bar in terms of operating time, ease of placement, oral hygiene, gingival status, occlusal stability and patient compliance.

Keywords: Maxillo mandibular fixation, Inter maxillary fixation screws, Erich arch bar.

Introduction

Mandibular fractures are one of the most common facial fractures (12-56%), Of all mandibular fractures, 29 to 52 % are condylar fractures. Treatment options for fractures of the mandibular condyle consist of either closed treatment by maxillomandibular fixation (MMF) or open reduction with internal fixation (ORIF).[1] Several studies have reported favourable clinical results with closed treatment of condylar fractures. Various methods to achieve MMF are Ivy eyelet wiring, arch bars, Risdon wiring, metal splints, acrylic splints, Gunning type splints for edentulous arches and intermaxillary fixation (IMF) screws. According to literature, the conventional methods such as arch bars and eyelet wiring are the most commonly used, but these methods have their own shortcomings. With the introduction of IMF screws, many of the drawbacks with the use of arch bars can be eliminated.[2] Hence, the aim of this study was to compare the efficiency of IMF screws over Erich arch bars in achieving MMF in unilateral condylar fractures.

Material and Methods

A prospective study was conducted for a period of 1 year. Patients reporting with unilateral condylar fractures reporting to the emergency or outpatient department of Faciomaxillary surgery, were considered for the study. The inclusion criteria were as follows: 1. Patients who present with unilateral condylar fractures with mild occlusal discrepancy, planned for closed reduction. 2.Patients aged between 18 and 45 years. 3. Willing individuals (both male and female) with an informed consent. The exclusion criteria were as follows: 1. Patients with bilateral condylar fractures and other associated maxillary and mandibular fractures. 2. Patients with primary or mixed dentition.3. Patients with pre-existing infection, post - operative infection, malunion, medical co-morbidities.

Presurgical evaluation including thorough clinical examination, case history, photographs and radiographic analysis of the patient was done. Patients with man dibular unilateral condylar fractures were be divided into two groups using simple randomization method.

After obtaining informed consent, Patients in the first group were treated by MMF with IMF screws and patients in the second group were treated by MMF with Erich arch bar. In the first group, under local anaesthesia, IMF screws were placed on both the arches, three screws on each arch, one screw being placed between two central incisors, two screws being placed between second premolar and first molar on either side. Then MMF was done using 26-gauge stainless steel wire. In the second group, under local anaesthesia, MMF was done by using Erich's arch bar and 26-gauge stainless steel wire. The duration required for both techniques was evaluated in minutes. Post-operative radiographs- orthopantomo graphs was taken for all the patients.

Patients were followed up clinically and radio logically after 1 week, 1month and 3 months post- operatively. Patients were evaluated intrao peratively for operating time, post-operatively for oral hygiene status, gingival status, occlusal stability and patient compliance.

1. The oral hygiene status in both groups was evaluated using the simplified Oral hygiene index (OHI-S) by Greene and Vermillion.[3]

OHI -S Interpretation

Good 0 to 1.2

Fair 1.3 to 3.0

Poor 3.1 to 6.0

2. The gingival status in both the groups was evaluated using Gingival index by Silness and Loe.[4]

0 = normal gingiva

1 = mild inflammation: slight change in colour, slight edema, no bleeding on probing

2 = moderate inflammation: redness, edema, and glazing, or bleeding on probing;

3 = severe inflammation: marked redness and edema, tendency toward spontaneous.

Bleeding and ulceration

3. Postoperative occlusal stability was analysed by scale given by Meghana et al.[5]

Occlusal stability evaluation

After IMF release

Stable-No intervention required (0)

Mild Discrepancy-Elastics required (1)

Moderate discrepancy - IMF and occlusal adjustments required (2)

Severe Discrepancy-Required re-operation (3)

3. The patient's compliance was evaluated using three-point Likert scale.

0- Agree

1- Neutral

2- Disagree

Results

All subjects were aged between 18 and 45 years, with the mean age being 31 years in IMF screw group and 27 years in Erich arch bar group. Out of 10 patients in each group, 8 were males and 2 female patients in MMF group and 9 male patients and 1 was male in Erich arch bar group. The mean operating time was 19.5 minutes in IMF screw group and67.7 minutes in Erich arch bar group.

In the MMF group, the oral hygiene status during the first postoperative visit, was good in 6 patients, fair in 3 patients and poor in 1 patient. During the 1st month postoperative follow up, the oral hygiene status was good in 7 patients, fair in 2 patients and poor in 1 patient and at the time of 3rd month postoperative follow up, the oral hygiene status was good in 8 patients, fair in 1patient and poor in 1 patient. In the arch bar group, the oral hygiene status during the first post operative visit, was good in 4 patients, fair in 5 patients and poor in 1 patient. During the 1st month postoperative follow up, the oral hygiene status was good in 2 patients, fair in 2 patients and poor in 6 patients and at the time of 3rd month postoperative follow up, the oral hygiene status was good in 1 patient, fair in 2 patients and poor in 7 patients.

The gingival status in MMF group during the first post operative follow up, was normal in 2 patients, mildly inflamed in 7 patients, moderately inflamed in 1 patient and none had severe inflammation.

During the 1st month postoperative follow up, it was normal in 5 patients, mildly inflamed in 4 patients, moderately inflamed in 1 patient and none had severe inflammation.at the time of 3rd month postoperative follow up, it was normal in 6 patients, mildly inflamed in 3 patients , moderately inflamed in 1 patient and none had severe inflammation, In the arch bar group, during

the first postoperative follow up, gingival status was mildly inflamed in 1 patients, moderately inflamed in 5 patients and severely inflamed in 4 patients.

During the 1st month post operative follow up, it was mildly inflamed in 1 patient, moderately inflamed in 7 patient and severely inflamed in 2 patients. At the time of 3rd month postoperative follow up, it was mildly inflamed in 2 patients, moderately inflamed in 7 patient and severely inflamed in 1 patient.

In the MMF group, the occlusal stability during the first postoperative visit was stable in 7 patients, mild discrepancy in 1 patient, moderate discrepancy in 1 patient and severe discrepancy in 1 patient.

During the 1st month post operative follow up, 6 patients had stable occlusion, 2 patients had mild discrepancy, 1 patient had moderate discrepancy and 1 patient had severe discrepancy. And during the 3rd month postoperative follow up, it was stable in 7 patients, mild discrepancy in 1 patient, moderate discrepancy in 1 patient and severe discrepancy in 1 patient.

In the arch bar group, the occlusal stability during the first postoperative visit was stable in 1 patient, mild discrepancy in 4 patients, moderate in 4 patients and severe discrepancy in 1 patient.

During the 1st month post operative follow up, 1 patient had stable occlusion, 3 patients had mild discrepancy, 4 patients had moderate discrepancy and 2 patients had severe discrepancy. During the 3rd month postoperative follow up, it was stable in 4 patients, mild discrepancy in 3 patients, moderate discrepancy in 2 patients and severe discre pancy in 1 patient.

When evaluating patient compliance, patients in MMF screws group were more compliant compared to patients in Erich arch bar group.

Discussion

Maxillomandibular fixation (MMF) forms a basic and fundamental principle in the management and treatment of the maxillofacial trauma patient.[6] The MMF promotes the necessary occlusal stability to guide the reduction and fixation of the maxillofacial fractures affecting the occlusion in order to recover the patients' maxillo-mandibular function.[7] Since World War I, the arch bar has been the mainstay for the management of maxillo-mandibular bony injuries.[6]Although this method offers great occlusal stability and adequate fixation, it has some disadvantages, such as difficulty maintaining good oral hygiene, periodontal is chaemic necrosis, loss of tooth vitality, dental extrusion, and high risk of needle stick injuries to the surgeon. Furthermore, Erich arch bars placement and post operative maintenance can result in substantial discomfort for the patients, which can affect their quality of life. An adverse sequalae of usage of arch bars or wire loops for splinting causes marginal conditions to be compromised causing gingivitis and increased tooth mobility.[8] IMF screws were introduced in 1989 as an alternative.[7]According to Van Den Bergh et al, advantages of this method were reported: ease of placement in a short time, lower financial cost, reduced risk of injury to the operator, as well as reduced trauma to the gingival margins and easier oral hygiene maintenance for the patient, when compared with the Erich arch bar.[8]According to some studies, the IMF screws provide advantages, including short time of application and removal and low risk of puncture accidents, being recommended for intraoperative IMF and postoperative elastic traction. The Erich arch bars demanded a longer operational time to be applied and removed when compared with the IMF screws. This time difference may be justified by the higher complexity of installing the Erich arch bars. Each arch

bar (superior and inferior) is fastened to the dental arches tooth by tooth, individually, using steel wires that wrap both the tooth and the arch bar.[7]

In the current study, time required for MMF with IMF screws was lesser than the time required for MMF with Erich arch bar. According to Rai et al, Oral hygiene maintenance is better in patients with IMF screws than with Erich arch bars.[9]According to the results of the current study, the patients in IMF screw group had better oral hygiene status, gingival status, and occlusal stability compared to the Erich bar group. The IMF screws represent an easier and faster method to achieve the IMF because they are fewer in quantity and are placed, most of the time, with the aid of a drill to perforate the mucosa and the cortical bone to facilitate the screws' insertion, requiring shorter time.[7] According to Van Den Bergh et al, Using IMFS as a method for conservative treatment of condylar fractures led to a higher quality of life during the 6-weekperiod of fracture healing. In comparison to patients treated with arch bars, patients treated with IMFS experienced less social isolation and difficulty with eating.[8] Similarly, in the current study, patient compliance was better in IMF screw group than compared to the patients in Erich arch bar group.

Conclusion

In the treatment of unilateral condylar fractures, with closed reduction by MMF, IMF screws was found to be a better option when compared with Erich arch bar. Operating time was lesser with IMF screws when compared to Erich arch bar. We also observed better oral hygiene, better gingival status, good occlusal stability and better patient compliance with IMF screws when compared with Erich arch bar. Hence, according to the current study, the efficiency of IMF screws was better compared to the Erich arch bar in achieving maxillo mandibular fixation in unilateral condylar fractures.

Table 1: Age of the patients

	MMF group		Arch Bar group	
Age group	N (%)	Mean age (±SD)	N (%)	Mean age (±SD)
18 – 27	3 (30)	31 (8.48)	5 (50)	27 (7.52)
28 – 36	4 (40)		3 (30)	
37 – 45	3 (30)		2 (20)	
Total	10 (100)		10 (100)	

Table 2: Sex of the patients

Sex	MMF group N (%)	Arch Bar group N (%)
Male	8 (80)	9 (90)
Female	2 (20)	1 (10)
Total	10 (100)	10 (100)

Table 3: Operating time

Mean Operating time	Time (in mins) Mean (SD)
MMF group	19.5 (6.54)
Arch bar group	67.7 (11.2)

Table 4: Oral Hygiene Status

Oral Hygiene status – 1 week						
	Good	Fair	Poor	Total	Chi square	p-value
MMF group	6	3	1	10	0.9	0.63
Arch-bar group	4	5	1	10		
Oral Hygiene status – 1 month						
MMF group	7	2	1	10	6.34	0.04*

Arch-bar group	2	2	6	10		
Oral Hygiene status – 3 months						
MMF group	8	1	1	10	10.2	0.005*
Arch-bar group	1	2	7	10		

Table 5: Gingival status

	Gingival status – 1 week						
	Normal	Mild	Moderate	Sever	Total	Chi square	p-value
MMF group	2	7	1	0	10	9.35	0.025*
Arch-bar group	0	1	5	4	10		
	Gingival status – 1 month						
MMF group	5	4	1	0	10	7.83	0.049*
Arch-bar group	0	1	7	2	10		
	Gingival status – 3 months						
MMF group	6	3	1	0	10	8.27	0.040*
Arch-bar group	0	2	7	1	10		

Table 6: Occlusal stability

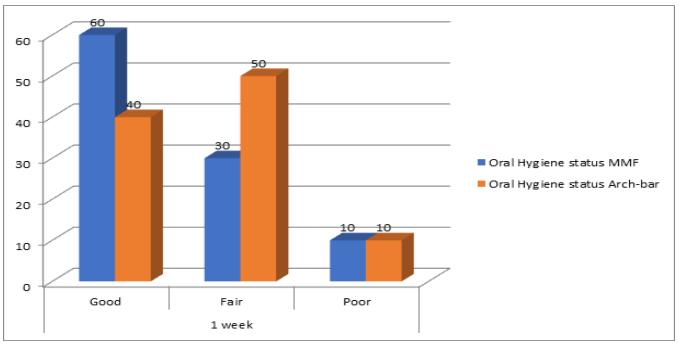
	Occlusal stability – 1 week						
	stable	Mild discrepancy	Moderate discrepancy	Sever discrepancy	Total	Chi square	p-value
MMF group	7	1	1	1	10	8.1	0.04*
Arch-bar group	1	4	4	1	10		
	Occlusal stability – 1 month						
MMF group	7	2	1	0	10	7.5	0.05*
Arch-bar group	1	3	4	2	10		
	Occlusal stability – 3 months						
MMF group	8	1	1	0	10	2.15	0.54
Arch-bar group	4	3	2	1	10		

Table 7: Patient compliance

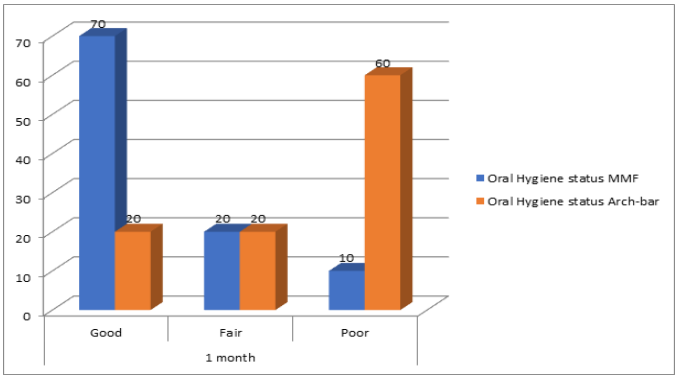
Patient compliance – 1 week						
	Agree	Neutral	Disagree	Total	Chi square	p-value
MMF group	7	2	1	10	5.072	0.07
Arch-bar group	3	3	4	10		
Patient compliance – 1 month						
MMF group	8	1	1	10	10.01	0.006*
Arch-bar group	1	6	3	10		

Patient compliance – 3 months						
MMF group	8	1	1	10	10.27	0.005*
Arch-bar group	1	2	7	10		

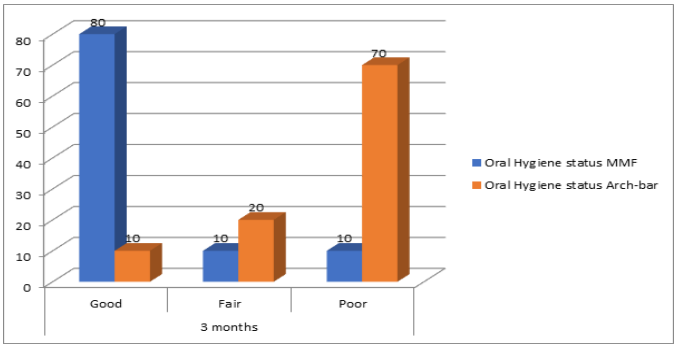
Graph 1: Oral hygiene status at 1 week postop follow up



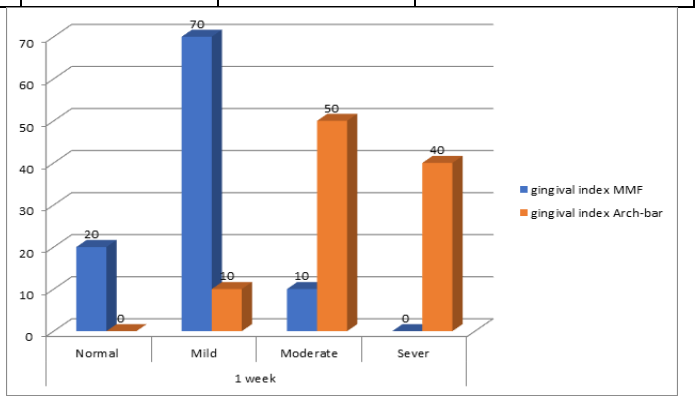
Graph 2: Oral hygiene status at 1st month postop follow up



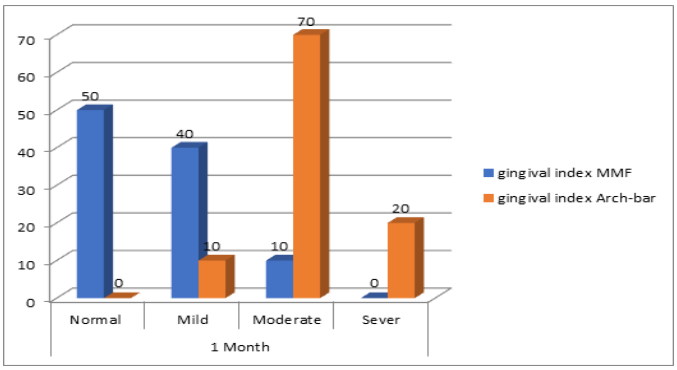
Graph 3: Oral hygiene status at 3rd month postop follow up



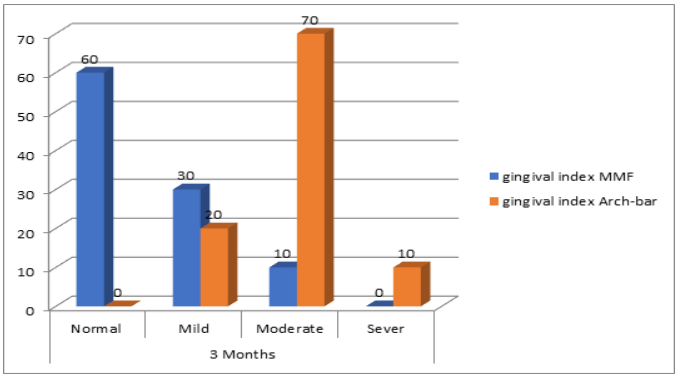
Graph 4: Gingival status at 1 week postop follow up



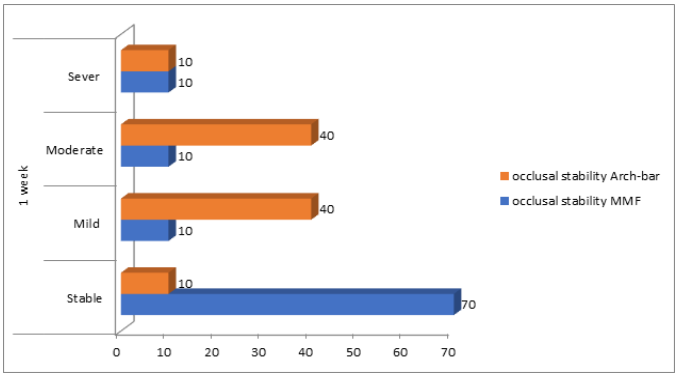
Graph 5: Gingival status at 1st month postop follow up



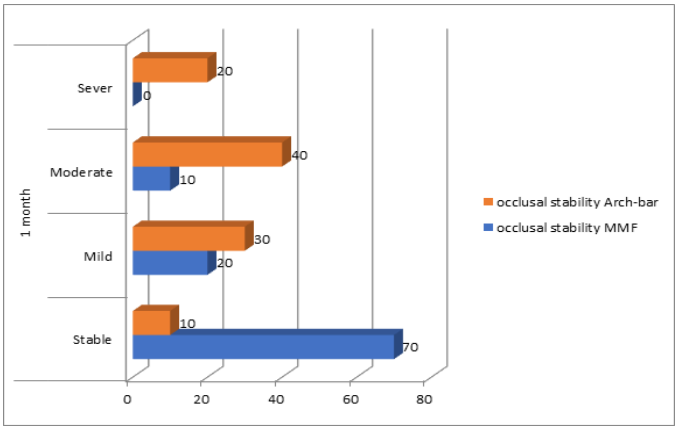
Graph 6: Gingival status at 3rd month postop follow up



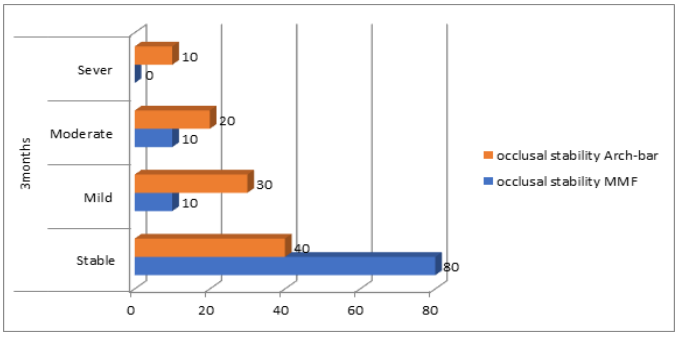
Graph 7: Occlusal stability at 1 week postop follow up



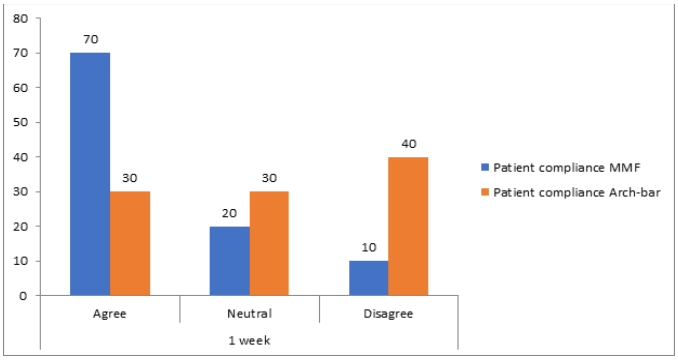
Graph 8: Occlusal stability at 1st month postop follow up



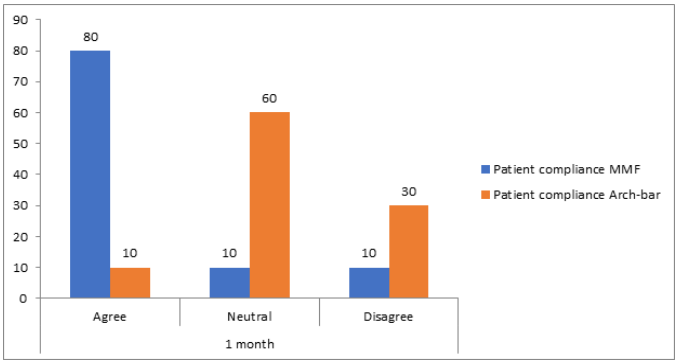
Graph 9: Occlusal stability at 3rd month postop follow up



Graph 10: Patient compliance at 1 week postop follow up



Graph 11: Patient compliance at 1st month postop follow up



Graph 12: Patient compliance at 3rd month postop follow up

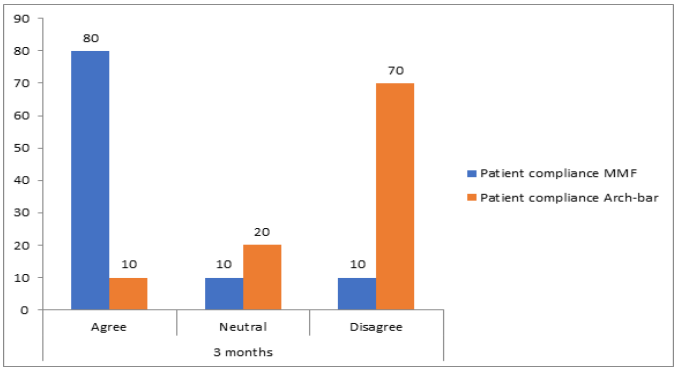


Figure 1: CT scan showing unilateral right condylar fracture

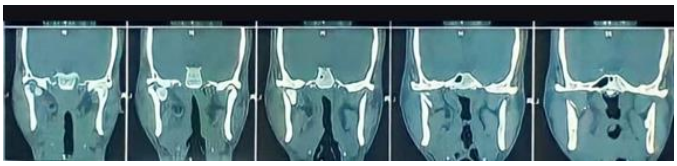


Figure 2: Intraoral photo graphs showing IMF screws and MMF.

Figure 3: Postoperative OPG showing IMF screws

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