

Eyelet Wiring V/S IMF Screws: A Comparative Evaluation Study.

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DOI: 10.47750/pnr.2022.13.S02.45

Abstract

Objectives- To evaluate in minutes the time taken in minutes required from the beginning of the IMF procedure to the end of both the eyelet wiring as well as IMFSSs; To record the intraoperative stability of both the groups in terms of device stability and IMF stability after maxillo-mandibular fixation; To evaluate intraoperative complications; Intra operative occlusion also checked; Radiographs taken post operatively to check for root perforations in case of IMFSSs group.

Methodology: 30 patients of either genders with the age groups between 18-60 years reporting to the Oral & Maxillofacial Surgery department at a tertiary health care center, Igatpuri, Nashik for treatment of facial bone fractures were randomly selected for this study. A standard Performa was used to collect the necessary information regarding each case after inclusion. Thirty patients divided into two random groups are as follows: Group a – Eyelet wiring group and Group B – IMFSSs group.

Results: The patient acceptance was better for Group B patients than compared to group A. 2/15m cases of IMFSSs had root perforations radiographically, however the teeth remained vital post operatively. Intra operative occlusion in all cases in group A as well as Group B, Post operative occlusion was present in all but 1 case each of group A and group B.

Conclusion: minimum risk of perforating glove was evident in the IMF screw whereas multiple glove perforation was noticed in the eyelet wiring group. IMF screw modality of treating mandibular fractures requires a shorter period of time as compared to eyelet wiring. Both groups had 100% intraoperative occlusion, almost equivalent clinical stability and bone healing post-operatively.

Keyword: eyelet wiring, Intermaxillary fixation, mandibular fracture, Intermaxillary screws

INTRODUCTION-

Mandibular fractures are one of the most frequent traumatic injuries treated by oral and maxillofacial surgeons. Among facial bone fractures, the mandibular fracture has a highest incidence next to nasal bone fracture. The important factors in the management of any fracture is reduction and stabilization of the fracture segment which should be accomplished by the simplest means possible, to achieve optimal results. The application of intermaxillary fixation (IMF) to the maxillofacial skeleton has a key role in the management of trauma in this region.

Restoring the occlusion and reducing and stabilizing the fracture segments are fundamental goals of inter-maxillary fixation technique.

Eyelets are time-proven method of applying IMF with well-recognized advantages. However the disadvantages with use of these sharp steel bands, though inexpensive has several disadvantages like time-consuming to place, periodontal injury, painful for the patient while placing and removing, inherent difficulty in maintaining good oral hygiene, and presents a significant health risk to the practitioner with regard to needle stick injury. Each passage of stainless steel wire increases the possibility of an inadvertent skin puncture and thus contamination by infected saliva or blood.

Recently self tapping IMF screws have been advocated for Intermaxillary fixation. The self-tapping intermaxillary screws were first introduced by Arthur¹² in 1989. He suggested the use of threaded titanium screws of 2 mm diameter and 10–16 mm length.

Aim of the study: To compare the efficacy and advantages of Eyelet wiring and IMF screws for intermaxillary fixation.

Objectives:

1. To evaluate the time taken in minutes required from the beginning of the IMF procedure to the end of both the eyelet wiring as well as IMFSs.
2. To record the intraoperative stability of both the groups in terms of device stability and IMF stability after maxilomandibular fixation.
3. To evaluate intraoperative complications like
 - A. Glove perforations to operator as well as assistants during the procedure.
 - B. Needle stick injuries associated with both the techniques will be assessed, any perforations due to wires will be considered as needle stick injuries.
 - C. Mucosal Tears or damage to the oral cavity of patient during passing of wires or during the process of IMF.
4. Intra operative occlusion will also be checked.
5. Radiographs will be taken post operatively to check for root perforations in case of IMFSs group.

METHODOLOGY:

Source of data:

30 patients of either genders with the age groups between 18-60 years reporting to the Oral & Maxillofacial Surgery department, at a tertiary health care center, Igatpuri, Nashik for treatment of facial bone fractures were randomly selected for this study.

Study Design:

A standard Performa was used to collect the necessary information regarding each case after inclusion. The patients were informed about the study and the consent was taken thereafter. All necessary pre-operative, intraoperative and post-operative records were maintained.

Thirty patients divided into two random groups as follows: Group A – Eyelet wiring group, Group B – IMFSs group

Clinical Parameters:

Various pre-operative, intra-operative and post-operative parameters were used for this study. They are as follows:

A. Preoperative Assessment:

- a. Clinical patient assessment for diagnosis of fracture.
- b. Patient radiographs for assessment of fracture.

B. Intraoperative Assessment:

- a. Time was recorded for each IMF device from the beginning till end of the IMF procedure.
- b. Number of times needle/wire prick occurred to the operator as well as the assistants
- c. Iatrogenic damage to the patients.
- d. Intraoperative occlusion

C. Post-operative Assessment:

- a. Root perforations in group B (Radiographically)
- b. Damage to adjacent structures
- c. Tooth vitality
- d. Patient acceptance

INCLUSION AND EXCLUSION CRITERIA:

A. INCLUSION CRITERIA:

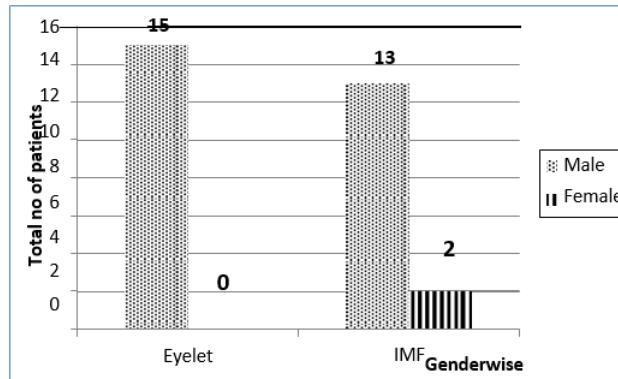
1. Age group between 18-60 years of age.
2. Favorable and unfavorable fractures of mandible & midface.

B. EXCLUSION CRITERIA:

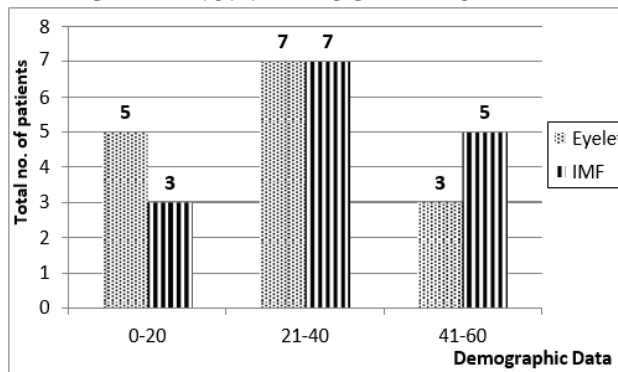
1. Pathologic Fractures.
2. Edentulous Patients
3. Severely periodontally compromised patients.
4. Comminuted fractures
5. Pediatric patients with mixed dentitions

RESULTS

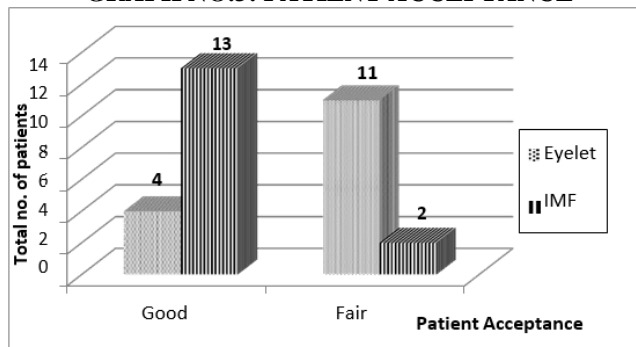
GRAPH NO.1: GENDER WISE DISTRIBUTION



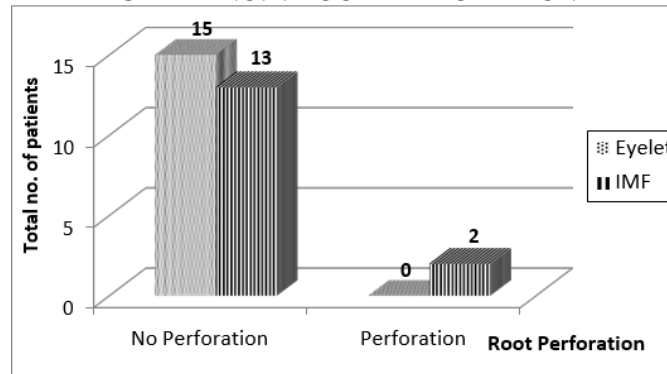
GRAPH NO.2: DEMOGRAPHIC DATA



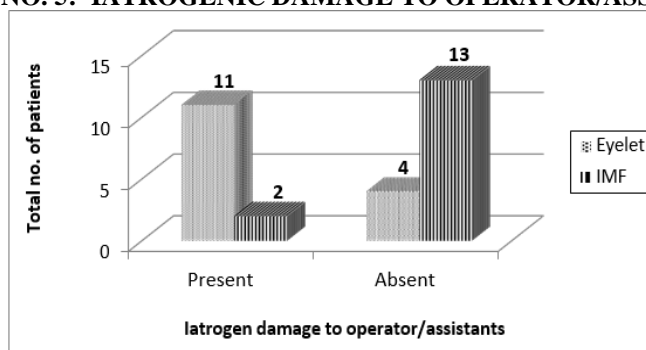
GRAPH NO.3: PATIENT ACCEPTANCE



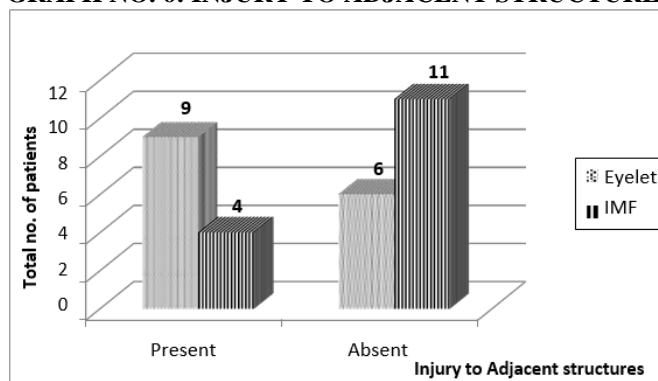
GRAPH NO.4: ROOT PERFORATION



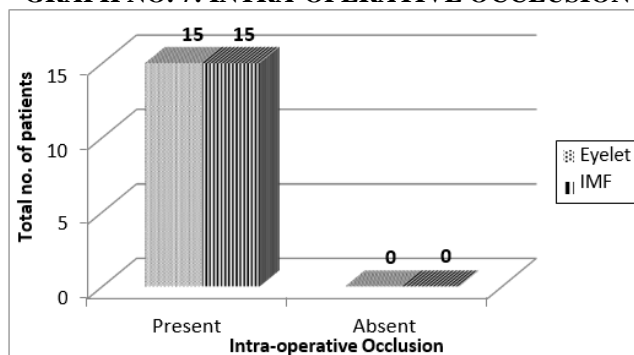
GRAPH NO. 5: IATROGENIC DAMAGE TO OPERATOR/ASSISTANTS



GRAPH NO. 6: INJURY TO ADJACENT STRUCTURES



GRAPH NO. 7: INTRA-OPERATIVE OCCLUSION



GRAPH NO. 8: POST-OPERATIVE OCCLUSION

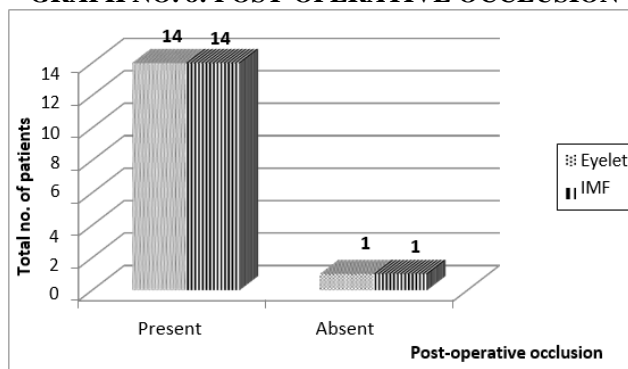


TABLE.NO. 1: PATIENT ACCEPTANCE

	Group	N	Mean Rank	t value	p value
Patient Acceptance	Eyelet	15	20.00	45.000	0.001
	IMF	15	11.00		

TABLE NO. 2: ROOT PERFORATION

ROOT PERFORATION		IMF		TOTAL
		NO PERFORATION	PERFORATION	
EYELET	NO PERFORATION	13	2	15
TOTAL		13	2	15

TABLE NO. 3: INJURY TO ADJACENT STRUCTURES

Injury to Adjacent structures		IMF		Total	Chi-square value	p value
		Present	Absent			
Eyelet	Present	1	8	9	2.784	0.143
	Absent	3	3	6		
Total		4	11	15		

TABLE NO. 4: IATROGENIC DAMAGE TO OPERATOR/ASSISTANTS

Iatrogenic damage to operator/assistants		IMF		Total	Chi-square value	p value
		Present	Absent			
Eyelet	Present	1	10	11	0.642	0.476
	Absent	1	3	4		
Total		2	13	15		

TABLE NO. 5: INTRA-OPERATIVE OCCLUSION

Intra-operative occlusion		IMF		Total
		Present		
Eyelet		Present		15
				15

TABLE NO. 6: POST OPERATIVE OCCLUSION

Post-operative occlusion		IMF		Total	Chi-square value	p value
		Present	Absent			
Eyelet	Present	13	1	14	0.077	0.933
	Absent	1	0	1		
Total		14	1	15		

- A. Study Population:** The study population consisted of patients in the age group 18-60 years of age , with a majority of population in the age groups of 21 to 40 years i.e. 7/15 patients in each group.5/15 patients in group A & 3/15 patients in group B were between 0-20 years of age. The remaining patients were in the 41 to 60 age group (Graph No. 2)
- B. Genderwise Distribution:** All patients in Group A were males while 13/15 patients in group B were males. (Graph No. 1)
- C. Patient Acceptance :** The patient acceptance was better for Group B i.e. 13/15 patients than compared to group A with 4/15 patients scoring the devices.(Graph No. 3 & Tableno. 1)
- D. Root perforation:** 2/15 cases of IMFSS had root perforations radiographically, however the teeth remained vital post operatively. (Graph No. 4 & Table no. 2)
- E. Iatrogenic Damage to operator/assistants:** The operator/assistants suffered iatrogenic injuries in 11/15 cases in group A while there was iatrogenic injury in 2/15 cases in Group B (Table no. 4 & Graph No. 5)
- F. Injury to adjacent structures:** 9/15 cases in group A and 4/15 patients in group B had presence of injuries to adjacent structures.(Graph no.6 & Table no. 3)
- G. Intraoperative Occlusion:** We achieved intra operative occlusion in all cases in group A as well as Group B.(Graph No.7 & Table No. 5)

Post Operative Occlusion: Post operative occlusion was present in all but 1 case each of group A and group B i.e. 28/30 cases had post operative occlusion. (Graph No. 8 & Table no. 6)

DISCUSSION:

- A. Incidence and Site:** Ingole et al conducted in 2014 showed a male predilection of 88% males and female patients

of 12% , the mean age of 20 – 40 years, RTA were the major etiologic factor contributing about 60% of cases, with symphysis and parasymphysis region with 52% being site of fractures. ⁴⁷A study conducted by Nandini et al involved 90 patients, 84 males & 6 females showing a major male predilection with patient age above 18 years of age, RTA was a major cause of the accidents. ³⁹ Hashemi et al conducted a study which gave a male predilection of 60% as compared to females of 40%³⁸. In our study we found the greatest incidence of mandible fracture was seen in the parasymphysis & symphysis region of the mandible (77%) followed by the angle, condyle and body. We in our study found a male predilection of 93% with the mean age between 20 to 41 years of age consisting of around 54% of patients. Road traffic accidents were a major cause of mandibular fractures followed by fall from heights.

- B. Injury to adjacent structures:** Carlton et al evaluated in a study that the rates of percutaneous injuries during maxillofacial procedures was around 1% in all and was caused by wires alone⁴⁸. Ayoub et al found percutaneous injury of 27% using wires for IMF⁴⁹. Bali et al state that the risk factors for such injuries were identified as posterior segments of jaws were more commonly affected, left side more commonly than right, maxilla more common than mandible. The reasons for these problems maybe the access difficulties for right handed operators, visibility limiting approach to posterior segments & Injuries may also be due to unpredictable reflexes, which makes it difficult to synchronize pathways for insertion of wires & hand movements procedures under Local anaesthesia³⁴. In our study we found 9/15 cases in group A and 4/15 patients in group B had presence of injuries to adjacent structures.
- C. Needle stick injury & Glove perforation:** Bali et al state that needle stick injuries are a serious complication & that all healthcare workers are at a risk of needle stick injuries with a maximum of 35% taking place in the operating room, while suturing caused 24% of total injuries³⁴ 1% of all omfs injuries occur due to wire prick as stated by Ayoub et al⁴⁹. In our study we found an overall glove perforation rate of around 40% i.e. 6/15 cases of eyelet wiring group & 6% i.e. 1/15 cases in IMFSs. This can be avoided by double gloving during the procedure, performance of procedure during the day, GA used to minimize jerky patient movements, injuries were comparatively more in inexperienced dentists.
- D. Removal of Devices:** Nandini et al found that the IMFSs become embedded in the soft tissues over a period of time and their removal necessitates use of stab incisions under local anaesthesia.³⁹ Gordon et al reported a high incidence of mucosal coverage of screws in their 6 week study and showed all screws were covered with mucosa ⁵⁰. Rai et al showed partial mucosal covering in more than half the number of screws⁴¹ while Hashemi et al showed as low as 21 out of 373 screws partially covered with mucosa³⁸ in our study we found that around 40% of screws were covered by mucosa correlating with most studies found in literature. The average removal time in our study was of around 7 minutes for IMFSs and 20 minutes for eyelet wire removal , thus matching with the average removal time of approximately 8 to 10 minutes for IMFSs and for eyelet was 10-12 minutes
- E. MEAN Time:** Rai et al conducted a study in Wardha between 2006 to 2008 found that the average time required for placement of IMF Screws was around 12 minutes.⁴¹ Gordon et al stated that the average working time was around 25 minutes ⁴⁹ In Another study by Ingole et al where comparative evaluation was done between Imf screws and eyelet wiring gave a mean time of placement of IMFSs as 17 minutes and eyelets as 35 minutes.⁴⁷ We found that the average time required for the placement of IMF was 8.5 mins for IMFSs , which was in correlation with studies that showed an average time of 10 to 15 mins required for insertion of IMFSs. Eyelet wiring in our study required a mean time of 16 minutes, we also found it easier to pass the wire in the heads of the IMFSs than through the loops of the eyelet wire.
- F. Root perforation:** Coburn et al conducted a study on 5 patients between the years 1999-2000 to study the complications of IMFSs in management of mandibular fractures, they found that the root perforations had taken place in 3 out of 5 cases and in one of those cases the root perforation was also associated with infections. The screws were removed and eventually the symptoms subsided.²¹ Coleti et al did a study on 24 patients of which 2 patients had complications of root perforation and thus required extraction of the affected teeth.²⁹ In our study we found root perforation in 2/15 cases (Pt. No. 22 & 26) however the affected teeth were vital as confirmed by hot gutta percha testing. Root perforation can be attributed to improper angulation while placing IMFSs, the screws are inserted bicortically at the level of attached and unattached gingivae with a cruciform blade screwdriver. Some pressure is required to engage the outer cortical plate but once it is within the cancellous bone the passage should feel easier to drill. Slight resistance is felt on entering the inner cortical plate. If roots are encountered the operator will feel the screw tip binds against them, in such a case the screw should be removed and re positioned. The ideal place of screw placement is between the canine and premolar with at least one screw per quadrant however more than one screw can be placed in each quadrant as per the operators comfort as stated by Gibbons et al.²²
- G. Occlusal discrepancies:** Ingole et al in 2014 showed that there were minor occlusal discrepancies of 2 patients in the IMFSs group 8% and 1 patient in the Eyelet group i.e. 4%.⁴⁷ Other published data correlated to our findings with a 2% & 3.4% incidence of malocclusion in each group of Eyelet & IMFSs respectively²⁵. However, we found in our study minor occlusal discrepancies in 1 patient (6%) in group Eyelet and 1 patient in group IMFSs. However the IMF devices were less stable in the eyelet group as compared to the IMFSs group

CONCLUSION:

Among the 30 patients a majority of them were males and belonged to the age group 21-40 years. On assessing these patients it was demonstrated that a huge number of patients had deranged occlusion in comparison to intact occlusion.

The collected data was then formulated and subjected to statistical analysis using Mann-Whitney test, Chi square test value >0.05 was considered to be not significant whereas <0.001 was considered as highly significant. Based on the data collected and statistical analysis, the following was summarized:

1. On comparing the risk of glove perforation among the patients treated with IMFSs and Eyelet wiring, it was demonstrable that minimum risk of perforating glove was evident in the IMF screw whereas multiple glove perforation was noticed in the eyelet wiring group.
2. IMF screw modality of treating mandibular fractures requires a shorter period of time as compared to eyelet wiring.
3. The study was suggestive of higher incidence of hardware failure in patients treated with IMFSs, which was unlikely to be seen in patients who underwent treatment with eyelet wiring.
4. Both groups had 100% intraoperative occlusion.
5. Both the groups showed almost equivalent clinical stability and bone healing post-operatively after three, four, five and six weeks respectively.

In conclusion, the use of eyelet for IMF is an economical method whereas IMFSs though a more expensive and technique sensitive option have proven to be a faster and better accepted option in terms of patient acceptance. The intermaxillary fixation screw is a more efficacious method as compared to conventional eyelet wiring. In addition, we found the oral hygiene maintenance to be better in patients with IMFSs than eyelet wiring in terms of maintenance of oral hygiene, occlusal stability, operating time and patient acceptance for management of mandibular fractures. But, individual decision must be made in each case, whether to do eyelet wiring or IMFSs as the modality of treating mandibular fractures. Every method employed in managing mandibular fractures has their own pros and cons. To our knowledge, no prospective study has compared the two modalities of achieving intraoperative IMF, which makes this study unique. The small sample size and limited follow up could however be considered as a limitation of our study. Hence, the management should be based on the clinical reviewing each case of trauma patients.

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