

Research Article

Outcomes of Intermaxillary Fixation Screws Versus Eyelet (Ivy Loop) Wiring Technique for Maxillomandibular Fixation in Fractures of Mandible

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Abstract

Various techniques have been employed to achieve Maxillomandibular fixation (MMF). Although eyelet wiring and arch bars provide an efficient and flexible method of MMF, but there are some drawbacks. However the introduction of newer Intermaxillary fixation screws (IMFS) has advantage over eyelet wiring and arch bars.

Objective: To compare the outcome of Intermaxillary fixation screws versus eyelet (ivy loop) wiring technique for Maxillomandibular fixation in fractures of mandible in term of mean time and mean pain.

Methods: A Randomized control trial involving 96 patients (age 18-40 years) with mandibular fractures requiring MMF was conducted from 8th July 2017 to 8th December 2017(6 month period) at Oral and Maxillofacial Surgery Department, King Edward Medical University affiliated Mayo Hospital, Lahore. The sampling technique was non probability consecutive. Patients with minimally displaced mandible fracture were included. The patients were divided randomly into 2 groups. Group-A received IMFS and group-B received eyelet fixation. Mean Time for fixation and mean pain score was measured.

Results: The mean fixation time in IMFS group and Eyelet Fixation group was 11.46±2.95 min and 15.67±4.08 min respectively. The mean fixation time in IMFS group was significantly lower when compared to Eyelet fixation group, p-value<0.001. The mean pain in IMFS group was 4.35±1.75 and in eyelet fixation group 6.56±1.84 with significantly lower pain in IMFS group, p-value <0.001.

Conclusion: Intermaxillary fixation with IMF screws is more efficacious in terms of less time and pain than eyelet wiring for fixation in mandibular fracture.

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Introduction

Mandible is the versatile bone of the facial skeleton, and has an important role in mastication, speech and deglutition as a part of masticatory apparatus.¹ Mandible is a very resilient

facial bone, it is the 10th most often fractured bone in the human body and only second to nasal bone fractures and it is fractured two or three times more often than other facial bones.² It fractures commonly because of its prominence on face.³ Etiology of mandibular fracture varies from, motor vehicle

accidents, falls and assaults⁴. The prevalence of mandibular fractures is higher in male subjects in all age groups⁵. Samman and colleagues reviewed the pattern of mandibular fractures Kingdom of Saudi Arabia over a retrospective period of 3 years. The most common location of mandibular fracture in 260 fractures was the condyle region (39%), followed by the angle (19%).⁶

The main goal of a treatment is to restore pre morbid occlusion⁷. Treatment of Mandibular fracture includes either close reduction or open reduction, both of which require Intermaxillary fixation to achieve occlusion⁸. Various methods were introduced for Intermaxillary fixation (IMF) including Eyelets (Ivy) interdental wiring and arch bars.⁹

Eyelet wiring and arch bars have problems like poor oral hygiene, reduced periodontal health, ulceration of oral and gingival mucosa, loss of teeth vitality and needle stick injury to the clinician, the procedure also takes lots of time. It is also not suitable in patients having multiple missing teeth, grossly carious teeth, implants, extensively restored and periodontal weakened teeth.¹⁰ Various articles have reported that Intermaxillary fixation screws can be used safely, with minimum chances of damage to the surgeon by pointed wires, decreasing the chances of spread of Hepatitis B, C, HIV and other diseases.¹¹

Pattern and etiology of maxillofacial trauma is different in Pakistan and no similar local studies available, International studies reported that the mean time taken from start till Intermaxillary fixation was 10.17 ± 2.918 min for IMF screws and 22.58 ± 2.57 min for the eyelets¹². Ingole et al. reported the mean pain in IMFS group was 4.92 ± 1.91 and in eyelet group was 6.40 ± 1.73 , on visual analogue scale.¹³

The rationale of this study is to compare inter maxillary fixation screws with eyelet wiring for inter maxillary fixation in mandibular fractures to know which technique benefit the patient by consuming less time. As no local study is available and international study (cited) reported benefits of IMFS for less time required for fixation and lower mean pain when compared to eyelet fixation¹⁴ but international study doesn't mention method of drilling i.e. either self drilling screws or by drill bit, which could change out comes Through this study if we find IMFS beneficial

then in future we can recommend to use IMFS to achieve optimum results, less time of fixation and lower pain after surgery can improve surgeons and patients satisfaction.

Methods

This research was conducted at Oral and Maxillofacial Surgery department, King Edward Medical University affiliated Mayo Hospital, Lahore, from 8th July 2017 to 8th December 2017 (6 month period). A total of 96 patients (age 18-40 years, both genders) which had mandible fractures were randomly divided into 2 groups (48 each) using lottery method. Group-A received IMFS and group-B received eyelet fixation.

We used 80% power of study, 95% confidence level (1.96) (z), Standard deviation 0.25, 5% margin of error (0.05) (e).

Source was out patient department (OPD) of and later admitted in ward. The study was randomized control trial and the sampling technique was non probability consecutive.

Clinical examination and 2 x-rays, Orthopantomogram and posteroanterior view of mandible was used to diagnose mandible fracture. Patients with minimally displaced mandibular fractures requiring Intermaxillary fixation were included in the study. The patients with comminuted fractures and condyle fractures were excluded from study. After radiologic evaluation of the mandibular fracture and verifying root position of teeth, IMF was done. Same team of three final year resident performed all procedures.

In group A, under local anesthesia, a hole was drilled using 1.5mm drill bit inserted in high speed hand piece (drill) which is attached to motor, also normal saline irrigation is used to prevent bone damage. The hole was drilled between canine and premolar area, at the level and medial to apex of premolar root (to avoid damage to tooth) Stainless steel IMF screw 2 mm in diameter and 9 mm from head to tip, was tightened in these holes. One screw for each quadrant and one screw in midline in both jaws were used. Total 6 screws were used. IMF was done by passing 0.45 mm, soft stainless steel wire, which was passed by the hole in IMF screw head and occlusion, was held by assistant; finally wire was crossed and twisted, cut

and rolled. IMF was maintained for 4 weeks.

In group B, eyelets were prepared from 0.45mm diameter soft stainless steel wire, with eye diameter of 3 mm and were passed using a classical eyelet (Ivy) technique under local anesthesia. A total of 10 eyelets were passed. Five stainless steel wires were passed through the eyes of ivy loop separately, occlusion held by assistant; finally all wire were crossed in a Knot manner, twisted, cut and rolled. IMF was maintained for 4 weeks.

Mean time for fixation was measured in minutes from start of placement technique till Intermaxillary fixation completion. Mean score of pain was measured on visual analogue scale at 12th hour of surgery, on a 0-10 scale, where 0 is no pain and is worst pain.

All data was collected by researcher himself on prescribed proforma.

The collected information was entered in SPSS version 21 and analyzed through it. The quantitative data like age, mean time of fixation and mean pain score was presented by mean and standard deviation. The gender, ASA status and educational status were presented by frequency and percentage. The final outcome i.e. means time required for placement and mean pain score in both groups was compared using independent sample t-test. Data was stratified for age, gender to address the effect modifiers; post stratified independent sample test was applied. p -value ≤ 0.05 was considered as significant.

Results

- A total of 96 patients with undisplaced mandibular fractures were included in study.
- The mean age in IMFS group was 31.56 ± 6.31 years with minimum and maximum of 19 and 40 years. The mean age in eyelet fixation group was 33.54 ± 5.52 , the minimum age in this group was 22 years and maximum age was 40 years.
- In IMFS group there were 28 (58.33%) males and 20 (41.67%) were females whereas in eyelet fixation group 25 (52.08%) patients were males and 23 (47.92%) patients were females.
- The mean fixation time in IMFS group and eyelet Fixation group was 11.46 ± 2.95 min and 15.67 ± 4.08 min respectively. The mean fixation time in IMFS group was significantly lower when

compared to Eyelet fixation group, p -value < 0.001 . Table-1

- The mean pain in IMFS group was 4.35 ± 1.75 and in eyelet fixation group 6.56 ± 1.84 with significantly lower pain in IMFS group, p -value < 0.001 . Table-2
- When data was stratified for age we found significant difference in operating time and mean pain in age group of 30-40 years, p -value < 0.05 while it was same in 18-29 years of age, p -value > 0.05 . When data was stratified for gender both mean operating time and mean pain was significantly less in IMFS group as compare to eyelet group, p -value < 0.05

Table 1: Comparison of Fixation Time between IMFS and Eyelet Fixation Group

	Study groups	Mean \pm S.D	Min.	Max.
Fixation time (minutes)	IMFS (n=48)	11.46 \pm 2.95	7.00	15.00
	Eyelet fixation (n=48)	15.67 \pm 4.08	9.00	22.00
	Total (n=96)	13.56 \pm 4.12	7.00	22.00

t-test = 5.78
p-value < 0.001

Table 2: Comparison of Pain between IMFS and Eyelet Fixation Group

	Study groups	Mean	Min.	Max.
Pain (VAS)	IMFS (n=48)	4.35 \pm 1.76	2.00	7.00
	Eyelet fixation (n=48)	6.56 \pm 1.84	4.00	9.00
	Total (n=96)	5.46 \pm 2.10	2.00	9.00

t-test = 6.01
p-value < 0.001

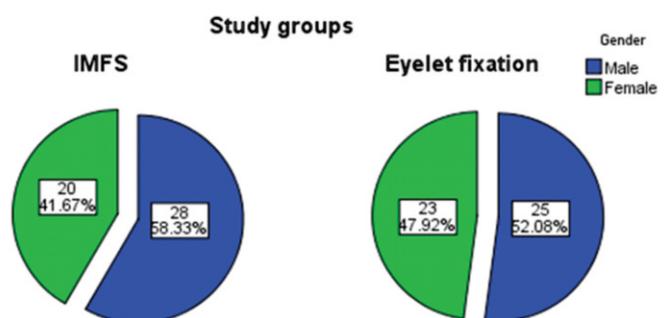


Figure 1 Percentage of Male and Female in both Groups



Figure 2: *Intermaxillary Fixation Group Showing 4 Screws Placed and Maxillo-Mandibular Fixation Done*

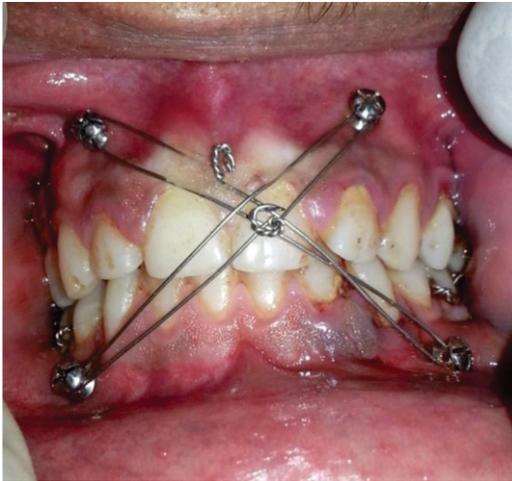


Figure 3: *4 Screws Placed and Maxillo-Mandibular Fixation Done in an X Pattern*

Discussion

Intermaxillary fixation with the utilization of Erich arch bars has been the standard treatment for fracture mandible⁹. Restoring the dental pre morbid occlusion status has been the mainstay of successful treatment of jaw fracture.⁷

Maxillomandibular fixation using IMFs appears to be an effective method, for less time consumption, less chances of needle stick injury to health professional as compared to wiring techniques including interdental wiring (eyelet wiring).¹⁰ Because latest methods of rigid skeletal fixation by open reduction has thus evolved into an increasingly advanced and widely used technique, long-term maxillo-mandibular fixation is not required. The use of maxillo-mandibular fixation is therefore largely limited to a short exten-

ded span intra-operatively and post-operatively.¹⁵

Intermaxillary fixation screws is an effective strategy investigated internationally¹⁶ practiced internationally, but unfortunately has sparse use in our country, and lacking research on it. Also internationally self tapping screws are being used; we used drill bits before placing screws, which could further reduce intermaxillary fixation time. Learning the method is clear and simple to apply. The mean working time has been decreased from more than one hour to about 18.7 min.¹⁷ The score of pain is also reduced; the fixation achieved is equal efficacy to both Erich arch bars and eyelet wiring¹³ they are likewise completely compatible with open reduction and internal fixation procedure.¹⁸

With IMFs enhanced oral cleanliness and a diminished rate of contamination have been observed as seen with eyelet wiring. The procedure isn't reliant on the quantity of teeth present, which is a huge advantage in partially dentate patient and is appropriate to be done under local anesthesia¹⁹. What's more, un displaced fractures in edentulous mandibular fracture spans might be effectively treated also, provided that dentures are present or can be made; arch arch bar and ivy eyelet wiring cannot be used in such patients.²⁰ They are particularly acceptable for patients with crown bridge work, as more and more people are getting these restorations and patients coming with maxillofacial fractures, IMFs appear valuable, recent options for such patients, hence less pain during procedure.²¹

There are obviously a couple of disadvantages to intermaxillary fixation screws. It requests the accessibility of IMF bone screws, whose cost is somewhat more than eyelet wiring. IMFs cannot be used for all maxillofacial fractures. The most suitable are for those fractures that are moderately undisplaced. The system is valuable both symphysis and Parasymphysis fractures with or without open reduction.²²

The intraoral cortical bone screw (IMFs) procedure isn't commonly favored for severely comminuted fractures, fire arm injuries where solid bone is not available, pediatric fractures which has teeth bud present in jaw and hence increased chances of teeth bud damage.²³

There are reports of complications but have been

minor and mostly overseen, including teeth root damage and screw loosening and nerve damages.²⁴ A well controlled, stable hand throughout the drilling process is critical, plenty of water system with clean saline during drilling process to prevent bone damage, also giving a feel when root surface is in contact, so changing direction or reinserting drill bit.

In Ingole et al.'s study of the 50 patients enrolled, the mean fixation time in IMFS group and eyelet fixation group was 11.46 ± 2.95 min and 15.67 ± 4.08 min respectively. The mean fixation time in IMFS group was significantly lower when compared to Eyelet fixation group, consistent with our study¹³.

That is why Intermaxillary fixation screws is a cheap, simple, and feasible option to awkward eyelet (ivy loop) wiring in term of less time and less pain to achieve occlusion, during close reduction and ORIF(open reduction internal fixation).

Conclusion

Intermaxillary fixation with IMF screws is more efficacious in term of less time and pain vs. eyelet (ivy loop) wiring technique for Maxillomandibular fixation in fractures of mandible.

In future we can recommend IMFS to achieve optimum results; less time of (intermaxillary) fixation and lower pain after surgery can improve surgeons and patients satisfaction.

Ethical Approval: Given

Conflict of Interest: The authors declare no conflict of interest

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