



## Comparative Assessment between a New Technique for Maxillomandibular Fixation and the Conventional Technique - A Pilot Study

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### KEYWORDS

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Pain, Glove  
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operative time,  
Embrasure screw  
and cover

### ABSTRACT:

**Background:** Advancements in surgery aim to make procedures atraumatic and reduce operative time. Techniques for interdental wiring, like Erich's arch bar fixation, have seen improvements over time. Maxillomandibular fixation (MMF) is the oldest and most widely used technique of immobilization of jaws for management of facial trauma. Although eyelet wiring provides sufficient immobilization, it has a number of disadvantages. It is a cumbersome procedure and requires much time specially for trainees to pass the wires interdentially, as well as high chances of glove perforation. Many simple modifications have been tried in reducing application time and hence increasing patient comfort. The aim of this study is to evaluate the efficacy of the new instrument in reducing intra operative time, patient's oral hygiene and increasing the safety of operator.

**Materials and methodology:** Using simple randomization, twenty participants were included in the study, and they were divided into group A (experimental group) in which embrasure screw and cover was used. While conventional technique of eyelet wiring was used in Group B (control group). Followed by IMF using wire or elastic. Similar post-operative instructions and medications were given to patients in both groups. Patients were recalled at regular intervals for checkup and assessment was done for operative time, glove perforation, occlusal stability and plaque accumulation.

**Results:** It was found that the difference in the mean age of the subjects between the groups was statistically non-significant. The mean intra-operative time in Group A was significantly shorter than that in Group B. All the subjects irrespective of the group, both intra-operatively and post-operative showed stability of the fractured fragments. There was no incidence of glove perforation in Group A whereas in Group B, the incidence was 60%. On comparing oral hygiene, it was found on post-operative day 21, the PI score in Group B was significantly higher compared to Group A while intra-group comparison showed significant increase in plaque score in both groups at each subsequent visit.

**Conclusion:** The technique is time-saving and more comfortable to operator as well as patient over conventional use of eyelet wiring for maxillomandibular fixation [MMF].

### 1. Introduction

Maxillomandibular fixation (MMF) is the oldest and most widely used technique of immobilization of jaws for management of facial trauma [1]. Immobilization of the fractured bone segments aims to reduce the motion

along the continuity disruption, which is important to promote timely healing or union. Although technology has advanced to a position where most of the cases of maxillofacial fracture can be treated by open reduction and internal fixation (ORIF) with ease, but traditional



conservative methods still hold their place in management of adequate occlusal stability [2].

The most commonly used MMF technique for management of facial trauma is the wired arch bar and Ivy eyelet wiring. The primary goal in management of maxillofacial fractures is to keep the reduced fracture segment stabilized by achieving dental occlusion. The ideal MMF technique should be simple and quick, allow maintenance of good oral hygiene and gingival health during MMF period and should provide adequate immobilization for particular fracture stability. But eyelet wiring is has many number of wires in the oral cavity, poor oral hygiene and gingival health maintenance and wires tends to loosen with time and thus compromising fracture stability. Thus, is a cumbersome procedure and requires much time specially for trainees to pass the wires interdentially [3].

This difficulty could be avoided with a simple modification of MMF technique that allows easy passing of an embrasure screw from palatal side and a cover from buccal aspect in between the 2 teeth. Although time is not a factor to judge the superiority of one technique or instrument over the other but it gives a reflection of the overall comfort throughout the procedure [2]. Keeping these facts in mind, we attempted to design a simple Instrument to pass embrasure screw interdentially in a shorter period of time to eventually reduce overall time for maxillomandibular fixation that can provide sufficient immobilization.

## 2. Materials and Methods

This prospective study was conducted at Saveetha Dental College, Chennai - Tamil Nadu, in the Department of Oral and Maxillofacial Surgery. The sample size was calculated using the G-power software with a confidence interval of 95%. Using simple randomization, twenty participants were included in the study, and they were divided into group A (experimental group) in which new instrument was used, embrasure screw was passed from the palatal side of embrasure and screw cover was tightened over it. [Image 1] While conventional technique of eyelet wiring, using only pre-stretched 6cm long wires were used in Group B (control group). Followed by 6cm long 26-gauge soft stainless-steel wire was used for IMF. Similar post-operative instructions and medications were given to patients in both groups.

Patients in the Age range of 18-60 years, both male and female with minimally displaced fracture were enrolled in the study. Pregnant females, anxious patients, episodes of epilepsy, partially or completely edentulous, the presence of prosthesis in the oral cavity, severely periodontally compromised patients, teeth with large embrasure area, severely displaced fracture or dentoalveolar fractures were were excluded from the study.

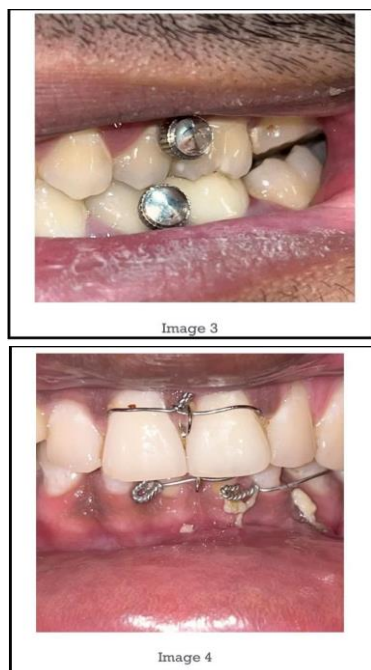
Under standard aseptic conditions, patient draping was done, and intraoral irrigation was done using 0.9% normal saline. In group A, the invention consists of 2 parts, the screw is glided into the embrasure of the 2 adjacent teeth from the palatal or lingual side. Since the screw has a head stopper larger than the size of the embrasure area it will be stuck on the palatal side and ready to receive the screw cover. Once the screw cover is nicely fit from the buccal side, the excess screw can be cut using a wire cutter easily and quickly [Image 2]. Maxillomandibular fixation was done and occlusion was checked [Image 3]. Similarly, in group B, conventional technique was followed using eyelets only occlusion was checked [Image 4]. Similar post-operative instructions and medications were given to patients in both groups. Patients were instructed to use mouthwash. Patients were recalled at regular intervals for checkup.



Image 1



Image 2



Clinical parameters that were assessed in the study are operative time, glove perforation by water inflation method, occlusal stability on preoperatively, 7th and 21st postoperative days and plaque calculation with the Turesky-Gilmore-Glickman modification of the Quigley-Hein plaque index [10]. Plaque was assessed on the labial and buccal surfaces and interdental areas from the central incisors to first molars of all 4 quadrants at the gingival third of all the teeth using a disclosing agent.

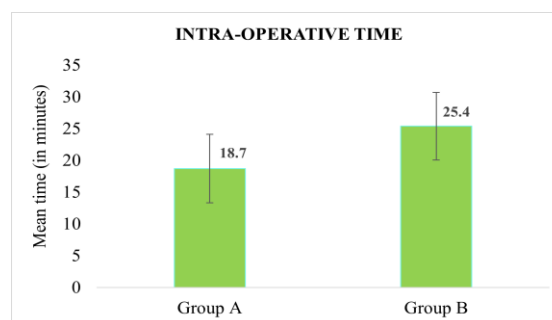
### 3. Statistical Analysis

Data were analysed using SPSS (Statistical Package for Social Sciences) 25.0 version. The normal distribution of the data was assessed using Kolmogorov-Smirnov test and data were found to be normally distributed. Thus, parametric tests of significance were applied. Inter-group comparison of continuous variables was done using independent t-test and that of categorical variables was done using Chi-square test. Intra-group comparison of continuous variables was done using Repeated measures ANOVA. P-value  $<.05$  was considered statistically significant.

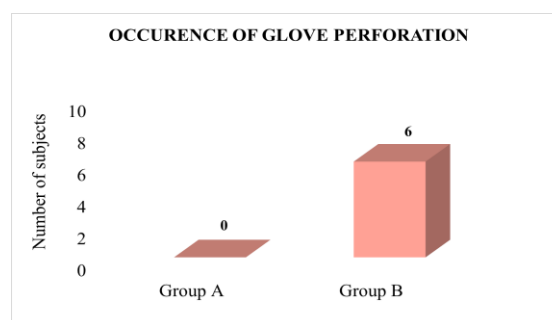
### 4. Results

The present study included 20 subjects which were equally distributed into 2 groups (Group a and Group B). The mean age of the subjects in Group A and Group B

was  $28.6 \pm 13.226$  years and  $35.1 \pm 7.781$  years respectively. The difference in the mean age of the subjects between the groups was statistically non-significant [t-value= -1.339, p-value= .197]. All the subjects included in the study were males. The mean intra-operative time in Group A ( $18.7 \pm 5.396$  minutes) was significantly shorter than that in Group B ( $25.4 \pm 5.316$  minutes) [t-value= -2.797, p-value= .012]. [Figure 1] All the subjects irrespective of the group, both intra-operatively and post-operative showed stability of the fractured fragments. There was no incidence of glove perforation in Group A whereas in Group B, the incidence was 60% (6/10) [Chi-square value= 8.571, df-1, p-value= .003]. [Figure 2] On comparing oral hygiene, it was found that at baseline the mean Plaque index score was non-significantly different between the groups (p-value= .265). Post-operatively on day 7, the PI score was higher in Group B compared to Group A, however, the difference was statistically non-significant (p-value= .098). On post-operative day 21, the PI score in Group B was significantly higher compared to Group A (p-value= .004). [Table 1] Intra-group comparison showed significant increase in plaque score in both groups at each subsequent visit (p-value=  $<.001$ )



**Figure 1. Intra-operative time in Group A and Group B.**



**Figure 2. Incidence of glove perforation.**

**Table I: Inter-group and intra-group comparison of plaque index.**

Time interval	Group A	Group B	t- value	p-value <sup>∞</sup>
Pre-operative	2.5 ± 0.721	2.8 ± 0.397	-1.151	.265
Post-operative day 7	2.7 ± 0.648	3.1 ± 0.431	-1.746	.098
Post-operative day 21	3.0 ± 0.741	3.9 ± 0.368	-3.248	.004*
F-value	50.394	55.588		
P-value <sup>Ω</sup>	<.001*	<.001*		

<sup>Ω</sup>Repeated measures ANOVA. <sup>∞</sup>Independent t-test. \*p-value <.05 was considered statistically significant.

## 5. Discussion

The goal of maxillomandibular fixation (MMF) is to provide indirect stabilization of fractures of the maxilla, the mandible, or both [4]. According to Rai et al. average time of application of eyelet wiring was 18.00 minutes [5], while by Ingole et al. it is 35 min [6] and by J Puri et al. it is 16 minutes [7]. The variation noticed is mainly dependent of the experience of the operator since the most time consuming and technique sensitive step is passing of wires interdentally which usually involves bending of tip of wire after hitting the tooth. Thus, increasing the time of procedure, damages more of papilla and wasting of wires. Since time, patient comfort, glove performance and ease of doing a procedure enhances the quality of treatment [8], hence many different methods have been done to reduce the duration of its application by passing a single wire interdentally from maxillary and mandibular arch [9].

Embrasure screws may be combined with other techniques, for example an arch bar, or trans osseous wiring. Unfortunately, many patients have already lost some of their teeth and it must be decided pre-operatively whether enough teeth remaining be sufficient to provide adequate fixation for the duration of immobilization.

With the biocompatibility, customization options, and mechanical strength, these screws provide oral and maxillofacial surgeons with a reliable and innovative tool to achieve improved patient outcomes, better healing, and reduced postoperative complications in craniofacial reconstruction and trauma procedures.

The bulky wired arch bars can be substituted with another technique having less bulk of wires, which is less tedious, quick and simple. The embrasure screws provide all the above-mentioned features. However, for obtaining

good results, proper case selection is of paramount importance. The embrasure screws can be used as eyelet wiring technique in condylar and non-displaced mandibular fractures as a mean of immobilization. The embrasure screw technique that is described here by no means is meant to surpass the already described conventional techniques. This technique as a mean of immobilization for fractures requiring a lesser degree of immobilization for shorter

The limitations of the study were that, it was conducted on a small population with limited parameters and under different conditions. In further studies, the sample size has to be increased. The study was also conducted at a single center, further studies must be conducted at multiple centers.

## 6. Conclusions

Passing of the wires interdentally while placing eyelets consume most of the time, this can be reduced significantly if this new instrument is used in cases of emergency as it passes easily requiring a smaller number of attempts than conventional technique. Another reason for more successful use of it is less incidence of glove perforation or needle prick injuries as well as its smooth surface allows good oral hygiene maintenance, hence making this technique more successful, superior and less technique sensitive than the conventional technique of eyelet wiring.

## 7. Declarations

### Ethics approval and consent to participate

The study got approval from the Institutional Human Ethical Committee (IHEC) with the reference number - IHEC/SDC/OMFS-2301/24/032. Treatment consents



were obtained from all participants after explaining the procedure to the patient.

### Consent for publication

All necessary consents were obtained from all participants for treatment and publication.

### Availability of data and material

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

### Competing interests

The authors declare that they have no competing interests.

### Funding

It was a self-funded study.

### Authors' contributions

Conception and design of study: Rajprakash Bhaskaran and Manan Gupta; acquisition, analysis and interpretation of data: Rajprakash Bhaskaran, Manan Gupta and Santhosh P. Kumar; drafting the manuscript: Manan Gupta, Santhosh P. Kumar and Murugesan Krishnan. The authors read and approved the final manuscript.

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