



RESEARCH ARTICLE

BONE SUPPORTED ARCH BAR VERSUS ERICH ARCH BAR FOR INTERMAXILLARY FIXATION: A COMPARATIVE CLINICAL STUDY IN MAXILLOFACIAL FRACTURES

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ABSTRACT

Aim: Arch bars that are directly fixated to the maxilla and mandible with self-drilling locking screws combine features of Erich arch bars and bone-supported devices and present an alternative method of intermaxillary fixation (IMF) that possesses potential advantages over existing techniques. The objective of this study was to compare IMF using this device with Erich arch bars secured with circum-dental wires. **Materials and Methods:** A prospective cohort study was performed of patients who were surgically treated for maxillofacial fractures from the year 2015 to 2017. The primary predictor variable was fixation technique, which was IMF using Erich arch bars secured with circum-dental wires or stainless steel arch bars fixated with maxillary and mandibular screws. The outcome variables were complication rates, time necessary for device application and removal, glove perforation rate, and cost. **Results:** Out of 40 cases 20 were included in under Group A and 20 under group B. In group A patients were treated with Inter maxillary fixation with Bone supported arch bar and in group B with erich arch bar. Time taken for the procedure was more in group B and also more cases of needle stick injuries were seen in group B when compared to group A where such injuries are completely nill. **Conclusion:** Bone-supported arch bars may be a comparable alternative to Erich arch bars secured with circum-dental wires for IMF.

INTRODUCTION

Inter Maxillary Fixation is a standard component of the treatment of mandibular fractures. Several techniques have been described, the majority of which involve placement of wires around teeth. However, these approaches are limited in the setting of poor dentition or in patients who are partially edentulous, can be time consuming, and are associated with risks of mucosal, dental and needle stick injuries (Avery, 1992)². To avoid this, Bone supported devices such as IMF (intermaxillary fixation) screws have been described, but may be limited to minimally displaced and favorable fractures, and do not exert a tension band effect. An alternative is the use of stainless steel arch bars fitted with eyelets for self-drilling/self tapping screw fixation directly to the maxilla and mandible. This device combines the features of both arch bars and bone supported devices (Albert et al., 2015)¹. In the present study, efficacy and clinical outcomes of Bone supported arch bars are compared with Erich arch bars in the management of minimally displaced maxillofacial fractures.

MATERIALS AND METHODS

Cases of maxillofacial injuries which reported to Department of Oral & Maxillofacial Surgery, Meghna institute of Dental

Sciences, Mallaram, Nizamabad, Telangana. This study was conducted on 40 patients with clinical and radiological evidence of fractures of maxilla and mandible and are treated by closed reduction with Bone supported arch bars and Erich arch bars. Cases were selected on the following criteria-

Inclusion criteria

- Patients with non pathological maxillofacial fractures.
- Age of 18 to 60 years.
- Patients with vital teeth in the area of self drilling screws.
- Favorable and unfavorable fractures in maxillofacial region.

Exclusion criteria

- Edentulous patients
- Patients with underlying systemic disease
- Pathological fracture.

Procedure for arch bar placement: Adequate anesthesia was achieved by using 2% Lignocaine with Adrenaline in 1:80000

concentration. The bone supported arch bar fitted with eyelets is cut extending from first molar to first molar. The length of the arch bar is adjusted according to the individual situation. Arch bars were generally fixated using five, 2.0mm diameter and 6mm long self-tapping screws in the maxilla and five, 2.0mm diameter and 8mm long screws in the mandible at the junction of attached gingiva and alveolar mucosa. A hole is drilled into the bone through the gingiva at approximately 90 degrees to long axis of the adjacent teeth, taking care to pass the drill between the roots of the teeth without penetrating palatal or lingual mucosa.

The number of screws placed was based on ensuring there were at least 2 screws on either side of a fracture. In both groups 26 gauge surgical round stainless steel wires were utilized to achieve IMF. The wire loop is placed over the maxillary and mandibular lugs of the arch bar and the wire loop is tightened. IMF was maintained for approximately 4 weeks, followed by elastics, with arch bar removal at approximately 6 weeks in the operating room. Post operative instructions were given. The patients were followed up clinically after 24hrs, and then at weekly intervals for 6 weeks. They were followed up radio graphically with Orthopantomographs

Parameters to be assessed

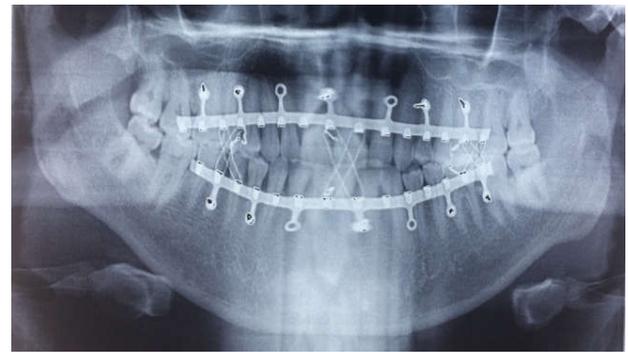
- Intra-operative time taken for the procedure.
- Oral hygiene index
- Iatrogenic dental injury
- Patient acceptance.
- Screw fracture.
- Needle stick injuries.
- Screw displacement
- Soft tissue coverage
- Loosening of arch bars and screws
- Stability of arch bar.

RESULTS

A total of 40 patients with maxillofacial fractures were selected for the study for Intermaxillary fixation 20 by Bone supported arch bar (group A) and 20 by Erich arch bar (group B). The patients were between 15 to 60 years of age. Out of 40 patients 33 were males and 7 were females. The most common etiology was road traffic accidents in 36 cases followed by, assaults in 2 cases and sports injury in 2 cases. Out of 40 cases 38 were operated under General anesthesia and 2 under local anesthesia



Intraoperative photograph of IMF done with bone supported arch bar

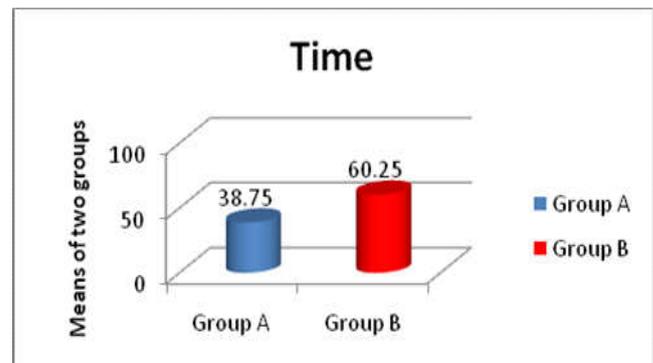


Postoperative OPG of IMF done with bone supported arch bar

Time taken for placement of bone supported arch bar and erich arch bar along with intermaxillary fixation

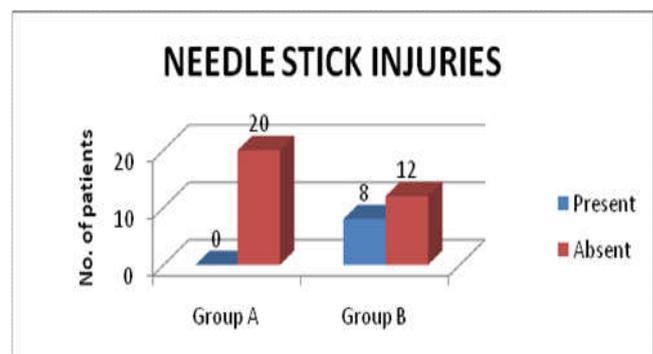
Time taken in Minutes	Min	Max	Mean±SD	Mean±SD difference	t value	P Value
GROUP A	30.00	55.00	34.87±10.09	10.143	-9.4	0
GROUP B	45.00	80.00	53.13±5.67			

Comparison of time between two groups



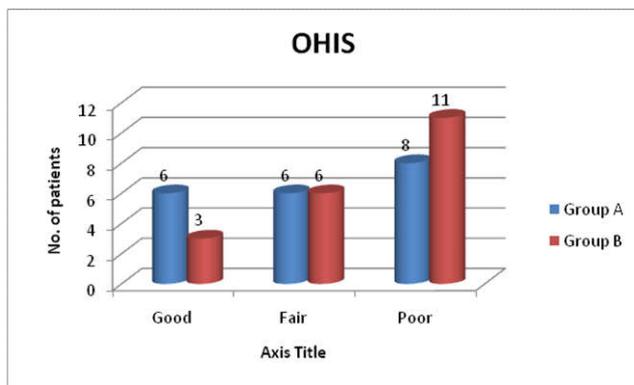
Comparison of incidence of needle stick injuries between two groups

Needle stick injury	group a n(%)	group b n(%)	mean	p value
Present	0 (0)	8 (40.0)	0.40	0.005
Absent	20 (100)	12 (60.0)		s
Total	20 (100.0)	20 (100.0)		



Comparison of oral hygiene status between two groups:

OHIS	Group I n (%)	Group II n (%)	t Value	p Value
Good	6 (30)	3 (15)	7.91	0
Fair	6 (30)	6(30)		
Poor	8 (40)	11 (55)		
Total	20 (100)	20 (100)		



Postoperative complications

	GROUP A (n=20)	GROUP B (n=20)	p value
Iatrogenic dental damage	5	0	0.317
Soft tissue coverage	7	0	0.068
Loosening of arch bar	5	0	0.143
Stability of arch bar	19	20	0.317

p value <0.05, Non- significant

DISCUSSION

Intermaxillary fixation is a hallmark principle of maxillofacial trauma, and assists in proper reduction of facial fractures, providing a stable foundation to reconstruct facial form and function. In the process of fully satisfying the criteria of fracture reduction. A variety of Maxillo Mandibular fixation techniques have been described¹. In modern practice, however, arch bars are considered the standard. While arch bars provide an effective and versatile means of MMF, their use is not without consequence. Risk of penetrating injury to the surgeon, increased surgical time both in placement and removal, trauma to the periodontium, and compromised oral hygiene are all shortcomings of traditional arch bars. The introduction of the bicortical selfdrilling / tapping intermaxillary fixation (IMF) screw has eliminated many of these issues (Johnathan, 2008)³.

The advantages of IMF screws include their quick and safe placement and removal; decreased trauma to the periodontium; less complicated oral hygiene; the ability to use intraoperative and postoperative elastic guidance. Most of these techniques will require wires to be tightened around the teeth, which can cause ischemic necrosis of the marginal gingiva and trauma to the adjoining mucosa, Compared with arch bars or eyelets, there is no trauma to the gingival margin and gingival health is easier to maintain. Because of discomfort, difficulty in wire removal, and maintaining oral hygiene leading to deterioration in periodontal health and patients have a low acceptability to arch bars. In addition, the incidence of glove perforation was significantly high with wiring techniques, which increases the percutaneous injury risk (Johnathan, 2008). The constant traction applied on the engaged teeth can also cause the teeth to extrude. Additionally, these techniques cannot be used in patients with partially edentulous dentition or patients with extensive periodontal disease. They are also not suitable for dentition with extensive crown and bridgework. To overcome these drawbacks, in 1989, Arthur and Berado reported a simplified method of using IMF Screws as a method for IMF that can be applied rapidly and painlessly. Arthur and Berardo are acknowledged to be among the first to propose the use of conventional 2.0 mm self tapping titanium bone screws

directly linked by wire loops to establish mandibulo-maxillary fixation (Busch, 1991). This direct connection over the screw heads was preceded by 2.0 mm bone screws equipped with J- or S-shaped metal hooks serving as indirect attachment points⁴. These specially designed hooks made of 0.8 mm Cr-Ni steel wire with a ring bent at their base for passing through the bone screw were introduced in 1981 by Otten and are referred to as "Otten hooks. The maintainance of oral hygiene is another parameter which was assessed. Our study showed that the oral hygiene was good in 6 cases (30%), fair in 6 cases (30%), poor in 8 cases (40%) in Bone supported arch bar group, where as good in 3 cases (15%), fair in 6 cases (30%), poor in 11 cases (55%) in patients treated with Erich arch bars for intermaxillary fixation.

In a study conducted by Anshul J. Rai , Abhay N. Datarkar, Rajeev M. Borle in 2009 IMF screws are used in the management of fractured mandibles.75% of patients had growth of soft tissue on the screw. Heads of the screws were small and needed to place the screw above the attached gingiva, as loss of alveolar bone is common⁵. This might be the reason why tissue grew over the screw. To overcome this they modified the screw, to which a stainless steel washer was added which kept the soft tissue away from the screw head. The results of this study suggest that bone supported arch bars fixated with maxillary and mandibular screws may be a comparable alternative to Erich arch bars secured with circumdental wires for IMF with respect to clinical outcomes. Their use is associated with a shorter device application time, lesser glove perforation rate and good maintainance of oral hygiene.

Further study of this device will aim to prospectively examine outcomes with its use in order to better define its efficacy and indications with regard to fracture type and presence of other facial fractures, as well as with a larger sample size to allow for a more powered analysis. A pragmatic answer to the pros and cons of Bone supported arch bars versus Erich arch bars is to accept that these methods represent two divergent anchorage principles, skeletal versus tooth borne, and will coexist with each other. Both methods have a decade-long history and the time-honored versions should undergo and eventually profit from refinements and diversification in design and application.

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