Comparative Evaluation of the Resin Bonded Arch Bar Versus Conventional Erich Arch Bar For Intermaxillary Fixation

Sanjay Chandan · Shandilya Ramanojam

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Abstract

Purpose Application of Erich arch bar with the help of circumdental wires for intermaxillary fixation is most widely accepted method for mandibular fractures. However, circumdental wires causes injury to periodontium. There is always fear of inadvertent injury by wire ends and chances of serotransmission of blood born viruses to the operator thus, we want to use the safest method of intermaxillary fixation avoiding use of circumdental wires.

Methods and Result We modified arch bar and bonded it to the dental arches by light cure composite resin and intermaxillary fixation was done without circumdental wires. Comparative study against conventional Erich arch bar fixation and evaluation concerning the oral hygiene, stability and safety of operator was made among 20 patients in two groups.

Conclusion As per our observation and result, resin bonded arch bar is easy to apply, causes less periodontal injury, and its application minimizes threat of percutaneous injury to operator.

Keywords Adhesive arch bar · Mandibular fracture in seropositive patient

Introduction

Management of maxillofacial trauma resulting to the hard tissues following primary care is reduction of the bony

fragment, immobilization and fixation, as per basic principle of management. Arch bar has been used as main stay for management of maxillomandibular injury since World War 1. The originator of this method Sauer [1] in Germany and Gilmer [2] in United States used ordinary round bar that was ligated to teeth with bass ligation wires. Blair and Ivy [3] modified and flattened on one side about 2 mm in width for better conform to the dental arches for greater stability; little has changed since the introduction of arch bar. However doing intermaxillary fixation with the application of Erich arch bar to dental arches by circumdental wiring is the most preferred method. Passing of wire around the tooth is must for stabilizing the arch bar. This causes periodontal injury and difficulty in maintaining oral hygiene, and if not adapted properly, causes orthodontic movement of anterior teeth, wire end causes mucosal ulceration. There is always a threat of percutaneous injury by wire ends to the operator or assistant and high chance of serological transmission of pathogens such as HBV, HCV, HIV and the bacteria capable of inducing an infection. The serotransmission rate for HBV is 30%, HCV is 1.8% and that for HIV is 0.32% [4, 5]. In order to avoid circumdental wiring Takehisa Yamada et al. [6] developed a method of intermaxillary fixation by adhesive cast splints where the resultant strength was superior than, that of arch bar but, laboratory procedure was expensive and time consuming. Horold Baumash et al. [7] performed direct bonding of the arch bars to dental arches in the management of maxillo-mandibular injury. It was considered to be useful method for avoiding accidental puncture. To overcome the shortcomings of circumdental wiring and for safety of operator, we have done intermaxillary fixation using a modified technique where the arch bar was bonded to labial aspect of teeth with the help of composite resin thus, totally avoided the use of circumdental wires, and comparative evaluation

S. Chandan (✉) · S. Ramanojam
Bharati Vidyapeeth Dental College and Hospital, Pune, India
e-mail: sanjaychandan@hotmail.com

S. Ramanojam
e-mail: shandiyasmita@gmail.com

was made against conventional method of Erich arch fixation among those patients who require intermaxillary fixation for mandibular fracture.

Materials and Methods

For comparative evaluation, we included 20 patients of unilateral or bilateral favorable fracture of mandible, those required closed reduction for the management of symphysis, parasymphysis, body or angle fracture of mandible. Patients were randomly divided in two groups, each having 10 patients. Smooth traction forces to achieve intermaxillary fixation were given by elastics, where as to direct heavy forces to pull fracture fragment for reduction were avoided in both the groups.

Group A. Patients of this group were treated by intermaxillary fixation using Erich arch bar with the help of circumdental wiring.

Group B. Patients of this group were treated by intermaxillary fixation with the help of resin bonded arch bar. Our appliance was made by soldering continuous orthodontic mesh on the back side of erich arch bar. This arch

bar is bonded on labial aspect of maxillary and mandibular teeth and intermaxillary fixation was done. Thus, we totally avoided circumdental wiring.

Material for group A: Erich arch bar Fig. 1.

Material for group B: Resin bonded arch bar, light cure composite resin, orthophosphoric acid (etchant), primer, light cure machine and air and water syringe Fig. 2.

Fig. 3 Preoperative group A

Fig. 1 Erich arch bar

Fig. 4 Intermaxillary fixation group A

Fig. 2 Resin bonded arch bar

Fig. 5 Immediate postoperative group A

Common Instruments

Cheek retractor, 0.35 mm stainless steel wires, wire holder, wire twister, elastics, and high vacuum suction.

Procedure

Preoperative oral hygiene was evaluated using plaque Index (Stillness and Loe) and gingival Index (Loe and Stillness). Oral prophylaxis of all patients was done before treatment Figs. 3 and 6.

Procedure for group A: In this group, fractures of mandible was treated by intermaxillary fixation (Fig. 4) by using Erich arch bar and circumdental wire.

Procedure for group B: In this group, patients were treated by intermaxillary fixation by modified resin bonded arch bar. Plaque removal of teeth was done to facilitate good adhesion of appliance. Cheek retractor and isolation of teeth with the help of cotton roles was done. Etching of labial aspect of teeth by orthophosphoric acid till first molar of all quadrants was done. Water irrigation and drying of tooth surface was made. Application of primer and its curing was done for good adhesion. Composite resin was applied on labial aspect of teeth, and precountered resin bonded arch bar was hold by other hand, by giving gentle digital pressure excess composite was removed. Simultaneous application and curing for 30 s for each tooth from all around till first molar was done. After bonding of arch bar to both arches, intermaxillary fixation (Fig. 7) was done with 0.35 mm stainless steel wire or elastics.

Observation and Results

For each Group, after 6 weeks, oral hygiene was evaluated using Plaque Index (Stillness and Loe) and Gingival Index (Loe and Stillness) immediately after the removal of arch bar.

As per oral hygiene index, we obtained above graph, which suggestive of there were more postoperative

accumulation of plaque and more gingival inflammation in patients of group A Fig. 5, than group B Figs. 8 and 9.

Other findings are summarized in Table 1.

Fig. 7 During intermaxillary fixation group B

Fig. 8 Immediate postoperative group B

Fig. 6 Preoperative group B

Fig. 9 Graph of Comparative evaluation of *plaque Index* (Stillness and Loe) and *gingival Index* (Loe and Stillness) for the Patients of group A and group B

Table 1 Other findings are summarized in the table as below

Comparative study	Group A	Group B
Oral hygiene	Poor	Good
Ulceration of oral mucosa	More	Not seen
Application time of appliance	More	Less
Stability	Good	Good
Orthodontic movement	Not seen	Not seen
Breakage of appliance	Not seen	Not seen
Percutaneous injury	Not seen	Not seen
Removal time of appliance	More	Less

Discussion

One of the most rewarding and yet demanding aspect of surgical practice is the management of patient who has suffered facial trauma. This is because maxillofacial injury not only causes great physical agony but the associated disfigurement can become a source of intense emotional distress. Most common and trusted method for mandibular fracture is the application of Erich arch bar for intermaxillary fixation with the help of circumdental wiring, yet circumdental wiring has its own shortcomings. Nevertheless, it has following disadvantages: wires have to pass below the gingival margin to guarantee stability, chances of gingival injury are more and compromises the health of periodontium, rounded wire edges collects food debris and causes gingival inflammation and difficulty in maintaining oral hygiene result in fetid breath, as per our study it has been proved that amount of periodontium injury is minimized and oral hygiene is well maintained by application of resin bonded arch bar. Sometime due to ill-fitting of Erich arch bar and over tightening of wires causes orthodontic movement of anterior teeth, but as we have avoided circumdental wiring so possibility of improper application of wires and orthodontic movement of anterior teeth, is out of question. In conventional method optimum tension and stable placement is a difficult task, breakage of wires during and after placement of wire is not uncommon which encounter instability of appliances. Sharp edges of wire will always injure the oral mucosa, but broken pieces of wires poses a threat a aspiration, and can lead to further complication. But for bondable arch these all risks are avoided. Possibility of dental pain, secondary to galvanic current occurs when stainless steel wires crosses the dissimilar metal filling, like gold or amalgam. This can be prevented by avoiding the use of interdental wires. In case of trismus, passing of wires in posterior teeth is a difficult task. Some times it is too cumbersome and traumatic especially to those patient where there is gross deposits of calculus. To overcome

these difficulties some authors have advocated commercially available brackets, fabricated hooks and attached brackets [8], these may not have good stability. But bondable arch bar can easily fixed on the labial aspect of teeth in limited mouth opening. Moreover stability is good as bondable area to tooth surface is more. Many time general or local anesthesia is required for passing of circumdental wires, as it is a painful and scary procedure for patient, here for application and bonding of our arch bar usually anesthesia is not required and thus its associated complications can be minimized. While passing of the wires and manipulating the fracture fragments, there is always a threat of accidental pricking of the wire end to the hands of the operator or the assistant, but avoiding the use of infected wires minimizes the chances of percutaneous injury and serotransmission of diseases. Looking towards the above shortcoming, application of resin bonded arch bar is comparatively a superior method than that the conventional Erich arch bar fixation for the intermaxillary fixation of mandibular fracture.

Conclusion

One of the most rewarding and yet demanding aspect of surgical practice is the management of patient who has suffered facial trauma. This is because maxillofacial injury not only causes great physical agony but the associated disfigurement that can become a source of intense emotional distress. There are various methods for intermaxillary fixation for mandibular fracture, which usually varies from patient to patient and availability of dentate arch. Most common and trusted method for intermaxillary fixation is the application of Erich arch bar with the help of circumdental wiring; this has lots of shortcoming as mention earlier. These can be avoided by using our resin bonded arch bar. If safety measures are concerned, resin bonded arch make procedure more safe for the operator and assistant, as it does not involve infected wires. Its application and postoperative removal is easy, less time consuming and painless for the patient. However light cure technique, bonding of this arch bar is technique sensitive procedure, requires plaque removal and methodical cleaning and drying of tooth surface. Postoperative cleaning of composite resin from tooth surface is additional step. In case of overridden fragments, smooth traction with the help of elastics is given and after achieving proper occlusion intermaxillary fixation was done. Thus, pulling of fracture fragments with heavy force was avoided. However, this is one of the economical and safe methods for intermaxillary fixation for the fracture of mandible.

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