



MODIFIED ERICH ARCH BAR- A CROSSOVER BETWEEN IMF SCREWS AND CONVENTIONAL ERICH BAR, AN OBSERVATIONAL STUDY

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ABSTRACT

Introduction: Maxillomandibular fixation has been done using Erich arch bar for decades but it has its own disadvantages like gingival trauma, poor oral hygiene, wire prick injuries, time consuming. To overcome this modified Erich arch bar has been discovered but lack of literature on the use of modified Erich arch bar makes it questionable. Therefore, the present observational study focuses on application modified arch bar for maxillomandibular fixation. **Materials and Methods:** This observational study was conducted on 50 patients that required MMF and received intermaxillary fixation (IMF) with modified Erich arch bars. The parameters recorded were average surgical time required, wire prick injuries, IMF stability, occlusal stability, screw loosening, oral hygiene status, and vitality response of the teeth. The variables were statistically analyzed and displayed in means of percentage and numbers. **Results:** The wire prick injury was found to be only 4 episodes, intraoperative time in average was around 8minutes. Debris indices were found to be mild in all the cases(average=0.65). No vitality response of tooth was around 5 in numbers. **conclusion:** The modified Erich arch bar could be a best alternative for conventional Erich bar but clinical trials are required to know about the efficiency of modified Erich arc bar over conventional Erich bar.

KEYWORDS :

Introduction

Immobilization is the most proven part in treatment of maxillofacial fractures. Intermaxillary fixation or maxillomandibular fixation is an established method of allowing fracture to heal and ensuring that occlusion is stabilized. Since then, different methods with various shapes and uses have been incorporated in the management of patients with maxillofacial trauma.[1] The most commonly used techniques for attaining intermaxillary fixation (IMF) are arch bars, eyelet wiring, direct interdental (Gilmer) wiring, and IMF screws.[1].The gold standard method followed for IMF is interdental wiring using Erich arch bars on the mandibular and maxillary teeth.[2] Although reliable, they have certain fundamental drawbacks. Almost all of these techniques involve wiring around the cervical portion of tooth and, therefore, are likely to cause ischemic necrosis[3] and trauma to the marginal gingiva and the adjacent mucosa.[4] These techniques have presented with poor patient cooperation results in difficulty maintaining good oral hygiene causing gingival and periodontal diseases. They also carry a high risk of needle stick injury paving way for fatal blood borne disease. There is also tooth extrusion on which perpetual traction is applied. In addition, these techniques cannot be applied in edentulous patients. They are also inapplicable for patients with extensive prosthetic work.[5]

To overcome these shortcomings, Erich arch bar with screws as a method for IMF that can be preferred for a prompt and painless procedure. Modified Erich arch bar with IMF has a potential advantage in means of accessibility, rapidity, shortened operating time, and minimal distress to the gingival margin, the only disadvantages being the risk of root injury.[6] Recently, a new modification of the conventional Erich arch bar has been improved by Queiroz in 2012 to overcome these disadvantages.[7] Perforations were drilled in between the winglets using a No. 701 bur. This modified Erich arch bar is

positioned in interradicular spaces of the maxillary and mandibular arches with 1.3 mm bur and the arch bar is secured using 1.5 mm screws (2 screws anterior and 2 screws posterior), thus preventing the hazard of root injuries.[7] The added advantage of modified Erich bar is that in case of multiple fractures, force distribution with elastics is much more efficient than IMF screws. Mucosal coverage of the screw head is not observed in modified Erich arch bar when compared with IMF screws. Hardware ingestion and aspiration which is a common complication in IMF screws is not observed in modified technique.[7,8] However, there is not much available documentation with quite number of samples describing the efficacy of this modified Erich arch bar. Therefore, the present study was done to gauge the advantages, disadvantages, efficiency, and probable complications such as incidence of wire prick as well as iatrogenic injury to the patient associated with modified Erich arch bar in the management of maxillary and mandibular fractures.

Materials and Methods

This present observational study was conducted at the department of oral and maxillofacial surgery from 2015 to 2017. Before commencement of the study, ethical approval was attained from the Institutional Ethical Committee. Prior informed consent was obtained from the study sample. A total of 50 patients of either gender between 15 and 60 years with a nonpathological fracture of the mandible, maxillary fractures where occlusion was affected, that required maxillomandibular fixation (MMF) for intraoperative/definitive reduction were included in this study.[8,9] Patients who fall under American Society of Anesthesiologists III and IV, edentulous patients, comminuted fracture of facial bone (in maxilla/mandible), pathologic fractures, multiple fractures (parasymphysis with angle, maxillary fractures, and associated condylar fractures), comorbidities such as fractures in other bones (femur

fractures, pelvic bone fractures, etc.), and patients having primary and mixed dentition were excluded from this study.[8,9]

Data collection

Demographic data, including age and gender of the subjects, were recorded. Open reduction and internal fixation were done after careful analysis of interradicular space with the help of prefabricated cast model of maxillary and mandibular arches and panoramic radiograph. Analyzing the interradicular space, three perforations were made in the maxilla and mandible correlating to the arch bar holes which were made in vitro [Figure 1]. The modified arch bar of preferred length was taken. The ischemic necrosis of the mucosa was prevented as the screws were not over tightened. The first hole was directed between the incisors, so that enough holes would correlate with the interradicular spaces needed for the settlement of the arch bar. MMF fixation was achieved by wiring or elastics[8,9,22] [Figure 1]. The dimension of the screw to secure and stabilize the arch bar was 1.5 mm width and 6 mm in length. The screws were placed for 4-6 weeks. The fixation of the screws was estimated instantly post insertion, using an intraoral periapical radiograph or panoramic radiograph and a secondary radiograph after screw removal. A follow-up of 1 month after removing the arch bar and IMF screws were included[9] [Figure 2]. The duration for the entire surgical procedure in minutes was recorded. Needle stick/wire prick injury and incidence of perforations in the gloves of the operator and primary assistant were identified by water inflation method.[11] At the time of arch bar removal, tooth vitality was checked using electronic pulp tester (Vitality Scanner™ 2006), a diagnostic tool traditionally used to determine the vitality of dental pulp preoperatively and postoperatively.[9,10] Oral hygiene was assessed using the Oral Hygiene Index-Simplified (OHI-S)[12] by examination of debris, stains, and calculus on specific surfaces of 6 index teeth that included the buccal and lingual surfaces of maxillary and mandibular molars and central incisors.[12] The Index values were calculated using the debris score and calculus score. In both groups, surgeon-induced injuries to the tooth, stability of IMF, and postoperative occlusion were also noted. Intraoperative pain assessment was done using visual analog scale (VAS score), a psychometric pain measuring instrument that consists of a horizontal line with verbal descriptors at each end to express the extremes of feeling. [13]

Statistical analysis

The data were analyzed and the compiled information comprising of potential complications, frequency of mucosal tears, root perforations and comparison of postoperative stability, occlusion, and device replacement and oral hygiene status were expressed in numbers, average and percentage.

Results:

Of the 50 patients enrolled for the study, there were 47 males and 3 .The mean age of the patient in 31.93. Most reported fracture was parasymphiseal fracture(nos.24) followed by symphysis fracture (nos 10) , condyle (nos.8), mandibular angle fracture(nos. 6) ; Le Fort I (nos. 1) , and Le Fort II fracture(nos.1). Needle prick/wire prick injury to the surgeons and assistants were reported to be 6 episodes. There was one screw loosened in 3 cases two screws loosened 1 case. The average operating time was found to be 8mins. As per the VAS scale, the average pain during procedure was 2.9[table 1]. There was no reported mucosal tear in modified arch bar. Requirement of device replacement was required in one case[table 2]. The postoperative occlusion was found satisfactory in all patients except 1 patient who required enameloplasty to attain proper occlusion. The debris and calculus indices were mild (average=0.65) in all the cases. Tooth vitality recorded were one tooth in 2 cases, two tooth in 1 case.

Discussion

Even though arch bars deliver an active and resourceful means of MMF, their use is not without concern. The current document tests the efficacy of modified Erich arch bar wires whether it can be an alternative for conventional Erich arch bar. The maximum intraoperative time duration for arch bar fixation was less for modified arch bar group which was in line with the study done by Ingole *et al.* who reported that the time taken for intraoperative procedure with modified Erich arch bar was 6 min unlike conventional arch bar wires.[14] Our results revealed the frequency of wire prick injury and mucosal tear was far less with the usage of modified Erich arch bar which was in agreement with the research by Qureshi *et al.*[15] The possible reason for this could be the manifestation of extended wires in conventional arch bars. The postoperative stability, occlusion was better in patients with modified Erich arch wire.[16] Device replacement was required were less in modified arch wires. These observations were parallel to the Balakrishnan *et al.*'s study who reported 80% stability in postoperative occlusion of patients who were treated with modified Erich arch bar.[17] Oral hygiene was observed to be significantly enhanced postoperatively after scrupulous oral hygiene instructions with modified arch bars except in one case where the oral hygiene was poor credited to patient's negligence. The findings were substantiated with the results of various studies reported in literature that revealed significantly good oral hygiene with modified Erich arch bar patients.[18-20] A study conducted by Kirk *et al.* concluded that vitality test was positive in 60% of cases managed with conventional arch bar whereas vitality test was positive in 100% of the cases managed with modified arch bar.[21] These findings were parallel with our study where nonvitality of teeth was seen very minimal in modified Erich arch bar group. The pragmatic reason for the efficiency of modified arch bar wires could be attributed to the fact that modified arch bar were adapted to the vestibular surface of the maxilla and mandible, and not to the cervical portion of the teeth and perforations were made in the interradicular spaces, thus avoiding the chances of root perforation, tooth nonvitality and necrosis of the gingival tissues and restoring adequate postoperative occlusal stability as well. The results observed in the present document provide adequate novelty, indicating that modified arch bar technique is a good alternative to conventional arch bars for temporary IMF in mandibular and other facial fractures which required IMF as the modified arch bar provides greater stability between the screws with no incidence of bending, bowing or deformation of segments of arch bar used as observed in the present study. The study has a few potential limitations as well. First, the modified arch bar technique although safe is still not indicated in incidents of comminuted fractures where the role of tension band and postoperative directional traction is a mandatory, pediatric patients, and patients with severe osteoporosis. These outcomes must be judiciously interpreted, and it needs advanced investigations to be executed on a big sample size along with specificity of technique to extend their use in the management of other facial fractures.

Conclusion:

IMF with modified Erich arch bars can be considered as an alternative to the conventional Erich arch bars in the treatment of MMF fractures. Even though both devices offer a better short term inter maxillary fixation intraoperatively to evaluate occlusion, the modified Erich arch bar greatly diminishes the operating time and the risk of needle stick and wire prick damages to the operating surgeon and assistant and consequently the spread of blood borne diseases was reduced. They are also concomitant to minimal trauma for the periodontium; and good patient compliance for the management of facial and mandibular fractures.

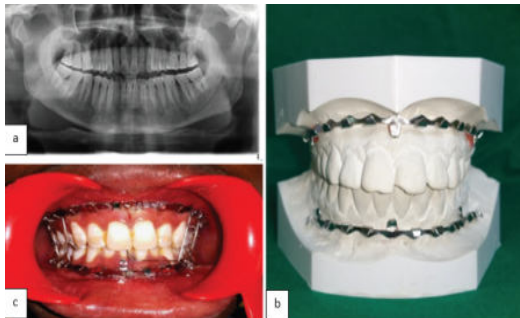
Table 1

s.no	Variables	Count in numbers
1	Wire/needle prick	6
2	Screw loosened	7
3	Intra operative time	8mins (average)
4	pain	2.9 (average)
5	Mucosal tear	0

Table 2

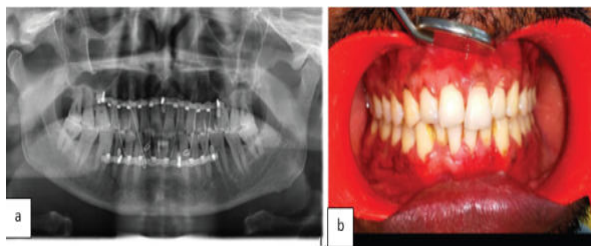
s.no	Variables	Count in numbers	Percentage
1	Postoperative stability	unstable	3 6%
		stable	47 94%
		Device replacement	
2	Required	1	2%
		Not required	49 98%
3	Postoperative occlusion	stable	48 96%
		unstable	2 4%

Figure 1



- a. Preoperative x-ray of right condylar fracture
- b. Arch bar fabrication in a prefabricated model
- c. Intraoperative image after fixing modified erich arch bar

Figure 2



- a. Post operative x-ray after fixing modified erich arch bar
- b. Modified erich arch bar post removal

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