

**Comparison of Efficacy of Hybrid Arch Bars to Erich's Arch Bars during Treatment of Maxillomandibular Fixation- A Prospective Study**Ashish Maheshwari<sup>1</sup>, Kanishka Guru<sup>2</sup>, Deepak Sharma<sup>3</sup><sup>1</sup>Assistant Professor Department of Dentistry, GRMC Gwalior M.P.<sup>2</sup>Associate Professor, Department of Dentistry, GRMC Gwalior M.P.<sup>3</sup>MDS (Oral And Maxillofacial Surgery)

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**Abstract:****Aim:** This study aimed to assess the comparative efficacy of a hybrid arch bar (hAB) and the conventional Erich arch bar (EAB) in temporarily fixing jaw fractures during open reduction and internal fixation (ORIF) procedures.**Materials& Methods:** A total of 40 patients within the age range of 20 to 50 years were enrolled. The patients were randomized into two study groups with 20 patients in each group as follows: Group 1- Patients who received hAB and Group B- Patients who received EAB. Complete demographic and clinical details of all the patients was obtained. The main outcome variable was stability, which was assessed on the incisors and the left and right first molars at three different times four weeks after the arch bar was placed. A An assessment was made of the postoperative problems. All the results were recorded in Microsoft excel sheet and was subjected to statistical analysis using SPSS software.**Results:** While comparing the stability score among group 1 and group 2, significant results were obtained. 3 patients of group 1 demonstrated screw loosening, while 8 patients of group 2 needed wire retightening or replacement. Subjects of hAB group demonstrated higher stable arch bars proportion.**Conclusion:** The hybrid arch bar (hAB) presents several advantages over conventional Erich arch bars (EABs) in clinical practice.**Keywords:** Open maxillomandibular fixation, Hybrid arch bar, Erich arch bar

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**Introduction**

In jaw fractures, the primary objective is to restore proper jaw function and anatomy by ensuring the accurate union of fractured segments. [1] Achieving intraoperative occlusion through maxillomandibular fixation (MMF) is a crucial yet often challenging step in achieving proper fracture reduction [2]. Traditional MMF techniques utilize malleable steel-bearing hook arch bars, allowing for hands-free attainment and maintenance of precise occlusion during surgery with reproducibility [3]. However, drawbacks such as prolonged operative time for placement under general anesthesia, eventual loosening of ligature wires, and limitations for certain patients with dental issues or extensive dental work exist. Moreover, the presence of hardware in the oral cavity can compromise oral hygiene, induce gingivitis, and pose risks of injury to clinicians and assistants due to sharp hardware. To address these challenges, a hybrid arch bar (hAB) for MMF has been developed, aiming to mitigate some of the limitations associated with conventional arch bars, also known as Erich arch bars (EABs) [4,5]. Unlike

EABs, hABs are anchored directly to the alveolar bone using screws, eliminating the reliance on teeth for support. Hence; the present study was conducted for assessing the comparative efficacy of a hybrid arch bar (hAB) and the conventional Erich arch bar (EAB) in temporarily fixing jaw fractures during open reduction and internal fixation (ORIF) procedures.

**Materials & Methods**

A total of 40 patients within the age range of 20 to 50 years were enrolled. Only those patients were included in the present study who underwent ORIF of maxilla and mandible fractures. The patients were randomized into two study groups with 20 patients in each group as follows: Group 1- Patients who received hAB and Group 2- Patients who received EAB. Complete demographic and clinical details of all the patients was obtained. The duration (minutes) from adaptation of hAB to dental arch and placement of the last screw was recorded separately for the upper and lower arch bar. Reproducible pre-traumatic occlusion was seen

intraoperatively; it was identified by the interdigitation of occlusion facets and was grouped according to how simple it was to reduce occlusion. The main outcome variable was stability, which was assessed on the incisors and the left and right first molars at three different times four weeks after the arch bar was placed. A standardized heavy wire twister was used by the lead investigator to clinically assess mobility at the moment of removal for every arch bar. A stability score method was used to assess any movement in the vertical plane that was  $\geq 1$  mm, as it was deemed unstable. An

assessment was made of the postoperative problems. All the results were recorded in Microsoft excel sheet and was subjected to statistical analysis using SPSS software.

### Results

While comparing the stability score among group 1 and group 2, significant results were obtained. 3 patients of group 1 demonstrated screw loosening, while 8 patients of group 2 needed wire retightening or replacement. Subjects of hAB group demonstrated higher stable arch bars proportion.

**Table 1: Stability scores**

Stability score	Group 1 (hAB)	Group 2 (EAB)	p-value
Zero	0	1	0.001 (Significant)
One	0	3	
Two	2	12	
Three	18	4	
Total	20	20	

**Table 2: Risk ratio for instability of arch bars**

Study group	Unstable arch bars	Stable arch bars	p-value
EAB	16	4	0.001 (Significant)
hAB	2	18	

### Discussion

Before the advent of plates and screws for facial fracture fixation, closed reduction with intermaxillary fixation (IMF) was the predominant treatment approach for most maxillofacial fractures. The Erich arch bar (EAB) was widely regarded as the gold standard for IMF due to its ability to promote superior occlusal stability compared to other available methods. Typically, IMF would last for four to six weeks, necessitating stable fixation throughout this period. In contemporary practice, Open Reduction and Internal Fixation (ORIF) has become the primary management approach for mandibular fractures [6]. This technique allows for a shorter IMF period, minimizing patient discomfort. IMF is primarily utilized intraoperatively to facilitate surgical access and patient recovery, with the aim of allowing patients to resume normal activities as soon as possible. However, in certain clinical scenarios such as unstable fractures or concerns regarding the quality of ORIF, IMF may need to be extended postoperatively. In such cases, evidence from this systematic review suggests that the EAB demonstrates superior outcomes when prolonged IMF is required. [7]

In this study, we compared the bone-retained hybrid arch bar (hAB) with the conventional tooth-retained Erich arch bar (EAB) using various clinically significant parameters to identify a rapid and stable method for achieving maxillomandibular fixation (MMF). Although MMF screws share a

resemblance with hABs due to their anchorage in bone, they possess a distinct limitation. Typically, elastics or wires can only be attached to the screw heads (usually four screws for both jaws) [8, 9]

While comparing the stability score among group 1 and group 2, significant results were obtained. 3 patients of group 1 demonstrated screw loosening, while 8 patients of group 2 needed wire retightening or replacement. Subjects of hAB group demonstrated higher stable arch bars proportion. EAB wires can complicate gingival maintenance by promoting debris accumulation and may lead to gingivitis. Additionally, the wires securing the EAB around the teeth during application can potentially cause ischemic necrosis of the mucosa, extrusion, and subsequent loss of tooth vitality [9]. On the other hand, screw-based approaches such as hABs may cause gingival trauma and stimulate mucosal overgrowth around the screws. A study by van den Bergh et al. observed "mucosal disturbances" in patients undergoing IMF with screws or arch bars, with 22 patients equally distributed between the two groups experiencing complications. The authors reported partial mucosal overgrowth around 11 screws (5.8%) in 11 patients (45.8%) in the IMF screw group, while gingival hyperplasia was observed in 11 patients (42.3%) in the arch bar group, primarily located at the interdental papillae and diffusely across the oral cavity. Similarly, Rothe et al. [10] reported minimal mucosal growth with conventional EABs, followed by modified arch bars and IMF screws. In a review of MMF screws, Cornelius and Ehrenfeld

[11] noted that soft tissue burying or mucosal overgrowth of MMF screws was mainly encountered in studies where screws were placed adjacent to or within the mobile mucosa, suggesting mucosal overgrowth as a complication specific to MMF screws.

Recent studies have highlighted several drawbacks associated with Erich arch bar (EAB) application, including prolonged operating time, risks of needle-stick injuries, elevated plaque index, potential for periodontal damage, and undesirable tooth movement in lateral and extrusive directions [12,13]. Additionally, EAB may not be suitable for certain clinical scenarios such as cases of anterior open bite, pediatric fractures, patients with mental disorders, and partial or completely edentulous fractures [14].

### Conclusion

The hybrid arch bar (hAB) presents several advantages over conventional Erich arch bars (EABs) in clinical practice.

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