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Mini Review

Bone Supported Arch Bars

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Abstract

Inter Maxillary Fixation (IMF) is a standard component of the treatment of mandibular fractures. Number of IMF techniques has been described in the literature till date such as Erich arch bars, Ernst ligatures, Ivy loops, and Gilmer wiring. Arch bars are considered as the gold standard for IMF. Bone supported arch bars uses titanium arch bars fitted with eyelets for self-drilling screw fixation into the maxilla and mandible. A narrative review was conducted to provide concise and current evidence about the efficacy of bone supported arch bars.

Keywords: IMF; Bone Supported; Arch Bars; Maxilla

Introduction

Intermaxillary fixation (IMF) or Maxillomandibular fixation IMF)) is considered as a hallmark method in fixing the jaws following a fracture injury. It forms a base for facial reconstruction procedures among fracture cases. A perfect IMF is a must for improved post operative outcomes. Number of IMF techniques has been described in the literature till date such as Erich arch bars, Ernst ligatures, Ivy loops, and Gilmer wiring [1]. Each one of it has its own advantages and limitations. These techniques have their limitations in setting up the wire in poor dentition cases, partially edentulous cases, increased surgical time, and associated with needle stick injuries to the surgeon. Hence, search for an alternative procedure resulted in the development of bone supported arch bars which uses titanium arch bars fitted with eyelets for self-drilling screw fixation into the maxilla and mandible [2]. This alternative combines the applications of both arch bars and bone supported devices. With time, surgeons are preferring bone supported arch bars over conventional Erich arch bar as they hold many advantages.

Bone supported arch bars. Background.

In order to overcome the limitations associated with conventional IMF procedures, in 1981 Otten described the application of screws for IMF. In 1989, Arthur and Berardo first described the use of dedicated cortical screws for IMF [2]. The first-generation IMF screws used were monocortical screws which required drilling and associated with the risk of damaging the adjacent teeth roots. Later, bicortical screws were introduced to avoid the damage to the adjacent roots. Self-tapping screws are recommended. Generally, 4 self-tapping screws are placed for adequate IMF. Investigations are required before the placement of the screws in both maxilla and mandible. Both titanium and stainless-steel screws are avail-

able. However, screws made of titanium are preferred as the tensile strength of it is equivalent to bone. Stainless steel screws could be used in cases where bone density is high [3].

Advantages of bone supported arch bars [3]

- Screw hole necrosis and bone sequestration is reduced.
- Reduced chances of screw loosening.
- Screw insertion/removal is quite easy.
- Cross infection associated with wires is eliminated.
- Reduction of damage to periodontium and oral mucosa.
- Oral hygiene maintenance is made easy.
- Titanium screws used are compatible with any plating system.

Discussion of Literature Review

Literature search about the bone supported arch bars resulted in a number of studies comparing it with Erich arch bars in IMF cases. In a study by Chao., *et al*. in 2015 [4], the time taken for placement of bone supported arch bar is less when compared with Erich arch bars. It could be attributed to the 2mm self-tapping screw system used in bone supported arch bars. Additionally, it was found that the root perforation/damage associated with screw placement was less with bone supported arch bar. When the device fee was considered, it was same for both Erich arch bars and bone supported arch bars. In a similar study, Rani., *et al*. in 2018 [5]. compared the efficacy of Erich arch bars and Bone supported arch bar for IMF cases. The study results showed that the oral hygiene maintenance was good in 30% of cases in bone supported arch bar group compared to 15% of cases in Erich arch bar group. The results of the study suggested that bone supported arch bars fixed with screws in maxilla and mandible might be a suitable alternative to alternative to Erich arch bars secured with circumdental wires for IMF in terms of clinical outcome measures. Additionally, reduced operative time and reduced glove perforation rate was observed in the same study.

Rai., *et al.* in 2011 [6] used bone supported arch bars for IMF in mandibular fracture cases. In this study, it was observed that there was soft tissue growth over the screws as the screw head was small and were placed above the attached gingiva to avoid alveolar bone loss. Hence, a stainless-steel washer was added to the screw head to avoid soft tissue growth over it. Though many successful cases have been described with the use of bone supported arch bar, Jones., *et al*. [7]. stated that IMF with screws is adequate and strong enough only for a short period or acts as a temporary treatment option in stabilizing the fractured jaws and not suitable for long term IMF.

IMF screws have been modified according to the clinical situation. Jang., *et al.* [8] used patient's denture as a splint in multiple fractures involving mandible and inserted screws through the vestibular flanges of the denture. This kept the denture in position which was used as a splint after the closed reduction of the fractured segments. MMF screws are also used to provide orthodontic anchorage with the jaws in IMF position in orthognathic surgery cases.

As there are multiple views on the efficacy of bone supported arch bars, it becomes difficult for a clinican/a researcher to understand it wisely. A systematic review and meta-analysis were conducted in 2021 [9] with the aim of identifying which one is better among bone supported arch bar and Erich arch bar. Search was directed towards the outcomes such as time taken for placement, oral hygiene maintenance, stability in oral cavity, root damage and glove perforation. The analysis results showed that bone supported arch bars are associated with reduced treatment time and better oral hygiene maintenance. The authors concluded that bone supported arch bars are superior to Erich arch bars and further studies are needed to analyze the associated confounding factors.

Conclusion

The results of the literature search show that bone supported arch bar remains as the best advancement till date for a perfect IMF. It is associated with better outcome measures.[10] Further research should aim at the factors which could be useful to further improve the treatment results and outcome measures. A larger sample size might be helpful in bringing up stronger conclusions. Efficacy of bone supported arch bars in different clinical situations, in different fracture types and with the presence of other facial fractures is warranted in the near future.

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