

## ORIGINAL RESEARCH

# Analysis of efficacy of use of arch bar vs ivy eyelet for IMF: A comparative study

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### ABSTRACT

**Background:** To compare and evaluate arch bar with ivy eyelet for inter-maxillary fixation.

**Materials & Methods:** A total of 20 subjects were enrolled. The subjects were divided into two groups with 10 in each group. In Group 1 cases arch bar was placed and in group 2, ivy eyelet wiring was done. The p- value less than 0.05 was considered significant.

**Results:** A total of 20 subjects were enrolled. The patient acceptance was good in 7 cases of arch bar and 3 cases of ivy eyelet wiring. In the majority of cases within both groups, the postoperative occlusion was deemed satisfactory.

**Conclusion:** Both Ivy eyelets and arch bars demonstrate equivalent efficacy for intermaxillary fixation, with no statistically significant difference observed between the two methods.

**Keywords:** Occlusion, Inter-maxillary fixation, Arch bar.

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### INTRODUCTION

Inter-maxillary fixation (IMF) is an important contrivance in the treatment of maxillofacial fractures, and is usually applied by wiring together the fixed upper and lower arch bars or Ivy eyelet. Different IMF methods, including prefabricated arch bars, direct interdental wiring, continuous or multiple loop wiring, and IMF screws, have been reported.<sup>1,2</sup> However, these techniques are time consuming, complicated, costly, need laboratory support, extend surgery time.<sup>3</sup> In maxillofacial fractures, it is most important to restore normal occlusion by intermaxillary fixation (IMF). Erich arch bars are most commonly used for achieving IMF because of their rigidity and versatility.<sup>4</sup> To fix the arch bar to teeth, multiple wires need to be passed around the teeth and then two ends of the same wire (one end goes above and one end goes below the arch bar) are picked up and twisted firmly to secure the arch bar against the teeth. Multiple wire ends around the teeth look same and lie close to each other in a confined space creating confusion. One may pick up the end of the next wire and twist, which not only causes loosening of arch bar but also wasting of the next in line wire. This makes removal of two consecutive wires necessary. The treatment of mandibular fractures has

been in a constant state of evolution over the last few decades.<sup>5</sup> The main aim of treating mandibular fractures includes: fracture site reduction, stabilization, and achievement of correct dental occlusion. During these processes, it is also advantageous to use methods that decrease the risk of percutaneous transmission of blood-borne diseases, operating time and duration of general anesthesia, and hospital costs. The management of maxillofacial fractures includes different techniques from closed reduction to open reduction and internal fixation (ORIF) and requires control of the dental occlusion with the help of IMF which is time-consuming with the use of conventional technique.<sup>6</sup> The arch bar has been the backbone for the administration of maxillary mandibular fracture since First World War.<sup>7</sup> The originators of this technique, Gilmer in USA and Sauer in Germany, used a regular round bar flattened on one side that was ligated by using brass ligature wires to the teeth.<sup>8</sup> Ivy and Blair's modification was "flattened on one side" which was about 2 mm in width to confine better to the teeth and provide greater stability. Introduction of "bone plating system" has reduced the duration of IMF though there is often a need for temporary intermaxillary fixation intra-operatively and sometimes postoperatively to

correct dental occlusal discrepancies by elastic traction. <sup>6</sup>Erich arch bar or eyelet wires are the most common methods of achieving IMF, although other techniques are described. These methods are relatively time-consuming for application and removal of arch bars besides having an inherent risk of perforation of the surgeons gloves and consequent “needle stick injury” caused by the sharp-ended wires. <sup>9</sup> Moreover, this technique is difficult to use when the teeth are grossly carious, periodontally compromised, crowded, and extensive crown and bridgework in oral cavity. <sup>10</sup> Final tightening of wires during the placement of conventional arch bars around the teeth may cause “necrosis of the mucosa,” “extrusion,” and subsequent loss of vitality of the tooth. It is also not easy to maintain the gingival health. <sup>11</sup> Hence, this study was conducted to compare and evaluate the use of arch bar vs ivy eyelet for IMF.

## MATERIALS & METHODS

A total of 20 subjects were enrolled. The subjects were divided into two groups with 10 in each group. In Group 1 cases arch bar was placed and in group 2, ivy eyelet wiring was done. Complete dental history was

taken. The assessment of postoperative occlusion took place a month after the procedure, with outcomes categorized as either satisfactory or unsatisfactory based on the presence of malocclusion issues such as tipping or rotation. Chi-squared test was done. The results were analysed using SPSS software. The p-value less than 0.05 was considered significant.

## RESULTS

A total of 20 subjects were enrolled. The patient acceptance was good in 7 cases of arch bar and 3 cases of ivy eyelet wiring. In the majority of cases within both groups, the postoperative occlusion was deemed satisfactory. In cases involving arch bars, the surgical procedure typically took between 90 to 115 minutes, while for Ivy eyelet cases, the surgical time ranged from 75 to 105 minutes. Oral hygiene was found to be subpar in four cases among those treated with arch bars and in two cases among those treated with Ivy eyelets. Upon conducting a chi-square test, no statistically significant difference was observed between the two groups, as the p-value exceeded 0.05.

**Table 1: Evaluation of arch bar and ivy eyelet wiring**

| Parameter                  |                | Arch bar | Ivy eyelet | P – value |
|----------------------------|----------------|----------|------------|-----------|
| Patient acceptance         | Good           | 7 (70%)  | 3 (30%)    | 0.117     |
|                            | Poor           | 3 (30%)  | 7 (70%)    |           |
| Occlusion post-operatively | Satisfactory   | 9 (90%)  | 8 (80%)    | 0.845     |
|                            | Unsatisfactory | 1 (10%)  | 2 (20%)    |           |
| Surgical time (minutes)    |                | 99.2     | 102.7      | 0.212     |
| Oral hygiene               | Good           | 6 (60%)  | 8(80%)     | 0.338     |
|                            | Poor           | 4 (40%)  | 2 (20%)    |           |
| Stability                  | Adequate       | 9 (90%)  | 8 (80%)    | 0.458     |
|                            | Inadequate     | 1 (10%)  | 2 (20%)    |           |

## DISCUSSION

The first and most important aspect of surgical correction of mandibular fractures is to reduce the fracture properly. In the tooth-bearing bones, it is of utmost importance to place the teeth in a pre-injury, occlusal relationship. <sup>12</sup> To establish a proper occlusal relationship, several techniques have been described, generally referred to as intermaxillary fixation (IMF). <sup>13</sup> Various wiring techniques are available for closed reduction of mandibular fractures like Gilmer’s wiring, <sup>14</sup> Col stout wiring, Obwegeser wiring, kazanjian buttons, eyelet’s and arch bars. <sup>15</sup> Hence, this study was conducted to compare and evaluate the use of arch bar vs ivy eyelet for IMF. In the present study, a total of 20 subjects were enrolled. The patient acceptance was good in 7 cases of arch bar and 3 cases of ivy eyelet wiring. In the majority of cases within both groups, the postoperative occlusion was deemed satisfactory. In

cases involving arch bars, the surgical procedure typically took between 90 to 115 minutes, while for Ivy eyelet cases, the surgical time ranged from 75 to 105 minutes. A study by Kuldeep Pal, prospective observational study was conducted amongst 30 subjects who had mandibular fracture and were randomly allocated into two groups. It was poor in 5 cases of arch bar and 9 cases of ivy eyelet. There was no significant difference between the two groups. According to the study, both ivy eyelet and Erich arch bars are equally efficacious for performing maxillomandibular fixation with no significant difference between the two. <sup>16</sup> In the present study, oral hygiene was found to be subpar in four cases among those treated with arch bars and in two cases among those treated with Ivy eyelets. Upon conducting a chi-square test, no statistically significant difference was observed between the two groups, as the p-value exceeded 0.05. Another study by Pathak P et al,

randomized prospective study included 20 patients with mandibular fracture who were randomly allotted to two groups. Group A patients received modified **Screw retained arch bar** and group B patients received Erich's arch bar. The parameters considered were time taken to place the arch bar, perforation in the gloves, patient acceptance, oral hygiene, iatrogenic dental injuries, and needle (wire) stick injuries during IMF. The mean time taken for arch bar placement was 27.20 min with modified **Screw retained arch bars** compared with 82.50 min with Erich's arch bar. Incidence of glove perforations was more in group B patients. Oral hygiene status was good in 90% of the patients from group A whereas it was 100% fair in group B patients. This study has shown that both the techniques achieve satisfactory IMF with post-operative occlusion. IMF with modified **Screw retained arch bar** reduces the operating time and the incidence of the needle (wire) prick injuries. But modified **Screw retained arch bar** has its own limitations in spite of its ease of application.<sup>17</sup> Rothe TM et al, a randomized clinical trial in which participants were divided into three groups of 10 each, and designated as Group A, Group B, and Group C. In Group A, intermaxillary fixation was achieved by the conventional method using Erich arch bar, fastened with 26-gauge stainless-steel wires. In Group B, intermaxillary fixation was achieved by the use of 2 mm × 8 mm 4–6 stainless-steel intermaxillary fixation screws. In Group C, intermaxillary fixation was achieved by modified screw arch bar. Modified arch bar was significantly stable when compared with IMF screws, and therefore, for the patients who require long-term intermaxillary fixation, modified arch bars can be a viable option.<sup>18</sup> Rai A et al, a prospective randomized clinical trial. The time required for placement and removal (in minutes) was compared between the eyelet wiring and direct interdental wiring techniques. Postoperative stability after achieving IMF was analyzed in the 2 groups. Eyelet wiring is preferable to direct interdental wiring as evidenced by fewer complications, and requires a shorter operating time in patients with minimally displaced fractures.<sup>19</sup> Verma A et al, conducted a study in which upper and lower arch bars or Ivy eyelet wiring is secured by wires and IMF is done with the help of box wiring. They present a new type of IMF technique, using 26-gauge stainless steel 'loop-design' wire, which is a simple, quick, economical and minimally invasive technique without using arch bars.<sup>20</sup> Kumar M et al, aimed to establish the MMF technique using Erich arch bars and Ivy eyelet wiring for closed reduction and observed when ivy eyelets and Arch bar were compared there was no significant difference between the two as far as stabilization and needle stick injuries were concerned.<sup>21</sup>

## CONCLUSION

Both Ivy eyelets and arch bars demonstrate equivalent efficacy for intermaxillary fixation, with no statistically significant difference observed between the two methods.

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