

Are Embrasure Wires Better Than Arch Bars for Intermaxillary Fixation?

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Purpose: To compare the outcomes of mandible fractures treated with open reduction and internal fixation versus adjunctive intermaxillary fixation (IMF) using 2 different techniques.

Materials and Methods: We performed a retrospective medical record review. The medical records of consecutive patients with mandible fractures treated surgically with adjunctive use of IMF (embrasure wires vs arch bars) were reviewed for demographic data, etiology, fracture location, antibiotic use, and interval to repair. Specifically, the complications, including infection, malunion or nonunion, hardware failure, and wound dehiscence, were recorded. The data were analyzed using Student's *t* test and the chi-square test or Fisher's exact test, as appropriate. Statistical significance was set at $P < .05$. A descriptive cost analysis was also performed and compared with those from previously published studies.

Results: The data from 86 subjects were included in the present study. Of the 86 subjects, 33 were in the embrasure wire group and 53 in the arch bar group. Of the patients in the arch bar group, 26% had complications compared with 15% in the embrasure wire IMF group. No statistically significant difference between the groups in terms of infection ($P = .63$), hardware failure ($P = .75$), malocclusion ($P = .85$), and nonunion ($P = 1.0$). However, the cost of arch bar placement and removal was approximately \$2,672 more than the placement of embrasure wires.

Conclusions: Patients treated with embrasure wire IMF had slightly better clinical outcomes compared with those treated with arch bar IMF. Also, the cost reduction for patients treated with embrasure wire IMF was significant.

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The concept of establishing an optimal occlusal relationship remains a critical part of complex facial trauma and reconstructive procedures. Intermaxillary fixation (IMF) uses occlusion as a foundation to repair facial fractures. Open treatment of complex mandible fractures could require some form of IMF or manual reduction in a selected few cases.¹ During the past several decades, numerous different techniques have been reported for IMF in the treatment of mandibular fractures.²⁻⁷ IMF with arch bars has been the most commonly used method. However, the application time, risk of disease transmission, dental caries, and periodontal disease, and limited use in a partially dentate condition are some of the disadvantages associated with arch bars.⁸ Relatively recent tech-

niques such as IMF screws and embrasure wires were introduced to overcome the limitations of traditional arch bar IMF. Many studies have been published comparing the efficiency of the different techniques. However, few studies have reported on the quality of IMF according to the clinical outcomes. The purpose of the present study was to evaluate the outcomes of surgically treated mandible fractures with adjunctive use of either arch bars or embrasure wire IMF.

Materials and Methods

The present study was a retrospective study to analyze the treatment of a series of patients with mandible fractures treated by open reduction and

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rigid internal fixation, assess the complications, and determine whether the method of intraoperative IMF affected the surgical outcomes. One group of patients was treated with adjunctive use of embrasure wire IMF and the other with arch bar IMF. All patients treated for mandible fractures from April 2011 to April 2012 were included in the present study. Pediatric (younger than 14 years old) mandible fractures and medical records with incomplete data were excluded from the present study. The institutional review board at the university approved the review.

The demographic data such as age, gender, medical history, and tobacco use were recorded. The cause of injury and associated fractures were also recorded. In addition, postoperative complications, including infection, hardware failure, malocclusion, nonunion, and wound dehiscence, were evaluated. The complications were analyzed according to the diagnosis at the follow-up examinations. Although the clinician's examination of malocclusion was considered, only patients who complained of an "improper bite" or a "bad bite" were noted. During the follow-up period, all the patients underwent some form of radiographic evaluation, including panoramic radiography, cone beam computed tomography, or postoperative plain radiographic series, of the mandible. The data were analyzed using Student's *t* test and the chi-square test or Fisher's exact test, as appropriate. Statistical significance was set at $P < .05$. A general cost analysis was performed that included the operating room, hardware, anesthesia, and procedure costs.

For the embrasure wire technique, with the mouth open, a single stainless steel wire (18 or 20 gauge) approximately 5 to 6 in., is introduced through the facial embrasure between the maxillary premolar and molar (Fig 1). Next, the palatal end of the wire is looped and then passed through the opposing lingual embrasure in the mandible (Figs 2, 3). Next, the fracture segments are reduced appropriately, and then both the embrasure wires are twisted together until the fixation is rigid (Figs 4, 5). Just 1 wire on each side will be adequate for excellent fixation (Fig 2). It is very important to reduce the fractures before twisting the wires. Unlike arch bars, the embrasure wires provide superior stability, which could prevent fracture reduction once IMF has been established. Ideally, normal interproximal contacts are necessary to achieve good fixation. However, in patients with missing teeth or periodontal involvement, the wires can be passed through the alveolus after making an entry point with a small drill bit. The occlusion can then be established by matching the opposing wear facets on the teeth. When removing the fixation, the wires should be cut close to the teeth. Gentle pressure is placed on the maxilla and mandible to help open the mouth slightly. Next, a periosteal elevator or a wire

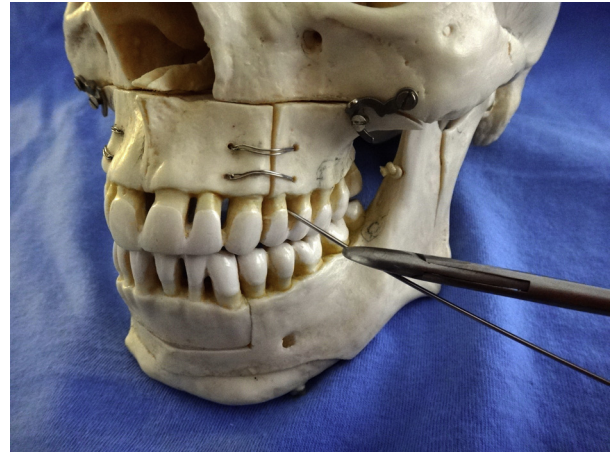


FIGURE 1. A 20-gauge wire entering the facial embrasure between the premolars on a skull model.

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pusher is gently used to push the wire toward the tongue and the wires are removed. Placement and removal of embrasure wires requires 2 to 3 minutes.

Results

The data from 86 patients were included in the present study. Of the 86 patients, 33 were in the embrasure wire group and 53 in the arch bar group (Table 1). Systemic diseases that affected wound healing were recorded in 3 patients (1 in the embrasure group and 2 in the arch bar group). Approximately 85% of the patients in the embrasure group and 60% in the arch bar group reported a history of smoking. Assault was the most common mechanism of fractures in both groups. The most common fracture location



FIGURE 2. Wire exiting through the lingual embrasure on the palatal side.

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