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Review Article

Treatment of Mandibular Angle Fractures

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The management of mandibular angle fractures is often challenging and results in the highest complication rate among fractures of the mandible. In addition, the optimal treatment modality for angle fractures remains controversial. Traditional treatment protocols for angle fractures have involved rigid fixation with intraoperative maxillomandibular fixation (MMF) to ensure absolute stability. However, more recently, non-compression miniplates have gained in popularity and the use of absolute intraoperative MMF as an adjunct to internal fixation has become controversial. In this article, the history of, and current trends in, the treatment of mandibular angle fractures will be briefly reviewed. In addition, issues regarding the management of the third molar tooth will be discussed.

Keywords: Mandibular fractures / Fracture fixation, internal / Molar, third

INTRODUCTION

Due to its prominence, the mandible is frequently involved in fractures of the facial bones. A retrospective review published in 2007 showed that in patients with a facial fracture, mandibular fractures ranked second (23.3%) to nasal bone fractures (58.6%) [1]. Among mandibular fractures, the incidence of angle fracture is relatively high (27%–30%) because the cross-sectional area is relatively thin within the angle, and also because of the presence of the third molar tooth [2]. Although many studies in the literature have suggested technical options to treat such fractures, the data are variable and the ideal treatment modality remains controversial. In addition, the reported complication rates range from 0–32% [3-10].

In this study, current trends in the treatment of isolated mandibular angle fractures will be briefly reviewed.

VARIOUS TECHNIQUES

Various techniques, including closed reduction, open reduction by non-rigid fixation with wire, and open reduction and rigid internal fixation with plates or lag screws, have been reported for the management of mandibular angle fractures [11]. Although open reduction and internal fixation were first introduced in 1888, external techniques have predominated due to the poor treatment results associated with the corrosion and fatigue of metal plates.

In the 1960s, with the introduction of Viltallium compression plating by Luhr [12], internal fixation began to gain popularity. In the 1970s, the AO Foundation/Association for the Study of Internal Fixation (AO/ASIF) developed bone healing techniques that involved compression via dynamic compression plating. They stressed the need for absolute stability to prevent fragment mobility and to ensure primary bone healing [13]. Hence, for treatment of angle fractures, the original AO technique involved the placement of double plates along the superior and inferior borders of the mandible.

Simultaneously, Michelet et al. [14] began experimenting with monocortical non-compression plates for mandibular angle fractures. Champy et al. [15] showed that absolute rigid fixation was not mandatory for the healing of mandibular fractures and recommended the use of a single non-compression miniplate on the superior border of the mandible for angle fractures. With this technique, safe placement of the plate without causing damage to

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the roots of the teeth was possible because the size of the plate was small and the screws were monocortical. Subsequently, Ellis et al. [6,7,10] identified a trend towards increasing complication rates with increasing rigidity of fixation. This appeared to be because rigid fixation with a smaller number of plates required less periosteal stripping, thereby reducing disruption of the blood supply [16]. A recent systemic meta-analysis also showed that the single miniplate technique was statistically significantly superior compared with the two miniplate technique with regard to the incidence of postoperative complications [17].

However, many biomechanical tests continue to demonstrate the stability of two plates compared to single plate fixation for mandibular angle fractures and some investigators have advocated the use of two plate fixation for angle fractures [18-20]. In these studies, bony gaps were observed along the inferior border and such movement of the fracture was considered to contribute to subsequent complications, such as infection.

In spite of these conflicting results, the concepts underlying the management of mandibular angle fractures continue to evolve and a transition from large, dual compression plates to a single miniplate appears to be evident. A survey by the North American and European AO/ASIF regarding treatment modalities for mandibular angle fractures showed that about 51% of responders preferred the Champy technique while 22% preferred the placement of multiple plates. Interestingly, surgeons who treated more than 10 mandibular fractures per year favored the Champy technique over the tension band and bicortical plate combination, while surgeons who treated less than 10 mandibular fractures per year favored the tension band and bicortical compression plate combination over the Champy technique. Although superior placement of a single plate is generally preferred, an inferior border plate is indicated if adequate bone is lacking at the superior border (comminuted fracture), or if there is a history of previously failed hardware or a pathologic fracture is present [17].

Another controversy involves the use of postoperative maxillomandibular fixation (MMF). In a retrospective study of 287 patients, Valentino and Marentette [21] found that the addition of MMF did not significantly alter complication rates. Similarly, Kumar et al. [22] found no significant differences in outcomes or complications between internal fixation with immediate release and internal fixation with 5–7 days of MMF. However, postoperative MMF still seems to have several advantages, including allowing the undisturbed healing of the intraoral incision, stabilizing the occlusion, and encouraging patients to become accustomed to a liquid diet [16].

The final point to consider is the management of the third molar tooth. Traditionally, the third molar tooth in the line of an angle fracture was known to be associated with an increased risk of infection, because intraoral communication via the periodontal ligament promotes the ingress of bacteria-laden saliva to the fracture site [16,23,24]. The absolute indications for the removal of the third molar tooth are as follows: (1) non-restorable damage to the tooth substance; (2) grade II or III mobility due to chronic periodontitis; (3) the presence of caries with periapical pathology; and (4) a displaced or extracted tooth preventing reduction [25].

On the other hand, some authors have advocated that the tooth in the line of the fracture should be preserved [25]. The preserved tooth can help with the repositioning of the fracture segments and can be used later on as an abutment for prosthesis placement. In addition, extraction might cause trauma and compounding of the fracture, which precludes rigid fixation. A recent systemic review and meta-analysis also showed that there was no significant statistical difference between removing or retaining the tooth in the line of the fracture with respect to the occurrence of postoperative infection [26].

These conflicting results indicate that the occurrence of postoperative infection does not depend solely on the status of the third molar tooth, but on many other factors (e.g., adequacy of the fixation, administration of adequate antibiotics, socioeconomic condition of the patient, oral hygiene, postoperative compliance of the patient, etc.).

CONCLUSION

In conclusion, although a trend does exist, the definitive treatment option for mandibular angle fractures remains elusive. This is perhaps to be expected because there are numerous confounding preoperative, intraoperative, and postoperative factors that

can affect surgical outcomes. It is therefore important to understand the pros and cons of each treatment option and individualize it according to the unique condition of the patient.

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