Original Article

Transoral approach alone in single miniplate osteosynthesis of angle fracture - our experience

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ABSTRACT

Aim: The aim of this study was to determine the outcome of transoral approach alone to treat the mandibular angle fracture using single 2.0 mm miniplate. **Materials and Methods:** In this study, 28 patients were included and treated with 2.0 mm single miniplate osteosynthesis at upper border along Champy's line of osteosynthesis using transoral approach alone. **Results:** All the cases were treated successfully with 2.0 mm single miniplate with common complications such as infection (two cases) and plate exposure (one case) in a total of two cases. **Conclusion:** Use of single miniplates by transoral approach alone for superior border osteosynthesis is effective and simple approach without need of extra armamentarium.

Key words: Angle region, mandible fracture, single miniplate, transoral approach

Introduction

The mandible occupies a very prominent position on the face and vulnerable to intentional and unintentional trauma accounting for nearly 70% of maxillofacial fractures.[1,2] Haug *et al*. gave the ratio of the incidence of mandibular, zygomatic, and maxillary fractures were 6:2:1, respectively.[3]

Mandibular angle fractures have increased significantly in the last decade[3,4] and represent 26%–35% of all mandibular fractures.[1,2] There are several reasons proposed for the increased occurrence of mandibular angle fracture: The abrupt change in the anatomy at mandibular angle region which is 20° in the vertical plane and 90° in the horizontal plane at the upper border, the presence of impacted mandibular third molars, which weakens the region,[5,6] less cross-sectional area due to the large amount of space occupied by the crypt of mandibular third molars, and biomechanical consideration of angle as a lever area of mandible.[7]

The unfavorable mandibular angle fractures require open reduction and internal fixation (ORIF) as the applied masticatory forces lead to rotation of the proximal and distal fracture segments and cause displacement of the ramus.[6,7] These above said reasons and limited intraoral access make treatment difficult with high complication rate (0%–32%).[8-10]

The type of fracture, location of fracture, amount of displacement, surgeon's experience, and training often dictate decision about approaches for ORIF of angle fractures. Various treatment modalities are in-practice for mandibular angle fractures ranging from simple maxillomandibular fixation (MMF) to rigid

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internal fixation, although the ideal modality remains controversial.[11-13]

The aim of this study was to determine the outcome of intraoral approach alone to treat the fractures of the mandibular angle using single 2.0 mm miniplate.

Materials and Methods

A total of 28 patients treated for mandibular angle fracture were included over the period from January 2014 to December 2015 in the present study. Patients were aged 16–56 years with sufficient dentition to reproduce the occlusion. All the patients were treated with a single four holed, 2.0-mm noncompression miniplate at the superior border through transoral approach alone.

All the cases were admitted as inpatients and treated after obtaining written informed consent from the patient. Orthopantomogram was the radiographic investigation of choice for all patients.

General anesthesia was administered through nasotracheal intubation. The occlusion was reestablished after manual reduction and MMF was achieved through the application of the arch bars. The incision was placed intraorally, over the external oblique ridge starting from the distal aspect of the second molar and extending over the ascending ramus posteriorly about 1 cm superior to occlusal plane. A full thickness mucoperiosteal flap was reflected along the superior and lateral aspect of the mandible taking care to preserve the integrity of the lingual mucoperiosteum. Third molars in the line of injury, which were mobile, had root exposure in markedly distracted fractures, or interfered with either reduction or fixation of fractures was extracted.

A 2 mm four-hole noncompression miniplate plate was contoured and adapted along the medial side of the external oblique ridge and held in position with plate holding forceps.

The first drill hole was placed closest to the fracture site on the distal fragment using 2-mm bur and copious saline irrigation. The plate was stabilized with a 2-mm titanium screw. The second hole was placed on the closest to the fracture anteriorly and stabilized. The other two holes were similarly prepared and stabilized. We did not use drains in our patients. We applied MMF to all of our patients for 10 days. The occlusion and alignment of the fracture line were checked, and the wounds were closed with polyglactin 3-0 sutures.

All the patients were discharged on the third active postoperative day. Antibiotics were maintained for 5 days postoperatively. All patients were advised soft diet and given oral hygiene instructions.

The follow-up period was for a maximum of 6 months with review being done at 7 days, 3 weeks, 3 months, and 6 months with instructions to report to the department in case of any problems.

Results

We studied 28 patients with mandibular angle fractures. Of the total, 24 patients (86%) were males and 4 patients (14%) were females with male: female ratio of 6:1. Preoperatively, cross bite was present in all cases. Out of 28 patients [Figure 1], 16 patients (57.1%) had angle fracture alone, 6 patients (21.4%) had associated parasymphysis fractures and body of the mandible, 3 patients (10.7%) had associated condylar fractures, and 3 patients (10.7%) had associated midface fractures. Assaults and road traffic accidents were observed as the most common etiological factors. Fifteen patients (53.57%) presented with neurosensory deficit preoperatively. Those patients who had no neurosensory deficit (46.4%) did not show any neurosensory changes after plating [Figure 2]. MMF was given to all the patients while transoral plating. Plate exposure was observed in 1 patient (3.6%), and infection occurred in only 2 patients (7.1%), which include the patient of plate exposure. None of our patients had malocclusion or malunion over the period of 6 months. All the patients (100%) achieved good occlusion and temporomandibular joint movements [Figure 3].

Discussion

The angle fracture is the most frequent site when only one fracture is present.[3,4] The treatment is dictated by the anatomical location of the fracture line, type of fracture, amount of displacement of the fractured segments, dentition of the patient, associated maxillofacial fractures and general condition of the patient, principles of fixation, esthetic demand by the patient, and experience of the operator. Due to various factors mentioned above, the management of mandibular angle fractures is still a topic of debate in terms of best approach to be used.

Angle fractures of mandible are managed either using closed reduction by MMF or ORIF. Although the closed reduction and MMF are commonly accepted method for treatment of favorable mandibular angle fractures, the major disadvantages are restricted airway, loose excess weight, inability to maintain oral hygiene, and more vulnerable to the sequelae of postoperative hemorrhage and edema. Moreover, the patient has to survive on a

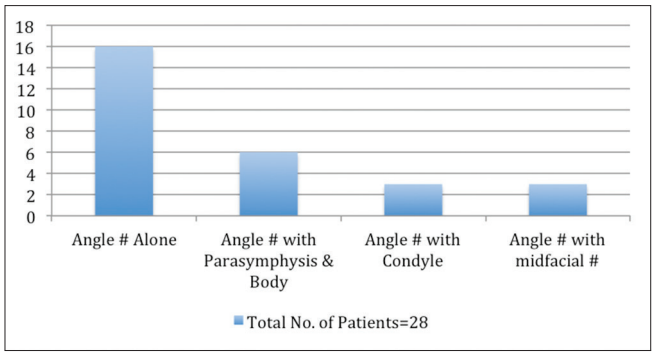

Figure 1: Distribution of patients based on fracture site

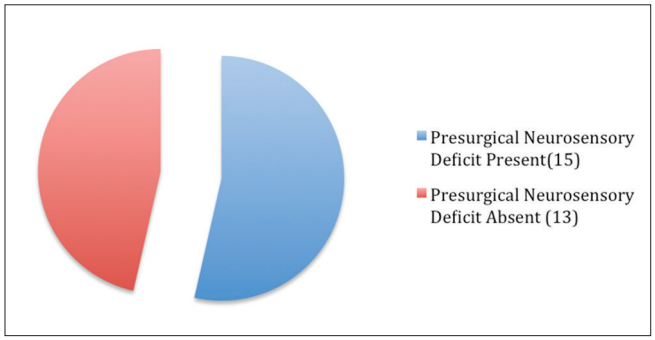

Figure 2: Distribution of the patients based on the neurosensory deficit

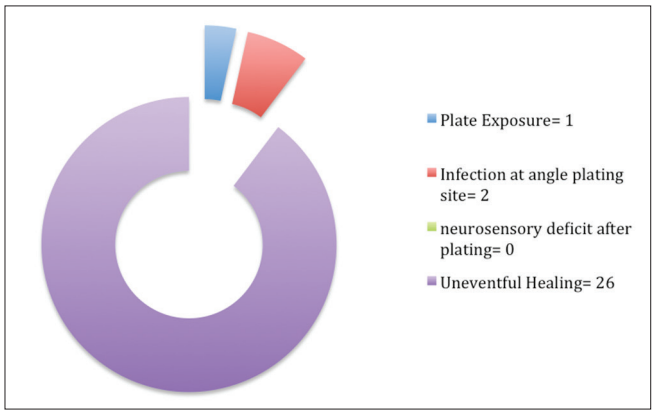

Figure 3: Distribution of patients based on complications

liquid diet for 4–6 weeks.[8] MMF for 4–6 weeks may result in marked thinning and disruption of the articular cartilage.[14]

The methods of ORIF are lag screw osteosynthesis, miniplate osteosynthesis, dynamic compression plates (AO/ASIF principles), and AO reconstruction plate. The advantages of the rigid intraoral fixation over closed reduction technique are: shorter MMF period or no MMF, early return to function, increased patient satisfaction, stable anatomic reduction, minor risk of postoperative fractured fragments displacement, decreased hospital stay, and faster healing.[5,15,16]

According to Scolozzi and Richter,[17] one must perform osteosynthesis capable of supporting full functional load and reinitializing tension forces while maintaining fractures fragments in the anatomic position in case of comminuted fractures, which is possible by AO reconstruction plate only. However, AO reconstruction plates cause the extraoral scar through which the plate is inserted, and the possibility of injury to the marginal mandibular branch of facial nerve is high.[18] AO reconstruction plate should be used in infected and comminuted fractures or extensive bone loss cases.

Compression plates based on AO/ASIF principle have an inherent set of disadvantages. The use of bicortical screws causes sensory disturbances of inferior alveolar nerve in many cases. Postoperative malocclusion rates are also high due to the problems in bending and adapting the rigid compression plate. The traditional extraoral approach has certain disadvantages such as an unaesthetic scar, the risk of facial nerve injury, though exposure and direct application of the plate was better with this approach.[19]

The main objective of any approach is to promote rapid healing, restore the anatomical form and function to reestablish the functional occlusion, facial esthetics with minimal disability, and complications. The transoral approach has overawed the extraoral approach for the management of mandibular angle fractures due to increased esthetic demands and avoidance of extraoral scar.[20,21]

Singh *et al*. described the placement of easily bendable miniplate with monocortical screws transorally in 1973.[22] This technique contradicted the AO concept on compression and absolute rigidity. Champy later executed a series of experiments with miniplate that explained "ideal lines of osteosynthesis" within the mandible.[22] According to Champy *et al*. optimal fixation, stability and a successful outcome can be achieved by miniplate fixation on the mandibular superior border or just below external oblique ridge in cases of the angle fractures as undesirable tensile forces are neutralized while favorable compressive forces are retained during function.[23] The advantages of intraoral approach with miniplates include less risk of facial nerve damage and formation of hypertrophic scar; minimal mucoperiosteal flap need be raised preserving major blood supply, ease of adaptation, ability to confirm occlusion during surgery, and less likely to be palpable because of their smaller size and thinner profile. Moreover, the removal of the plate is easier as it may be performed in the outpatient setup.[16,24]

Gear *et al*.[25] published a survey on current trends in the management of simple, noncomminuted mandibular angle fractures and concluded that a single miniplate on the superior border of the mandible has become the

preferred method of treatment among surgeons. Choi *et al*.[26] showed that two-miniplate fixation technique provides a better stability compared with Champy's method while Schierle *et al*.[27] reported that two-plate fixation might not offer advantages over single plate fixation. Single miniplate fixation is associated with lower complication rate[11,28] compared to double miniplate fixation and no signs of malocclusion[29] for mandibular angle fractures.[8] Ellis[24] examined various treatments modalities for angle fractures and showed a significantly higher complication rate using compression plates.

Keeping the above-mentioned results in mind of all the available techniques, we concentrated on the use of miniplate superior border osteosynthesis (buccal shelf of external oblique ridge) as per Champy's technique to treat noncomminuted angle fractures. In the present study, 2-mm four-hole plate with gap and 2 mm × 8 mm monocortical screws for holes closer to the tooth and 2 mm × 10 mm screws for holes away from the tooth were used transorally.

The studies in literature by Gear *et al*. and Sugar *et al*. have shown increased surgical time with the transbuccal approach when compared to the transoral approach.[25,30] In the present study, the time taken for plating by transoral approach was a mean of 45.6 min. According to Devireddy *et al*.,[7] who compared transoral and extraoral approach for angle fracture osteosynthesis, found that a mean time for plating was 49.7 min transorally and a mean of 73.4 min extraoral approach. They also found transoral approach had minimum difficulty level in the management of the fractures as compared to extraoral approach. A recent study on comparison between transoral versus transbuccal approach for the management of mandibular angle fractures by Khandeparker *et al*.[31] showed that there is no significant difference between the two approaches for surgical time, ease of plate fixation, and no long-term occlusal discrepancy.

Our study found no complications associated with superior border miniplate fixation of mandibular angle fractures except plate exposure in one case and infection in two cases only, which included the plate exposure case. The results of our study are in contrast to Nakamura *et al*.,[32] who found higher complication rate with miniplate fixation. Barry and Kearns[6] presented fifty patients of isolated angle fractures treated with superior border plating and reported 12% experienced complications requiring plate removal, 8% patients experienced superficial soft tissue infections associated with bone plate, treated with oral antibiotics, 2% experienced plate exposure, and a further patient 2% presented with a fractured bone plate.

In the present study, 15 (54%) patients presented with neurosensory deficit preoperatively and 13 (46%) patients had no neurosensory deficit. Not a single patient was identified with sensory nerve disturbance after plating. The sensory nerve disturbances identified after surgery are possibly due to the manipulations at the fracture site during the surgery and most of them being transient.[8] Ellis *et al*. showed 17.2% of total facial nerve disturbances improved after 6 weeks and complete healing after 6 months.[33] Fox and Kellman studied complications in patients treated with two-miniplate fixation for mandibular angle fractures and reported the incidence of damage to inferior alveolar nerve in 4.4% of their patients.[5]

None of our patients showed signs of malunion. Malunion is associated with decreased blood supply to the area, following mandibular fracture treatment.[29] Similarly, Siddiqui *et al*. found no case of malunion;[34] however, Passeri *et al*. reported 1%–2% malunion.[35]

The complication rate is one of the criteria for evaluating the efficacy of treatment of angle fracture. In literature, the complication rate varies from 2.3% to 25.2%.[22] Such enormous difference in complication rate by different authors is because some authors attribute bleeding, hematomas, infections, neural damage, and postoperative calluses to complications while others think that complications include fracture fragments adhesion failure, damage to the lower alveolar nerve, osteomyelitis, and malocclusion.[22] Iizuka and Lindqvist[36] also noted infection as an important complication and suggested that it can be reduced by experience of the operator.

Conclusion

Use of single miniplates by transoral approach alone for superior border osteosynthesis is effective and simple approach without need of extra armamentarium compared to transbuccal or extraoral approaches for the treatment of mandibular angle fractures. The chances of morbidity and complications are feeble. In addition, this method reduces the cost of second miniplates and time for treating mandibular angle fracture.

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Conflicts of interest
There are no conflicts of interest.

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