OPEN ACCESS
Saudi Journal of Medicine
Abbreviated Key Title: Saudi J Med
ISSN 2518-3389 (Print) |ISSN 2518-3397 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: http://scholarsmepub.com/sjm/

Case Report

Management of Mandibular Angle Fractures: Persisting Dilemma

Dr. Priyesh Kesharwani[1], Dr. Ishita Rathee[2], Dr. Himani Gupta[3], Dr. Bharti Wasan[4], Dr. Rahul Vinay Chandra Tiwari[5], Dr. Prateek Tripathy[6]

[1]MDS, Oral and Maxillofacial Surgeon and Implantologist, Dent-O-Facial Multispeciality Dental Clinic, Mira Road, Thane, Maharashtra, India
[2]Consultant OMFS, CDAS hospital, Sector 47, Gurgaon, India
[3]PG student, Sudha Rustagi College of dental science and research, Faridabad, India
[4]MDS, OMFS, Senior lecturer Guru nanak dev dental college and research institute, Sunam Punjab, India
[5]FOGS, MDS, Assistant Professor, Department of Oral and Maxillofacial Surgery, Sri Sai College of Dental Surgery, Vikarabad, India
[6]Final Yr PG, Department of Oral and Maxillofacial Surgery, Kalinga Institute of Dental Sciences, Campus 15 Rd, Chandaka Industrial Estate, K I I T University, Patia, Bhubaneswar, Odisha 751024, India

***Corresponding author:** Dr. Rahul Vinay Chandra Tiwari | **Received:** 06.03.2019 | **Accepted:** 17.03.2019 | **Published:** 30.03.2019
DOI:10.21276/sjm.2019.4.3.8

Abstract

The peculiar anatomy, muscular attachment, and thickness of cortical plate which is interposed between the thicker tooth- bearing mandibular body and the thinner ascending ramus in addition to the presence of the third molar makes the angle region of the mandible irreplaceable. Innumerable treatment modalities have been proposed for mandibular angle fractures; although the ideal modality remains controversial. The choice of fixation in maxillofacial skeleton should be reformed based on the fracture patterns, displacement, stability of segments, and satisfactory postoperative function. However, due to the varied fracture patterns, there arises a need for variation in fixation devices and their localization. We put forth a case of a mandibular angle fracture displaying a unique fracture pattern and its management along with a brief review and update pertaining to the way mandibular angle fractures should be managed.

Keywords: Mandibular angle fracture, ORIF, impacted third molars.

INTRODUCTION

In the current scenario, mandibular fractures are very common accounting for 23% to 42% of all facial fractures [1]. The thin cross-sectional bone area, the presence of the third molars and proximity of tooth roots may cause problems for attaining a stable fixation of the segments. In addition, there is always a limited intraoral access making treatment difficult [2]. The applied masticatory forces on the mandibular angle also lead to rotation of the proximal and distal fracture segments and cause displacement of the ramus in unfavorable fractures [3]. The attachments of highly active muscles on the medial and lateral aspects have ramification not only on the fracture pattern but also on its management. Literature reveals that the mandibular angle shows the maximum number of complications among all mandibular fracture sites. Considering this fact, these fractures can rarely be managed by simple intermaxillary fixation (IMF). Therefore, the primary treatment option is open reduction [4]. Champy states that a single miniplate system provides sufficient support and stability to the bone fragments to allow immediate function [5]. Various types of osteosynthesis in the form of lag screws, compression plates, etc., were tried with varied success [6]. This paper intends to put forth a case of a mandibular angle fracture displaying a unique fracture pattern and its management along with a brief review and update pertaining to the way mandibular angle fractures should be managed.

CASE REPORT

A young male patient in his third decade of life reported to our unit with a chief complaint of pain and swelling in relation to the left side of the lower jaw since one day. He gave a history of sustaining an injury to the left side of his lower jaw during an interpersonal violence. On examination, there was a diffuse swelling on the left side of his face measuring 5 x 4 cm extending from the angle of the mandible anteriorly towards the corner of the mouth and from the lower border of the zygomatic arch inferiorly 1 cm below the lower border of the mandible. Skin overlying the swelling was normal. Swelling was soft and tender on palpation with local increase in temperature. Palpation of the facial skeleton revealed a discontinuity in the lower border of the mandible as well as the posterior border on the left side at the mandibular angle region associated with tenderness. Intraoral examination revealed a reduction in the mouth opening but the occlusion was intact. Patient was subjected to radiographic examination in the form of a CT scan of the middle and lower thirds of the face. Radiographic

evaluation revealed a unique bony discontinuity associated with displacement in the form of a triangular pyramid with its apex at lower border of the mandible inferior to the roots of the third molar as shown in Fig-1. Based on the clinical and radiographic evaluation, we arrived at a diagnosis of mandibular angle fracture secondary to trauma. Patient was advised open reduction and internal fixation under GA. Patient consents were taken and following through general examination and hematological examination the patient was taken up for surgery under GA. Under strict aseptic conditions, a submandibular incision was given 1 cm below the lower border of the mandible and soft tissue dissection was done to reach the lower border of the mandible. The mandibular angle fracture pattern was very much unique in a way that it did not involve the clinical angle or the surgical angle except the anatomical angle. In addition to the fact that its anatomical position is also very much at the base of the mandible involving the lower border as well as the posterior border of the mandible, we advocated the use of an extraoral incision to gain access to the fracture segments. The pterygomasseteric sling was cut and the masseter was striped in the subperiosteal plane along the lateral aspect of the ramus of mandible both posteriorly and superiorly to visualize the fractured segment as shown in Fig-2. The fractured triangular segment was grossly displaced which was held with an instrument and positioned in proper anatomical position as shown in Fig-3. The fact that the fracture segments cannot be stabilized based on the Champy's lines of osteosynthesis for a mandibular angle fracture along with the consideration that the amount of force the pterygomasseteric sling would have on the fixed fracture segments in the postoperative phase has forced us to use a 2.5 mm titanium reconstruction plate at the mandibular angle region for fixation as shown in Fig-4. Following the achievement of adequate hemostasis the wound was closed in layers. 3 months following surgery, the patient showed adequate mouth opening with good occlusion and satisfactory mastication with proper continuity at the lower and posterior borders of the mandible.

Fig-1: 3DCT Scan showing Mandibular Fracture

Fig-2: Clinical Picture showing Fracture Segment

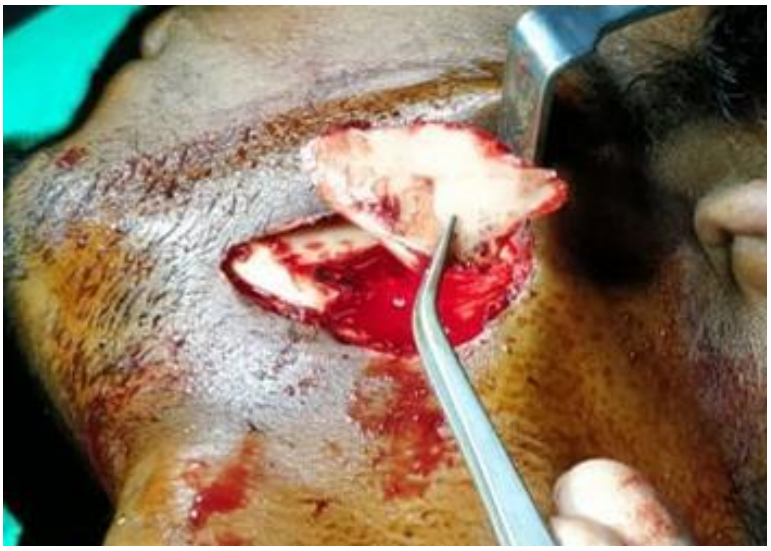

Fig-3: Anatomical Position of Fracture Traingular Segment

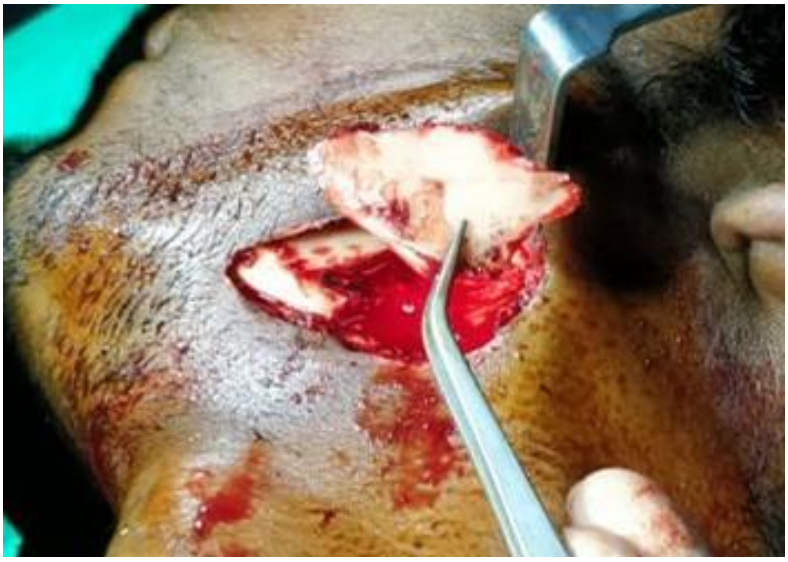

Fig-4: Fixation with Miniplate & Screws

DISCUSSION

Mandible is considered to be one of the strongest and most rigid bone of the facial skeleton. It is susceptible to fracture at various sites and accounts for 40–65% of all facial fractures [7]. The patterns of mandibular fracture depend on numerous factors in the form of the size of the object, direction, nature and surface area of the impacting force. Other contributing factors include presence of soft tissue bulk and biomechanical characteristics of the mandible [8]. 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 [9]. Third molar tooth is located exactly at this point of angulation between the posterior body and ramus. When third molars remain unerupted or partially rupted, this region becomes an area of inherent weakness and the incidence of condylar fracture decreases whereas the incidence of angle fracture increases [10]. Generally, the fracture line often encompasses the third molar tooth socket. Inspite of the fact that 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 [11]. In the 1960s, with the introduction of Viltallium compression plating by Luhr, internal fixation began to gain popularity [12]. 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. 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.[5] Simultaneously, Michelet *et al*., began experimenting with monocortical non-compression plates for mandibular angle fractures [13]. Champy *et al*., showed that absolute rigid fixation was not mandatory for the healing of mandibular fractures and recommended the fixation of the angle fractures on the superior border by means of a non-compression plate to produce a successful outcome [14]. It is considered to be a simple and reliable technique with a relatively low rate of associated complications. However, the placement of a single plate at the superior border leads to opening of the fracture line at lower border, lateral displacement of the fragments at the inferior border, and subsequent posterior open bite on the fracture side [15]. Biomechanical analysis of the mandible has demonstrated that when an occlusal load was placed on ipsilateral molars, splaying was produced along the inferior border of the angle of the mandible in a model in the single miniplate technique and emphasized that paired miniplate fixation in the form of one plate on the superior border and one plate on the inferior border may provide superior fixation of angle fractures over the placement of a single superior border technique [16]. Since the mandibular angle fractures are under a great degree of torsional strain than any other areas of mandible.[17] When the mandibular angle fractures are treated with a single miniplate at the superior border, bony gaps were observed along the inferior border and such movement of the fracture was considered to contribute to subsequent complications, such as infection [11]. 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 [18]. Ellis and Walker showed that using a single miniplate is associated with a lower complication rate than double miniplates in the fixation of angle fractures [19]. 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 in the presence of a pathologic fracture [18]. Hence, few authors advocated the use of 3D plates in this region to achieve a good three dimensional stability [20]. Few studies revealed no difference in the complication rate when fractures of the mandibular angle were treated with locking or nonlocking miniplates or bioresorbable plates. There were minimal complications even with retention of healthy non‐mobile third molars in the fracture line when ORIF was used [21]. There exists a never ending debate pertaining to the use of postoperative maxillomandibular Fixation (MMF). Few studies found no significant differences in outcomes or complications between internal fixation with immediate release and internal fixation with MMF in the immediate postoperative phase.[22,23] However, MMF allows the undisturbed healing of the intraoral incision, stabilizing the occlusion, and encouraging patients to become accustomed to a liquid diet [24]. 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 [24, 25]. Third molar tooth in the line of fracture should be removed when there is unrestorable damage to the tooth structure, gross mobility due to chronic periodontitis, presence of caries with periapical pathology; or if a displaced or extracted tooth prevents reduction [26]. Some authors advocate that the tooth in the line of the fracture should be preserved since it 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 [11]. The occurrence of postoperative infection does not depend solely on the status of the third molar tooth. It depends on the adequacy of the fixation, administration of adequate antibiotics, socioeconomic condition and oral hygiene maintenance of the patient [11].

CONCLUSION

Management of mandibular angle fractures is still challenging. A proper history pertaining to the etiology along with a complete physical examination and proper radiographic assessment are the keys to the development of a satisfactory treatment plan for comprehensive management of these fractures. The use of a single miniplate on the superior border of the mandible for noncomminuted angle fractures and an extraoral approach with larger reconstruction plates for comminuted fractures are the current preferred methods of treatment. The ultimate goal when addressing any mandibular fracture is safe and successful establishment of the patient's preinjury occlusion and function.

REFERENCES

1. Bormann, K. H., Wild, S., Gellrich, N. C., Kokemüller, H., Stühmer, C., Schmelzeisen, R., & Schön, R. (2009). Five-year retrospective study of mandibular fractures in Freiburg, Germany: incidence, etiology, treatment, and complications. *Journal of oral and maxillofacial surgery*, *67*(6), 1251-1255.
2. Saito, D. M., & Murr, A. H. (2008). Internal fixation of mandibular angle fractures with the Champy technique. *Operative Techniques in Otolaryngology-Head and Neck Surgery*, *19*(2), 123-127.
3. Barry, C. P., & Kearns, G. J. (2007). Superior border plating technique in the management of isolated mandibular angle fractures: a retrospective study of 50 consecutive patients. *Journal of oral and maxillofacial surgery*, *65*(8), 1544-1549.
4. Singh, S., Fry, R. R., Joshi, A., Sharma, G., & Singh, S. (2012). Fractures of angle of mandible–A retrospective study. *Journal of oral biology and craniofacial research*, *2*(3), 154-158.
5. Schierle, H. P., Schmelzeisen, R., Rahn, B., & Pytlik, C. (1997). One-or two-plate fixation of mandibular angle fractures?. *Journal of Cranio-Maxillofacial Surgery*, *25*(3), 162-168.
6. Haug, R. H., Fattahi, T. T., & Goltz, M. (2001). A biomechanical evaluation of mandibular angle fracture plating techniques. *Journal of oral and maxillofacial surgery*, *59*(10), 1199-1210.
7. Meisami, T., Sojat, A., Sandor, G. K. B., Lawrence, H. P., & Clokie, C. M. L. (2002). Impacted third molars and risk of angle fracture. *International journal of oral and maxillofacial surgery*, *31*(2), 140-144.
8. Lee, J. T., & Dodson, T. B. (2000). The effect of mandibular third molar presence and position on the risk of an angle fracture. *Journal of oral and maxillofacial surgery*, *58*(4), 394-398.
9. Haug, R. H., Prather, J., & Indresano, A. T. (1990). An epidemiologic survey of facial fractures and concomitant injuries. *Journal of Oral and Maxillofacial Surgery*, *48*(9), 926-932.
10. Kumar, S. R., Sinha, R., Uppada, U. K., Reddy, B. R., & Paul, D. (2015). Mandibular third molar position influencing the condylar and angular fracture patterns. *Journal of maxillofacial and oral surgery*, *14*(4), 956-961.
11. Lee, J. H. (2017). Treatment of mandibular angle fractures. *Archives of craniofacial surgery*, *18*(2), 73-75.
12. Luhr, H. G. (1987). Vitallium Luhr systems for reconstructive surgery of the facial skeleton. *Otolaryngologic clinics of North America*, *20*(3), 573-606.
13. Michelet, F. X., Deymes, J., & Dessus, B. (1973). Osteosynthesis with miniaturized screwed plates in maxillo-facial surgery. *Journal of maxillofacial surgery*, *1*, 79-84.
14. Champy, M., Lodde, J. P., Schmitt, R., Jaeger, J. H., & Muster, D. (1978). Mandibular osteosynthesis by miniature screwed plates via a buccal approach. *Journal of maxillofacial surgery*, *6*, 14-21.
15. Ellis III, E., & Walker, L. R. (1996). Treatment of mandibular angle fractures using one noncompression miniplate. *Journal of oral and maxillofacial surgery*, *54*(7), 864-871.
16. Kroon, F. H., Mathisson, M., Cordey, J. R., & Rahn, B. A. (1991). The use of miniplates in mandibular fractures: An in vitro study. *Journal of Cranio-Maxillofacial Surgery*, *19*(5), 199-204.
17. Farmand, M., & Dupoirieux, L. (1992). The value of 3-dimensional plates in maxillofacial surgery. *Revue de stomatologie et de chirurgie maxillo-faciale*, *93*(6), 353-357.
18. Al-Moraissi, E. A., & Ellis III, E. (2014). What method for management of unilateral mandibular angle fractures has the lowest rate of postoperative complications? A systematic review and meta-analysis. *Journal of Oral and Maxillofacial Surgery*, *72*(11), 2197-2211.
19. Ellis III, E., & Walker, L. (1994). Treatment of mandibular angle fractures using two noncompression miniplates. *Journal of oral and maxillofacial surgery*, *52*(10), 1032-1036.
20. Kumar, E. S., Sinha, R., & Uppada, U. K. (2018). Are three-dimensional plates as effective as superior border plating in mandibular angle fractures? A comparative evaluation of effectiveness. *Journal of Dental Research and Review*, *5*(3), 88-92
21. Bhatt, K., Arya, S., Bhutia, O., Pandey, S., & Roychoudhury, A. (2015). Retrospective study of mandibular angle fractures treated with three different fixation systems. *National journal of maxillofacial surgery*, *6*(1), 31-36.
22. Valentino, J., & Marentette, L. J. (1995). Supplemental maxillomandibular fixation with miniplate osteosynthesis. *Otolaryngology—Head and Neck Surgery*, *112*(2), 215-220.
23. Kumar, I., Singh, V., Bhagol, A., Goel, M., & Gandhi, S. (2011). Supplemental maxillomandibular fixation with miniplate

osteosynthesis—required or not?. *Oral and maxillofacial surgery*, *15*(1), 27-30.
24. Mehra, P., & Murad, H. (2008). Internal fixation of mandibular angle fractures: a comparison of 2 techniques. *Journal of Oral and Maxillofacial Surgery*, *66*(11), 2254-2260.
25. Ellis III, E. (2002). Outcomes of patients with teeth in the line of mandibular angle fractures treated with stable internal fixation. *Journal of oral and maxillofacial surgery*, *60*(8), 863-865.
26. Rai, S., & Pradhan, R. (2011). Tooth in the line of fracture: its prognosis and its effects on healing. *Indian Journal of Dental Research*, *22*(3), 495-496.