



CLINICAL EVALUATION OF ISOLATED ANGLE OF MANDIBLE FRACTURE – A STUDY

Plastic Surgery

Dr M. F. Shaikh Professor, Department of burns and plastic surgery, B. J. Medical College, Ahmedabad.

Dr Rutvij Parikh* Assistant Professor, Department of Burns & Plastic surgery, AMC MET Medical College and Sheth L. G. general hospital, Ahmedabad. *Corresponding Author

Dr Pratik Porwal Resident, Department of burns and plastic surgery, B. J. Medical College, Ahmedabad.

ABSTRACT

Background: Mandibular fractures occur frequently because of high risk of trauma, and mandibular angle is a region particularly prone to fracture from falls or attack, comprising 25% to 33% of all mandibular fractures. It is difficult to fix with inter-maxillary fixation, open reduction is universal. In the previous two decades, interest has increased for different methods of open reduction and internal fixation. There still is debate regarding the optimal treatment. This study is performed to study the epidemiology, pattern of isolated angle of mandible fractures. To study management, outcomes and complications following isolated angle of mandible fractures in patients at two tertiary care hospital in western India. **Materials and Method:** This prospective multi centric comparative study was carried out on patients of Department of Burns & Plastic Surgery, Civil Hospital and B. J. Medical College, Ahmedabad and Sheth L. G. general hospital, Ahmedabad, Gujarat, India from October 2013 to February 2016. A total of 31 patients who were admitted in civil hospital emergency department and were referred for facial injury were included in the study. The data was collected with a proforma regarding Patient information, referring to clinical examination, dental panorama, and radiographs of skull PA and computed tomography face with reconstruction film and chart records were researched retrospectively. **Result:** The average patient age is 28, Gender preponderance is 28 men (90.3%). The fracture causes are fist blow (12 cases, 38.7%), slip down (7 cases, 22.5%), traffic accident (3 cases, 9.6%), fall down (3 cases, 9.6%), hit by objects (5 cases, 16.1%), others (one case, 3.2%). Fractures are located on the left side in 24 cases (77.4%) and on the right side in 7 cases. 7 patients (22.5%) were operated through intraoral transbuccal approach using trocar technique, 23 patients (74.2%) were operated through extraoral approach and 1 patient (3.2%) conservatively. The rate of patients with mandibular third molar at the fracture line is 77.4% and of those who underwent surgery. 45.1% (14 cases) had the mandibular third molar extracted. The direction of fracture is unfavorable for all patients. Complications are reported in 8 cases which is 25.8%. Out of these 8 cases Post-surgical complication was in 4 cases which is 12.9%. There was no osteomyelitis, non-union of bone fragment, or displacement of metal plate. **Conclusion:** It is concluded that isolated angle of mandible fracture is not very uncommon. It was noted that patients ranged from 12-60 years and male preponderance noted owing to the fact that there is male dominance in riding the motor vehicles and outdoor activities. The most common mode of trauma for faciomaxillary injuries was fist blow, slip down, road traffic accident, and fall from height, hit by objects. Conservative methods include arch bar with intramaxillary fixation. Surgical management included open reduction and internal fixation followed up with arch bar and intramaxillary fixation either using wires or rubber bands. Miniplates was commonly used for angle of mandible fractures and patients recovered without any complications. Inferior alveolar nerve damage is the most common complication. Post operatively all patients achieved normal occlusion with adequate mouth opening of 3 fingers after removal of arch bars and intra maxillary fixation. The duration of stay in the hospital was on an average 7 days. Most patients were fit to resume their routine work by 3 weeks. There was no mortality in our study.

KEYWORDS

Isolated angle, Mandible fracture, clinical evaluation, intraoral, transbuccal.

I. INTRODUCTION

Face is the most admirable part of our body. Facial injury is the most common cause of disfigurement and affects the personality of the individual very much. Mandibular fractures occur frequently because of high risk of trauma, and an anatomic structure of arched form without a bone suture line cannot disperse the external force [1].

The mandibular angle is a region particularly prone to fracture from falls or attack, comprising 25% to 33% of all mandibular fractures. Masseter muscle and medial pterygoid muscle are attached to the angle and these can cause displacement of bone fragments after fracture. Reduction as a treatment for fracture should be considered especially for patients with a mandibular third molar. Other pertinent factors are the biomechanical characteristics of the mandible, bone density, and the pathologic state of the bone [2]. Because it is difficult to fix with inter-maxillary fixation, open reduction is universal [3]. Restoration of the occlusion usually indicates anatomic reduction and proper positioning of the mandible and facial bones. There is a recent emphasis on increasing cosmetic factor and correcting occlusion recovery when treating mandibular angle fracture. But other studies treating mandibular fracture emphasize the general mandibular aspect rather than the particular location of mandible. In the previous two decades, interest has increased for different methods of open reduction and internal fixation [4]. Methods of open reduction and internal fixation have continued to evolve and have changed enormously. However, there still is debate regarding the optimal treatment [5, 6]. Mandibular angle fractures have a high frequency of complications particularly in relation to the insufficient stability of the fixation systems [7-9]. A large number of studies testifies to the fact that no single approach has been shown to be ideal [10]. This study is

performed to study the epidemiology, pattern of isolated angle of mandible fractures. To study management, outcomes and complications following isolated angle of mandible fractures in patients at two tertiary care hospital in western India.

II. MATERIAL AND METHODS

This prospective comparative study was carried out on patients of Department of Burns & Plastic Surgery, Civil Hospital and B. J. Medical College, Ahmedabad, and Sheth L. G. general hospital, Ahmedabad, Gujarat, India from October 2013 to February 2016. A total of 31 patients who were admitted in civil hospital emergency department and were referred for facial injury were included in the study.

Study Design: Prospective Multi centric observational study

Study Location: These were tertiary care teaching hospital based study done in Department of Burns & Plastic Surgery, Civil Hospital and B. J. Medical College, Ahmedabad and AMC MET Medical College, Sheth L. G. general hospital, Ahmedabad, Gujarat, India.

Study Duration: October 2013 to February 2016.

Sample size: 31 patients.

INCLUSION CRITERIA:

1. Patient with fracture in the mandibular angle.
2. Patient who were possible to examine up to atleast 3 month after surgery.
3. Patient without fractures on other parts or bilateral fracture in mandibular angle.

EXCLUSION CRITERIA:

1. Patient with other facial fractures.
2. Patients with bilateral fracture in mandibular angle were excluded.

Procedure methodology:

Collection of data: The data was collected with a proforma regarding Patient information, referring to clinical examination, dental panorama, radiographs of skull PA and computed tomography face with reconstruction film and chart records were researched retrospectively. Surgical technique through the number and type of plates used, complications of study were collected which was later analyzed.

Procedure:

Both informed and written consent were taken about the procedure and the study on a pre-formed format. Patient information, referring to clinical examination, dental panorama, radiographs of skull PA and computed tomography face with reconstruction film and chart records were researched retrospectively. All patients were classified by age and sex, and we classified the fractures by cause, location, and pattern of fracture. We estimate surgical technique through the number and type of plates used, whether a mandibular third molar relating mandibular angle is extracted, and complications after operation such as neurologic damage, malocclusion, and infection. Among 31 patients, 30 patients received open reduction under general anaesthesia, and ONE patients received intermaxillary fixation because of systemic disease and comorbidities.

Out of 30 patients who underwent open reduction 7 patient were operated through intraoral transbuccal approach and rest were operated through extra oral submandibular approach. Intra oral transbuccal approach was mainly used in patients in which fracture line was passing through the oblique ridge and in patients whose mouth opening was not restricted. The fractures were rigidly fixed with 4-hole metal mini plates and screws. The patients were re-examined at postoperative weeks 1, 3, 6 and 12.

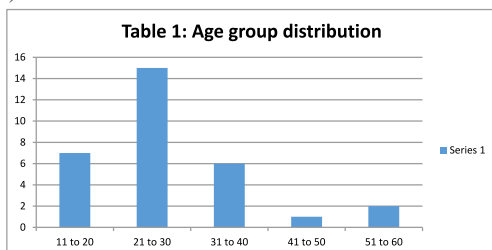
Follow up Procedure:

The arch bar used for intermaxillary fixation was removed 6 weeks after surgery. Patients asked to come for follow up again at 3 months postoperatively to look for any persistent complication.

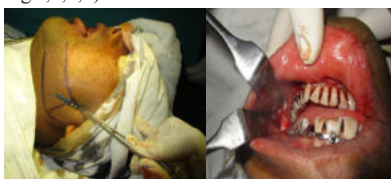
Assessment of Outcome: Data was recorded and analyzed.

III. Result

Thirty one patients satisfying were studied. The average patient age is 28, distributed from 12 to 60 years, with clustering in the third decade (Table. 1). Gender distribution is 28 men (90.3%) and three women (9.7%).



The fracture causes are fist blow (12 cases, 38.7%), slip down (7 cases, 22.5%), traffic accident (3 cases, 9.6%), fall down (3 cases, 9.6%), hit by objects (5 cases, 16.1%), others (one case, 3.2%). Fractures are located on the left side in 24 cases (77.4%) and on the right side in 7 cases (22.6%). We note that fracture of left mandibular angle occurs three times more frequently than the right. We hypothesize that there are several reasons like mandibular fractures result from fist blows from right-handed people Out of 30 patients (Table 2) 7 patient were operated through intraoral trans buccal approach using trocar technique.(Fig 1,2,3,4)



(Fig 1 and Fig 2): miniplate used for Fracture stabilisations and Exposure of angle fracture through intraoral incision



(Fig 3 and Fig 4): Intraoral transbuccal approach using trocar technique

Table 2: Distribution of management modalities for angle of mandible fracture.

Management of angle of mandible fracture	Number of patient
Intraoral transbuccal approach	7(22.5%)
Extraoral approach	23(74.2%)
Conservative Management	01(3.2%)
Total	31

The rate of patients with mandibular third molar at the fracture line is 77.4% and of those who underwent surgery. In our study we found that 45.1% (14 cases) had the mandibular third molar extracted.

The direction of fracture is unfavorable for all patients. 27 patients received one metal plate, 3 patients received two, and no patients received absorbable plate. If there was comminuted fracture or masseter muscle hypertrophy, two plates were used to increase rigidity.

Complications are reported in 8 cases which is 25.8%. Out of these 8 cases Post-surgical complication was in 4 cases which is 12.9%. There was no osteomyelitis, non-union of bone fragment, or displacement of metal plate (Table 3).

Table 3: Complication after operation

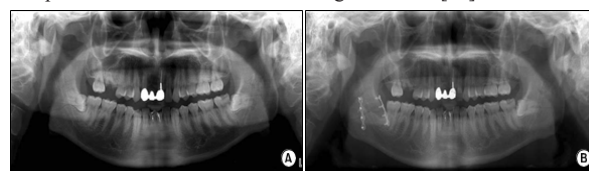
Complication	value
Nerve injury	4(12.9%)symptoms also present preoperatively
Pain	1(3.22%)
Loosening of screw	1(3.22%)
Malocclusion	1(3.22%)
Infection	1(3.22%)

IV. DISCUSSION

In Intraoral trans buccal technique initially the operative time was more as compared to extraoral approach but later on operative time as well as blood loss was reduced and with no cosmetically unacceptable scar over face. The rate of patients with mandibular third molar at the fracture line is 77.4% and of those who underwent surgery in our study we found that 45.1% (14 cases) had the mandibular third molar extracted. This shows that mandibular third molar can affect the risk of mandibular angle fracture.

In the mandible, unlike fractures of other hard tissues, the form of fracture, direction and degree of segment transition are affected by the anatomic structure, muscle insertion and bite force [11]. The angle is a common site for mandible fracture and has many active muscles that can displace segments. There is a high complication rate and the fracture only can rarely be adequately reduced by simple intermaxillary fixation. Therefore, the primary technique is open reduction [4]. In this study, except with those unsuitable for surgery, all patients were treated by open reduction. There are literature perspectives stating that the pterygomasseteric muscle sling provides protection against external forces to the angle region of the mandible [12].

Champy et al found that in a centered inferior alveolar canal, the tensile forces are generated on the upper border of mandibular angle and compressive forces are distributed along lower line. [13]



(Fig. 5). (A) Preoperation. (B) After open reduction internal fixation with 2 miniplates generated on the lower border, so ideal single plate fixation is possible on the external oblique line. But in cases of comminuted fracture and when reduction of interdental fixation is impossible after surgery, more than two plates are placed to improve bone healing and stabilize fixation under the functional load (Fig. 6) [14]. Postoperative complications such as the infection caused by reduced bone fixation and malunion can be decreased using lag screws and reconstruction plates [15,16]. Functionally, fixation with two metal plates increases stability of the mandibular angle fracture but the possibilities of infection due to increased surgical time or flap elevation, facial nerve injury, high price of the plates and difficulty of plate removal should be considered [17,18]. To overcome these drawbacks, lag screws can be used. Lag screw fixation offers firm fracture stabilization, reduction of tissue exposure compared to using metal plates, and short operation time [19]. The fact that an absorbable plate has lesser resistibility and stability at an average occlusal load than a metal plate after surgery has been demonstrated in several studies [20], so this is not a general method for the angle fracture. In this study, no cases were fixed by absorbable plate.

An impacted third molar can weaken the mandibular angle area by replacing osseous space, depending on its position and angulation [12]. In cross-section, the angle area is thinner than the tooth-bearing region, and the angle mandibular fractures [2].

Many postoperative complications have been reported, but hypoesthesia by inferior alveolar nerve injury was more frequently found than other complications in this study. This is not only because of surgical procedure but also nerve injury from trauma or movement of bone segments. Pain on mandibular movement is another possible complication. It can lead to trismus with the risk of damaging elevated muscles that are attached to the angle region. Other risks include posterior open bite at the fracture site right after surgery, infections through failure of primary suture and loosening of metal plates or screws [16]. Although the ideal period of maxilla mandibular fixation for the angle fracture is unclear, 4 weeks of fixation after surgery is regarded as the proper period in various studies as well as our study [18].

V. CONCLUSION

From the study it is concluded that isolated Angle of mandible fracture is not very uncommon. It was noted that the average age for Angle of mandible fractures was 28 years which was nearly the same in other observed studies. The patients ranged from 12-60 years. There was male preponderance noted owing to the fact that there is male dominance in riding the motor vehicles and outdoor activities. The most common mode of trauma for faciomaxillary injuries was fist blow, slip down, road traffic accident, and fall from height, hit by objects. Management can be done in various ways. Conservative methods include arch bar with intramaxillary fixation. Surgical management included open reduction and internal fixation. The surgical management should also be followed up with arch bar and intramaxillary fixation either using wires or rubber bands. Miniplates was commonly used for Angle of Mandible fractures. Patients recovered without any complications like plate infection or exposure. Inferior alveolar nerve damage is the most common complication. Post operatively all patients achieved normal occlusion with adequate mouth opening of 3 fingers after removal of arch bars and intra maxillary fixation. The duration of stay in the department of burns and plastic surgery in the hospital was on an average 7 days. Most patients were fit to resume their routine work by 3 weeks. There was no mortality in our study.

REFERENCES

1. Tevepaugh DB, Dodson TB. Are mandibular third molars a risk factor for angle fractures? A retrospective cohort study. *J Oral Maxillofac Surg* 1995;53:646-9; discussion 649-50.
2. Meisami T, Sojat A, Sándor GK, Lawrence HP, Clokic CM. Impacted third molars and risk of angle fracture. *Int J Oral Maxillofac Surg* 2002;31:140-4.
3. Singh S, Fry RR, Joshi A, Sharma G, Singh S. Fractures of angle of mandible: a retrospective study. *J Oral Biol Craniofac Res* 2012;2:154-8.
4. Booth PW, Schendel SA, Hausamen JE. *Maxillofacial surgery*, 2nd ed, vol. 1. London, UK: Churchill Livingstone, 2007; p. 74-76.
5. Gear AJ, Apasova E, Schmitz JP, Schubert W. Treatment modalities for mandibular angle fractures. *J Oral Maxillofac Surg*. 2005;63(5):655-63. <http://dx.doi.org/10.1016/j.joms.2004.02.016> PMID:15883941
6. Zix J, Lieger O, Iizuka T. Use of straight and curved 3-dimensional titanium miniplates for fracture fixation at the mandibular angle. *J Oral Maxillofac Surg*. 2007;65(9):1758-63. <http://dx.doi.org/10.1016/j.joms.2007.03.013> PMID:17719394
7. Iizuka T, Lindqvist C, Hallikainen D, Pauku P. Infection after rigid internal fixation of mandibular fractures: A clinical and radiologic study. *J Oral Maxillofac Surg*. 1991; 49(6):585-93. [http://dx.doi.org/10.1016/0278-2391\(91\)90340-R](http://dx.doi.org/10.1016/0278-2391(91)90340-R)
8. Lamphier J, Ziccardi V, Ruvo A, Janel M. Complications of mandibular fractures in an

- urban teaching center. *J Oral Maxillofac Surg*. 2003;61(7):745-9. [http://dx.doi.org/10.1016/S02782391\(03\)00147-2](http://dx.doi.org/10.1016/S02782391(03)00147-2)
9. Ellis E 3rd. Treatment methods for fractures of the mandibular angle. *J Craniomaxillofac Trauma*. 1996; 2(1):28-36. PMID:11951472
10. Gulses A, Kilic C, Sencimen M. Determination of a safety zone for transbuccal trocar placement: an anatomical study. *Int J Oral Maxillofac Surg*. 2012;41(8):930-33. <http://dx.doi.org/10.1016/j.ijom.2012.02.013>
11. Duan DH, Zhang Y. Does the presence of mandibular third molars increase the risk of angle fracture and simultaneously decrease the risk of condylar fracture? *Int J Oral Maxillofac Surg* 2008;37:25-8.
12. Lee JT, Dodson TB. The effect of mandibular third molar presence and position on the risk of an angle fracture. *J Oral Maxillofac Surg* 2000;58:394-8; discussion 399
13. Champy M, Loddé JP, Schmitt Spiessl B. Rigid internal fixation of fractures of the lower jaw. *Reconstr Surg Traumatol*. 1972;13:124-40. [Medline].
14. Yoon WJ, Kim SG, Oh JS, et al. A Clinical Study of Mandibular Angle Fracture. *Maxillofac Plast Reconstr Surg*. 2014;36(5):201-206. doi:10.14402/jkampr.2014.36.5.201
15. Patil PM. Lower third molar in the line of mandibular angle fractures treated with stable internal fixation: to remove or retain? *J Oral Maxillofac Surg Med Pathol* 2013;25:115-8.
16. Choi BH, Kim HJ, Kim MK, et al. Management of mandibular angle fractures using the mandibular angle reduction forceps. *Int J Oral Maxillofac Surg* 2005;34:257-61.
17. Siddiqui A, Markose G, Moos KF, McMahon J, Ayoub AF. One miniplate versus two in the management of mandibular angle fractures: a prospective randomised study. *Br J Oral Maxillofac Surg* 2007;45:223-5.
18. Danda AK. Comparison of a single noncompression miniplate versus 2 noncompression miniplates in the treatment of mandibular angle fractures: a prospective, randomized clinical trial. *J Oral Maxillofac Surg* 2010;68:1565-7
19. Schaaf H, Kaubuegge S, Streckbein P, Wilbrand JF, Kerkmann H, Howaldt HP. Comparison of miniplate versus lag-screw osteosynthesis for fractures of the mandibular angle. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2011;111: 34-40
20. Esen A, Ataoğlu H, Gemi L. Comparison of stability of titanium and absorbable plate and screw fixation for mandibular angle fractures. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2008;106:806-11.