POSTOPERATIVE COMPLICATIONS IN PATIENTS WITH MANDIBULAR ANGLE FRACTURE, TREATED BY SINGLE PLATE

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ABSTRACT

Mandible fracture is common fracture of facial bones due to its angular exposure. In 1060s Vitallium compression plating was introduced to manage mandibular fractures. But management of this fracture site is not free of postoperative complications. Purpose of this study was to determine the frequency of postoperative complications in patients with mandibular angle fracture, treated by single plate.

Study was case series and completed in six months from January 2017 to June 2018 in the department of oral and maxillofacial surgery, Nishtar Institute of Dentistry, Multan. A total of 52 patients were included in the study after ethical approval from the ethical committee of the hospital. Main outcome variables assessed in this study were infection rate and non union after surgery of mandible fracture. Computor software SPSS was used to analyze study data.

Thirty patients forming 57.7% had a mandibular angle fracture of left side, 22 an angle fracture right side forming 42.3%. Infection was present in 5 patients of total 52 patients while in 47 patients fracture healing occurred without infection. Infection rate was 9.6%. Non union was present in 2 patients. In 50 patients fracture healing occurred without non union.

Use of a single miniplate for fractures of the angle of the mandible is a simple, reliable technique with a relatively small number of complications.

Keywords: *Mandibular angle fracture, single plate, postoperative complications, non union, infection rate.*

INTRODUCTION

Most common facial fractures are the mandibular angle fracture which constitutes 25% of all fractures.¹ Angle fracture site had highest complication rate as compared to other site fractures of mandible and regarding its optimal treatment there was no consensus. Complications are 32% more in angular fracture than in other fractures^{2,3}.

Association of osteosynthesis recommended early stability to reduce mobility of fragmented portion of mandible with open reduction and internal fixation (ORIF) with steel plates.⁴ This method of mandible stability was first described by Schede in 1888. He used steel plates and screws in surgical management. In very early era of this invention ORIF give poor outcomes because of fatige and steel corrosion and high

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frequency of nonunion and screw failure.⁵

In early 1960s technique Vitallium compression plating was introduced by Luhr et al⁶ and after that Spiessl et al⁷ got inspiration from biochemical orthopaedic studies and reported great bone healing by using compression method of mandbiblr stability. Internal fixation got fame with development of biocompatible metals like Vitallium and titanium and transosseous wiring with intermaxillary fixation, at the superior border one non-compression mini plate, two non compression mini plates, at the border one tension band, two dynamic compression plates and one compression plate at the inferior border were applied for primary healing of bone.⁸

Arbeitsgemeinschaft für Osteosynthesefragen (AO) branch of maxillofacial surgery composed of maxillofacial surgeons, plastic surgeons, otolaryngology and number of general surgeons and neurosurgeons.⁹ This association also recommended application of two mini non compression plates for management of angular mandible fracture. These two plates were applies monocorticaly and bicorticaly. Extra oral access gives greater visualization and better control of fragmented portion of mandible.¹⁰ Study was designed to estimate frequency of complications in mandible angle fractures

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when managed with single plate.

METHODOLOGY

All the Patients diagnosed with mandibular angle fractures on clinical and radiographic findings fulfilling the inclusion criteria were selected from the outdoor patient department of Oral and Maxillofacial surgery, Nishtar Institute of Dentistry Multan. Demographic information like age and sex were recorded. Informed consent was taken from all the subjects for using their data in research. Ethical issues were considered and dealt with during the study after approval from Ethical Review Committee of the Institute. A consent form signed by the witness and the consenting person was delivered to the patient before the commencement of the procedure carrying all the information regarding the surgical procedure.

Patients with preoperative infection were excluded from the study. Patients were administered a short of antibiotics (Amikacin 500 mg intravenously) before surgery. All the patients were treated with the single miniplate a 2mm titanium plate was placed by an intraoral approach at the external oblique ridge with two secure screws on either side of the fracture line. Patients were reviewed 2 month postoperatively for infection and non-union. Surgical procedure was performed by researcher himself (having 18 month experience in oral surgery training) and was assisted by Consultant (5 years experience after post graduation).

Fracture site was checked clinically finally post-operatively at 2 months for infection, while non union was checked clinically and radiographically after 2 months. The final radiographic and clinical examination was done after two months. Data was compiled and analyzed with SPSS-11. Descriptive statistics were applied to calculate the mean and standard deviation of age, gender, and duration of fracture of the patient. Frequency and percentages were calculated for complications ((infection rate, nonunion), gender. Stratification was done with regards to age, gender and duration of fracture to see effect of this on outcome.

RESULTS

A total number of 52 patients with mandibular angle fractures treated with single miniplate were included. A total of 10 females were present in the study forming 19.2%. Forty two males forming 80.8% were present in the study.

Males formed the predominant gender with 80.8 % while females form 19.2 % of all the patients. The mean age of these patients was 26.62 ± 7.01 years with an age range of 17 to 55 years. Duration of fracture of 52 patients was 4.17 ± 1.779 with day's range of 1 to 7 days. Thirty patients forming 57.7% were having a

TABLE 1: DEMOGRAPHIC VARIABLES

Male	42 (80.8%)
Female	10(19.2%)
Mean Age	26.62 ± 7.01
Duration of Fracture	4.17 ± 1.779

TABLE 2: OUTCOME VARIABLES

Side of fracture	No. (%)
Right	22(42.3%)
Left	30(57.7%)
Infection Rate	
Yes	5 (9.6%)
No	47(90.4%)
Non Union Rate	
Yes	2~(3.8%)
No	50(96.2%)

mandibular angle fracture of left side, 22 having an angle fracture Right side forming 42.3%. Infection was present in 5 patients of total 52 patients while 47 patients fracture healing occurred without infection. Infection rate was 9.6% of total 52 patients.

Out of 10 female patients, only one patient had infection. Infection rate in female was 1.92%, while 9 females treated for mandibular angle fractures were without infection. Of total 42 Males,4 patients had infection. Infection rate in male was 7.69. Non union was present in 2 patients while in 50 patients of total 52 patients fracture healing occurred without non union. Non union rate was 3.8%. 10 female treated for mandibular angle fractures were without non union, while of total 42 Males,2 patients had non union. Non union rate in male was 3.8%.

DISCUSSION

In this study a total of 52 patients were treated with mandibular angle fractures with single miniplate. The mean age of these patients was 26.62 ± 7.01 years with an age range of 17 to 55 years. Compared to our study Ellis and Walker in their studies on angle angle fractures with one miniplate showed mean age of $27.2\pm$ 8 years with age range of 12 to 55 years¹¹. Duan et al and his colleagues reported that mean age of patients sustaining mandibular angle fractures was 27.9 ± 10.6 years¹².

Compared with our study Ma,aita et al¹³ in their study described a slightly raised age of the patients 33.2 \pm 11.4 years sustaining mandibular angle fractures. Also Iida et al¹⁴ found that mean age of their studied population was 26.4 \pm 9.4 years for those with angle fractures. What is of importance is that the mean age of these patients pointed towards a relatively young patient population with mandibular fractures.

In the study of Ellis et al¹¹ Eighty-one consecutive patients were treated by single plate, 68 men or boys (85%) and 13 women or girls. A total of 10 females were present in the study forming 19.2%. Forty two males forming 80.8% were present in the our study

Males bearing the main workload in our society necessitate them to work and travel around quite a lot more than the females. Also males being more aggressive in nature indulge in interpersonal violence's a lot more than females and results in sustaining more mandibular fractures than females

The angle fracture was seen to occur predominantly on the left side including 30 out of the 52 patients forming a percentage of 57.7 %. The right side was fractured in 22 patients forming a percentage of 42.3 % of the angle fractures. Compared to our study Abbasi MM et al¹⁵ in his study showed the angle fractures to occur predominantly on left side 57.9%. While in 39.5 % cases of his study the angle fracture was on the right side.

In two different studies Champy et al¹⁶ and Cawood et al¹⁷ concluded that incidence of infection and wound dehiscence can be controlled by performing miniplate osteosynthesis as soon as possible after injury. They recommended fixation period as 12 hours and 24 hours respectively. In our setup patients does not present within 12 or 24 hours of injury which is a hurdle in early management of such fractures. In our area average time of surgery is 4.17 days after fracture. Not only in our set up in some other countries Smith¹⁸, Barnard NA and Hook¹⁹ and Tuovinen²⁰ also reported such problems.

In this study 2 non union (3.8%) and 5 infections (9.6%) were observed. In all infected cases there were no teeth in the fracture line. Ellis and Walker¹¹ reported in their studies that infection rate and non union are two more importat variables than teeth removal. Such similar findings were also reported by Levy et al²¹, Peled and Laufer²² et al that faracture mobility and infection have strong association. Higher infection rate reduced the union of fracture.

Present study had short sample size that's why it was difficult to make a firm conclusion from our observation. Small number of infections show that not only biochemical but also some other contributing factors are responsible for postoperative complications such as infection of mandible angle fracture after rigid internal fixation. Sometime disruption of blood vessels delayed the healing time and increased the complication rate.

Cases with disrupted vessels and severe disocated

fracture, infected wounds, applying pressure force by dentition, fracture of edentulous mandible or other pathological occlusion may reduce the reliability and outcome of internal fixation. One of the limitations of our study was probably the smaller number of patients with mandibular angle fractures. Studies done over a 2-3 year period with around 500 patients or more would have allowed us to have a more conclusive result. A shortage of statisticians with interest in medical epidemiology and who are also ready to help in our region is also a hampering factor while analyzing such data. Another limitation of our study was only two postoperative complication were studied. Other postoperative complication like Nerve numbness, malunion, were also not studied .Other variables such as cause of the fracture, the magnitude ,direction and severity of the traumatic forces causing fracture were also not studied. A study taking into account all these variables might be helpful in explaining this relationship.

CONCLUSION

The use of a single miniplate for fractures of the angle of the mandible is a simple, reliable technique with a relatively small number of complications. The complications were minimal in our study. The infection rate was 9.6%, non union was 3.8% which is comparable to or better than infection and nonunion rate reported with use of two plate fixation. There are limited studies done over use of single plate fixation in mandible angle fracture in our settings. There is need for further studies to have clear guideline in this regard in best interest of patients, community and health care providers.

REFERENCES

- 1 Beza SA, Attia S, Ellis E, Omara L. A Comparative Study of Transbuccal and Extraoral Approaches in the Management of Mandibular Angle Fractures: A Systematic Review. Open Access Maced J Med Sci. 2016;4(3):482-88.
- 2 Elavenil P, Mohanavalli S, Sasikala B, Prasanna RA, Krishnakumar RVB. Isolated Bilateral Mandibular Angle Fractures: An Extensive Literature Review of the Rare Clinical Phenomenon with Presentation of a Classical Clinical Model. Craniomaxillofac Trauma Reconstr. 2015;8(2):153-58.
- 3 Hsueh WD, Schechter CB, Tien Shaw I, Stupak HD. Comparison of intraoral and extraoral approaches to mandibular angle fracture repair with cost implications. Laryngoscope. 2016;126(3):591-5.
- 4 Elsayed SA, Mohamed FI, Khalifa GA. Clinical outcomes of three different types of hardware for the treatment of mandibular angle fractures: a comparative retrospective study. Int J Oral Maxillofac Surg. 2015;44(10):1260-7.
- 5 Sawatari Y, Marwan H, Alotaibi F, Christensen J, Gannon J, Peleg M. The use of three-dimensional strut plates for the management of mandibular angle fractures: a retrospective analysis of 222 patients. Int J Oral Maxillofac Surg. 2016;45(11):1410-17.
- 6 Luhr HG. On the stable osteosynthesis in mandibular fractures. Dtsch Zahnarztl Z. 1968;23:754.
- 7 Spiessl B. Rigid internal fixation of fractures of the lower jaw. Reconstr Surg Traumatol. 1972;13:124.

- 8 Ulbrich N, Ettl T, Waiss W, Gosau M, Moralis A, Reichert TE. The influence of third molars in the line of mandibular angle fractures on wound and bone healing. Clin Oral Investig. 2016;20(6):1297-302.
- 9 Stojanovic A, Jacobson C, Gratz KW, Schenkel JS, Rucker M et al. Postoperative complications in the Lower Jaw in Trauma. Trauma Acute Care. 2017;2:p45.
- 10 Zanakis S, Tasoulas J, Angelidis I, Dendrinos C. Tooth in the line of angle fractures: The impact in the healing process. A retrospective study of 112 patients. J Craniomaxillofac Surg. 2015;43(1):113-6.
- 11 Ellis E, Walker RL. Treatment of Mandibular Angle Fractures using One Noncompression Miniplate.J Oral Maxillofac Surg.1996:54:864-71.
- 12 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.
- 13 Ma'aita J, Alwrikat A. Is the mandibular third molar a risk factor for mandibular angle fracture? Oral Surg Oral Med Oral Patho Oral Radio Endod 2000;89:143-6.
- 14 Iida S, Hassfeld S, Reuther T. Relationship between the risk of mandibular angle fractures & the status of incompletely erupted mandibular third molar.J Craniomaxillofac Surgery 2005;33:158-63.

- 15 Abbasi MM. Freuency of unerupted mandibular third molar in mandibular angle fracture. J Ayub Med Coll Abbottabad 2012;24(1):30-35.
- 16 Champy M, Lodde JP, Schmitt R, et al. Mandibular osteosyn-thesis by miniature screwed plates via a buccal approach.J Maxillofac Surg.1978;6:14.
- 17 Cawood JI. Small plate osteosynthesis of mandibular fractures. Br J Oral Maxillofac Surg 1985;23:77.
- 18 Smith WP. Delayed miniplate osteosynthesis for mandibular fractures. Br J Oral Maxillofac Surg. 1991;29:73.
- 19 Barnard NA, Hook P. Delayed miniplate osteosynthesis for mandibular fractures. Br .I Oral Maxillofac Surg 1991;29:357.
- 20 Tuovinen V, Norholt SE, Sindet-Pedersen S, et al. A retrospective analysis of 279 patients with isolated mandibular fractures treated with titanium miniplates. J Oral Maxillofac Surg 1994;52:931.
- 21 Levy FE, Smith RW, Odland RM, et al: Monocortical miniplate fixation of mandibular fractures. Arch Otolaryngol Head Neck Surg 1991;117:149.
- 22 Peled M, Laufer D: Treatment of mandibular fractures by means of compression osteosynthesis. J. Oral Maxillofac. Surg. 1989;47:566-71.

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