

OUTCOME OF RIGID INTERNAL FIXATION OF MANDIBULAR FRACTURES: A PROSPECTIVE STUDY

¹UMAR KHITAB, BDS, MSC (London)

²AHMAD KHAN, BDS

²MOHAMMAD TARIQ KHAN, BDS

ABSTRACT

This prospective study was undertaken to analyze the postoperative outcome in 80 mandibular fracture patients treated by open reduction and internal fixation at Oral and Maxillofacial Surgery Unit, Khyber College of Dentistry, Peshawar from Jan 2006 to June 2007. Data regarding the pattern of fracture and postoperative outcome was evaluated and reviewed. The most common cause of fracture was road traffic accident and common site was parasymphysis. Sixty two patients (n=62; 77%) had successful uneventful postoperative outcome. Infection was the common complication (n=7; 8.7%) followed by malocclusion (n=5; 6.2%).

Key words: Mandibular fracture, rigid internal fixation, postoperative complications

INTRODUCTION

Mandibular fractures are one of the most common fractures of facial skeleton because of its prominent position in maxillofacial region.¹ They may occur alone or in combination with other facial bone fractures.² Fracture site depends upon the mechanism of injury, magnitude and direction of impact force, prominence of the mandible and anatomy of site.³

Management of mandibular fractures varies among maxillofacial units across the world. It depends upon the clinical presentation, surgical expertise of operator and facilities available at maxillofacial surgery units. Traditionally, surgeons have attempted to achieve four main goals while treating mandibular fractures: anatomic reduction, immobilization, prevention of infection and rehabilitation of function. Meeting these goals are essential for successful bone healing and correct postoperative functioning of stomatognathic system.⁴ To restore esthetics and early functional recovery to life, maxillofacial surgeons have innovated surgical techniques to provide better options in the management of mandibular fractures.⁵ Current established

trends in the management of mandibular fractures include closed reduction with intermaxillary fixation (IMF) by dental wiring, Arch bars and Gunning's splints, open reduction and intraosseous wiring and IMF and open reduction and rigid internal fixation by miniplates, non-compression plates, compression plates and lag screws.^{4,6} Rigid internal fixation promotes primary bone healing without the extended period of intermaxillary fixation for immobilization. The elimination of IMF, generally, results in earlier jaw function, easier maintenance of oral hygiene and better nutrition.⁷ Early mobilization prevents the chances of ankylosis particularly in children and reduces the chances of postoperative complications in poly-traumatized and immobilized patients.⁸ It prevents life threatening events in mentally disabled, epileptics, war injuries and multiple traumas.⁴

However, despite having these advantages the rigid internal fixation has been criticized for having increased morbidity, difficulty of procedure, increased operating time, cost of the equipment, necessity of the second operation for the removal of plates and prolonged hospital stay.^{6,9} In addition, this modality of

¹Assistant Professor, Oral and Maxillofacial Surgery, Khyber College of Dentistry, Peshawar

²Former Postgraduate Resident, Oral and Maxillofacial Surgery, Khyber College of Dentistry, Peshawar

Correspondence: Dr Ahmad Khan c/o Mohammad Amin, Shop No; 01, Aslam Market, Baghdada, Mardan. E-mail: ahmad_surgeon@yahoo.com

treatment has resulted in postoperative complications that are different from those of traditional methods.¹⁰ Postoperative malocclusion will result by placing the plates incorrectly during fixation. Extra-oral and intra-oral approaches may result in nerve damage and externally visible scar. There may be damage to dental roots or these plates may be a constant source of infection.⁹

The purpose of this study was to evaluate the postoperative benefits and complications associated with open reduction and rigid internal fixation (ORIF). This study will help us regarding the measures to be taken in anticipation for the reduction of postoperative complications.

MATERIALS AND METHODS

This clinical study had been carried out on 80 patients presented to Oral and Dental Hospital, Khyber college of Dentistry, Peshawar from Jan 2006 to June 2007. Patients diagnosed with mandibular fractures, treated with open reduction and rigid internal fixation and associated with no other facial fractures were included in study. Condylar fractures, pathological fractures and patients having any severe systemic disease were excluded from the study. With the consent of the patients all the necessary information about the variables of the study written in preformed proforma were collected by history taking and meticulous clinical examination. Preoperative infection, occlusion and sensory disturbances were assessed and evaluated by clinical examination. Patients were followed for normal union, infection, non union, malunion, malocclusion and 5th and 7th nerve disturbances. The data so obtained were evaluated and analyzed by applying descriptive statistics.

RESULTS

The most common age group involved was 21-30 years with a mean value of 24.9 ± 15.4 years. Regarding gender distribution most patients were male with a male to female ratio of 5.6:1.

The most common cause of injury was road traffic accidents (n=37; 38.7%) followed by fall (n=25; 31.25%). Common site of fracture was parasymphysis (n=26; 32.5%) followed by angle (n=22; 27.5%), (Table 1).

Overall, 62 patients had a successful (77%) result characterized by anatomic reduction, clinical union, restoration of pre-traumatic occlusion and normal function. Infection was the most common complication (n=7; 8.7%) followed by malocclusion (n=5; 6.2%) malunion and 5th nerve injury (n=3; 3.7%), (Table 2)

TABLE 1: DISTRIBUTION OF MANDIBULAR FRACTURES ACCORDING TO SITE

Site	No. of fractures	%age
Symphysis	13	16.2
Parasymphysis	26	32.5
Body	17	21.2
Angle	22	27.5
Ramus	2	2.5
Total	80	100

TABLE 2: POSTOPERATIVE OUTCOME

Study variable	No	%age
Normal union	77	96.2
Non-union	0	0
Malunion	3	3.7
Delayed union	0	0
Infection	7	8.7
Malocclusion	5	6.2
5 th nerve injury	3	3.7
7 th nerve injury	0	0

DISCUSSION

The goal of any fracture management is the restoration of form and function with minimal morbidity. During the present study, the leading cause of the fractures was RTA and the common site was parasymphysis. These findings are in agreement with the previous studies^{2, 11, 12, 13, 14}. Bony union is expected to result in 4-6 weeks with proper reduction and immobilization. Ninety six percent of patients had clinically successful outcome of normal bony union. The results of this study coincide with the study of Iizuka T and Lindqvist C¹⁵ who reported 93.9% normal union in mandibular fractures. This study also correlates with the study of Peled M et al⁴ and Dodson TB et al⁷, 83% and 82.6% respectively.

Infection rate of 3% to 27% has been reported with the use of ORIF in previous studies^{9, 16, 17}. Pattern of

fracture, technical errors, lack of prophylactic antibiotics, mobility at fracture site and non compliance of patient are considered the predisposing factors for infection.^{5, 16, 18} The current study shows infection being the common complication (8.7%). Five patients responded to antibiotics and two patients to early plate removal. Similar rate of infection had been reported in previous studies.^{4, 19, 20, 21, 22} Some studies have documented higher infection rate in rigid internal fixation. A study by Moreno JC et al¹⁰ reported 12.5% and Renton TF et al⁹ 15%, while the study of Jaques B et al²¹ shows 2.9% infection which is less than those reported in literature and in the current study.

The second most common complication noted was post surgical malocclusion (6.2%). Malocclusion was based on evaluation of occlusion, checked for maximum interdilatation, midline relationship, molar relationship, attrition wear facets relationship and patient complains. The presence of post surgical malocclusion depends on patient's dental status, the number of fractures, type of fracture, the degree of displacement of fragments, type of reduction, fixation and immobilization. Previous reports of Smith WP²⁰ (7.5%), Cawood JI¹⁹ (8%), Peled M and coworkers⁴ (7.8%) and Dodson TB and coworkers⁷ (7.7%) also coincides with the present study. Some studies had reported different percentage of malocclusion in rigid internal fixation ranged from 2.5% to 18.2%^{5, 15, 24}. The postoperative malocclusion noted was minimal and was treated by selective occlusal grinding.

Malunion is the healing of bone segments in a non physiologic position due to inadequate treatment of displaced fractures. It may occur as a result of plate bending or poor intra-operative reduction of fractured segments. The malunion encountered in this study was minor in nature and required no surgical intervention. The occlusal discrepancies were eradicated with occlusal equilibrium procedures.

Sensory disturbances were recorded according to patient's complaint. Sensory disturbances were recorded as the disturbances of inferior alveolar nerve, mental nerve and lingual nerve. Sensory disturbances of two mental nerves and one inferior alveolar nerve were recorded. It was due to elevation of flap and inadvertent placement of screws in the course of nerves. In this study there was no record of any involvement of the mandibular branch of the facial

nerve as has been reported by Iizuka and Lindqvist¹⁵ and Dodson TB et al⁷. Schon R et al²³ reported 3% and Jaques B et al⁶ 1.45% sensory disturbances in mental nerve while Cabrini Gabrielli MA et al²⁴ reported 0.89% paraesthesia in I.D. nerve after applying rigid fixation while Iizuka T and Lindqvist C¹⁵ reported a higher number of sensory disturbances in rigid fixation. During open reduction mental, inferior alveolar and marginal mandibular branches of facial nerve are at high risk of injury. In this study all patients with sensory disturbances were treated conservatively.

CONCLUSION

Osteosynthesis by open reduction and internal fixation provides optimal stability for healing and allow immediate function of stomatognathic system. It was noted that rigid internal fixation by plates and screws provide precise reduction, superior esthetic results, increased comfort and safety of patients, early restoration of functional life and low rate of complications in hands of experienced surgeons. Further, more controlled prospective studies on open reduction and rigid internal fixation of mandibular fractures are necessary to establish clinical protocols.

REFERENCES

- 1 Tanaka N, Tomotsuka K. Etiology of maxillofacial fracture. *Br J Oral Maxillofac Surg* 1994; 32: 19-22.
- 2 Abbas I, Ali K, Mirza YB. Spectrum of mandibular fractures at a tertiary care dental hospital in Lahore. *J Ayub Med Coll Abbottabad* 2003; 15: 12-4.
- 3 Mwaniki DL, Guthua SW. Occurrence and characteristics of mandibular fractures in Nairobi, Kenya. *Br J Oral Maxillofac Surg* 1990; 28: 200-2.
- 4 Peled M, Laufer D, Helman J, Gutaman D. Treatment of mandibular fractures by means of compression osteosynthesis. *J Oral Maxillofac Surg* 1989; 47: 566-9.
- 5 Hussain S. Single plate management of mandibular fractures with immediate postoperative functional recovery. *Pak Oral Dent J* 2005; 25:145-50.
- 6 Jaques B, Richter M, Arza A. Treatment of mandibular fractures with rigid osteosynthesis: using the AO system. *J Oral Maxillofac Surg* 1997; 55: 1402-6.
- 7 Dodson TB, Perrott DH, Kaban LB, Gordon NC. Fixation of mandibular fractures: A comparative analysis of rigid internal fixation and standard fixation techniques. *J Oral Maxillofac Surg* 1990; 48: 362-6.
- 8 Kaplan BA, Hoard MA, Park SS. Immediate mobilization following fixation of mandible fractures: a prospective, randomized study. *Laryngoscope* 2001; 111: 1520-4.
- 9 Renton TF, Wiesenfeld D. Mandibular fractures osteosynthesis: a comparison of three techniques. *Br J Oral Maxillofac Surg* 1996; 34:166-73.

- 10 Moreno JC, Fernandez A, Ortiz JA, Montalvo JJ. Complications rates associated with different treatments for mandibular fractures. *J Oral Maxillofac Surg* 2000; 58: 273-80.
- 11 Stylogianni L, Arsenopoulos A, Patrikiou A. Fractures of the facial skeleton in children. *Br J Oral Maxillofac Surg* 1991; 29: 9-11.
- 12 Shah A, Shah AA, Salam A. Maxillofacial fractures: Analysis of demographic distribution in 320 patients. *Pak Oral Dent J* 2006; 26:235-38.
- 13 Ansari SR, Khitab U, Qayyum Z, Khattak A. Retrospective analysis of 268 cases of fractures of mandible. *Pak Oral Dent J* 2004; 24:135-8.
- 14 Khan AA. A retrospective study of injuries to the maxillofacial skeleton in Harare, Zimbabwe. *Br J Oral Maxillofac Surg* 1988; 26: 435-9.
- 15 Iizuka T, Lindqvist C. Rigid internal fixation of fractures in the angular region of the mandible: an analysis of factors contributing to different complications. *Plast and Reconst Surg* 1993; 91: 265-71
- 16 Kuriakose MA, Fardy M, Sirikumara M, Patton DW, Sugar AW. A comparative review of 266 mandibular fractures with internal fixation using rigid (AO/ASIF) plates or miniplates. *Br J Oral Maxillofac Surg* 1996; 34: 315-21.
- 17 Leach J, Truelson J. Traditional methods vs rigid internal fixation of mandible fractures. *Arch Otolaryngol Head Neck Sug* 1995; 121: 750-3.
- 18 Manor Y, Chaushu G, Taicher S. Risk factors contributing to symptomatic plate removal in orthognathic surgery patients. *Br J Oral Maxillofac Surg* 1999; 57: 679-82.
- 19 Cawood JI. Small plate osteosynthesis of mandibular fractures. *Br J Oral Maxillofac Surg* 1985; 23: 77-91.
- 20 Smith WP. Delayed miniplate osteosynthesis for mandibular fractures. *Br J Oral Maxillofac Surg* 1991; 29: 73-6.
- 21 Valentino J, Levy FE, Marentette LJ. Intraoral monocortical miniplating of mandibular fractures. *Arch Otolaryngol Head Neck Surg* 1994; 120: 605-12
- 22 Stone IE, Dodson TB, Bays RA. Risk factors for infection following operative treatment of mandibular fractures: a multivariate analysis. *Plast Reconstr Surg* 1993; 91: 64-8.
- 23 Schon R, Roveda SIL, Carter B. Mandibular fractures in Townsville, Australia: incidence, aetiology and treatment using the 2.0 AO/ASIF miniplate system. *Br J Oral Maxillofac Surg* 2001; 39: 145-8.
- 24 Gabrielli MAC, Gabrielli MFR, Marcantonio E, Hochuli-Vieira E. Fixation of mandibular fractures with 2.0-mm miniplates: review of 191 cases. *J Oral Maxillofac Surg* 2003; 61: 430-6.