ORIGINAL ARTICLE

Rigid Versus Non Rigid Fixation of Displaced Mandibular Parasymphysis Fracture

AHSAN ULLAH KHAN SHERANI[1], SYED TAHIR HUSAIN[2], ARSALAN AHMED SHAIKH[3], RABIA ANIS[4], MONIS MANSOOR[5]

[1]*BDS, FCPS, Senior Registrar department of Oral and Maxillofacial Surgery, Isra University Hyderabad*
[2]*BDS, FCPS, Senior RegistrarOral and Maxillofacial Surgery Liaquat National Hospital, Karachi*
[3]*MBBS, FCPS, Associate Professor Department of ENT Liaquat University of Medical & Health Sciences, Jamshoro*
[4]*Lecturer Department of Oral and Maxillofacial Surgery, Isra University Hyderabad*
[5]*Dental Officer 2 Liaqat National Hospital, Karachi*
Corresponding Author: Dr Ahsan Ullah Khan Sherani, Email: dr.sherani786@hotmail.com, Cell Phone: +923313554692

ABSTRACT

Objective: To compare the outcomes in terms of complications of rigid fixation (two miniplates Osteosynthesis) versus non-rigid fixation (maxillomandibular fixation alone) for treatment of displaced Mandibular Parasymphysis fracture.

Study Design: Randomized controlled trial

Place and Duration: Conducted at Bolan Medical College/ Civil Hospital Quetta for six months duration from July 2016 to December 2016.

Methodology: Total 116 patients of both genders were included in this study. Pre-operatively a written consent was taken from each patient by the primary investigator of this study. Patients were equally divided into two groups, 58 patients in each group. Group A treated with rigid fixation while group B treated with non-rigid fixation. Clinical examination, X-Ray Orthopentomogram of face were taken preoperatively. These measures were also be used to assess post-operative complications i.e. (surgical site infection, malocclusion, nerve damage, limited mouth opening)during follow-ups of the patient. Data was analyzed by SPSS 24.0.

Results: Mean ± SD of age in group A was 29.20±6.143 years and in group B were 29.10±5.280 years. In Gender distribution of group A 70.68% were male and 29.31% were female and in group B the distribution of male and female was 74.13% and 25.86% respectively. By comparing both groups, the non significant association were found between limited mouth opening, malocclusion, nerve damage and surgical site infection i.e. P (0.140, 0.406, 0.122 and 0.452) respectively.

Conclusion: It is to be concluded that rigid and non-rigid fixation provides optimal stability for healing and allow immediate function of stomatognathic system but high complications rate. Regarding postoperative infection, malocclusion, nerve damage, limited mouth opening, and statistically non-significant difference was found between the two treatment groups.

Keywords: Mandibular fracture, Rigid internal fixation, Intermaxillary fixation, Postoperative complications

INTRODUCTION

The biggest and strongest facial bone is Mandible. Its prominent position, anatomical configuration, mobility and lower bones make it more resistant to fractures in more than one location [1]. Falls, road crashes, sports injury, interpersonal abuse, workplace trauma and pathological fractures are causes of Mandibular fractures. These etiological factors rely on geographical location, social, cultural and environmental factors for physical activity[2]. Mandibular fracture is classed by anatomy; i.e., dentolar, condylate, coronoid, ramus, angle, body, symphysis, parasymphysis. The most common site of Mandibular fracture is parasymphysis [2,3]. In order to prevent severe complications and secondary operative procedures, careful management of mandibular fracture is necessary regardless of position. General principle for the management of Mandibular fracture is to reduce the fragments into proper position and immobilize them until bony union occurs (reduction and fixation) [4]. Parasymphysis Mandibular fracture (PMF) can be treated by variety of methods [5,6]. Non-rigid traditional method of maxillomandibular fixation (MMF) using dental wiring, arch bars and eyelets is most commonly used method but it, on the contrary, has been associated with limited jaw function and restriction to liquid or soft diet only, resulting in weight loss. It is also associated with inability to maintain oral hygiene, reduction in ventilatory volume, difficulty in clearing pharyngeal secretions and ultimately pulmonary atelectasis. Due to such significant morbidity resulting from this procedure, alternative methods of treatment are used these days to avoid or shorten period of immobilization. Currently rigid fixation with one or two miniplates has become widely accepted method of PMF which eliminates the need for postoperative maxilla mandibular fixation [7,8]. This has made possible a rapid return of function and ability to resume early normal life. Rigid fixation has been claimed to have less frequent visits to dental office and patient's ability to maintain oral hygiene. Previous study conducted in 2009 in Pakistan [9], According to the results of this study malocclusion (5% versus 10%), infection (5% versus 10%),limitedmouth opening (10% versus 0%), and nerve damage (0% versus 0%) was compared between the two groups i.e. non rigid versus rigid fixation.

Different treatment modalities for mandibular fractures are available. First of all, they are intermaxillary fixation (IMF) by dental wiring alone, arch bars and artificial splints. Second, trans-substantial wiring (TOW), circumferential wiring and external pin fixing IMF with osteosynthesis. Thirdly, osteosynthesis without intermaxillary attachment of the miniplates, non-compression plates, panels and lag

screws [10]. Traditionally, the fracture site is fixed and immobilized by non-stress fixation and is temporarily linked with the opposite jaw by some kind of intermaxillary fixation. It has significant drawbacks for patients. It inhibits the normal jaw function and limits the diet to the consistency of liquid and semiaquid. Weight loss is normal, oral hygiene is difficult to maintain and the recovery time has been extended. [11] Current developments in the treatment of mandibular fractures include conservative closed IMF cuts, open cable and IMF cuts and open cuts in the internal hard fixation.

The treatment of broken mandible is linked to various complications including inflammation, malocclusion, malunion, non-union, delayed union, restricted mouth opening and sensory disruption, irrespective of the treatment method. [12]

Earlier studies comparing rigid and non-strength attachment in Parasymphycal Mandibular Fracture are not randomized. In this context, we intend to perform a randomized controlled trial comparing rigid to non-rigid fixation in the parasymphial mandibular fracture with common postoperative complications, i.e. malocclusion, reduced open mouth, infection in the operating site (SSI), and nervous harm.

MATERIALS AND METHODS

Total 116 patients reporting to OPD of Bolan Medical College/ Civil Hospital Quetta seeking treatment of displaced Mandibular Parasymphysis fracture. Informed consent was taken from the selected patients. Risks and potential benefits of the surgical procedure had been explained to patient in the operation theatre, the patients were randomized to either intervention A (rigid fixation) or B (non-rigid fixation) by lottery method. For female patients a female attendant was also present at time of lottery. Patient comfort is also taken into consideration and all potential confounders are excluded i.e. pathological fracture, fracture in mixed dentition period and fracture in edentulous patients and fracture in patients having co- morbidities i.e. (diabetes mellitus, liver cirrhosis, and patient on steroid therapy). History, clinical examination, x-ray Orthopentomogram of face were taken preoperatively. These measures were also be used to assess post-operative complications during future follow-ups of the patient. These patients were followed up on 2nd, 4th, and 6th week after discharge. On each follow up every patient were assessed for presence or absence of same variables i.e. surgical site infection, malocclusion, nerve damage, limited mouth opening. All the procedure were done under the supervision of consultant having > 5 years of experience.

Data was analyzed through SPSS version 24.0. Means and standard deviation was calculated for quantitative variables like age and duration of fracture, frequency and percentage was calculated for qualitative variables like gender and outcomes variables. Chi-Square test was applied to compare the outcomes of both groups. P-value <0.05 was taken as statistically significant.

RESULTS

Mean ± SD of age in group A was 29.20±6.143 years and in group Bwere 29.10±5.280 years. Mean ± SD of duration of fracture in group A was 6.24±6.24 days and in group B was 5.96±5.96 days. In group A 41 (70.68%) patients were male and 17 (29.31%) were female and in group B the distribution of male and female was 43(74.13%) and 15(25.86%) respectively. (Table 1)

Table No 1: Baseline details of all the patients

Variables	Group A	Group B
Mean Age (yrs)	29.20±6.143	29.10±5.280
Fracture Duration (days)	6.24±6.24	5.96±5.96
Gender		
Male	41 (70.68%)	43(74.13%)
Female	17 (29.31%)	15 (25.86%)

Limited mouth opening was found 12% in group A , 22% in group B and P value found to be non-significant i.e. (P=0.140),Malocclusion was found in 15.51% in group A , 10.34% in group B with non-significant P value i.e.(0.406), In group A nerve damage was not reported and in group B 5.17% was reported with (P=0.122),Surgical site infection wasfound in 18.96% in group A and 13.79% in group B and non- significant association was found i.e.(0.452) (Table 2)

Table no 2: Comparison of Outcomes Between Groups

OUTCOMES	GROUPS		P-VALUE
	RIGID FIXATION (n=58)	NON-RIGID FIXATION (n=58)	
Limited Mouth Opening			
Yes	7	13	
No	51	45	0.140
Malocclusion			
Yes	9	6	
			0.406
No	49	52	
Nerve Damage			
Yes	0	3	
			0.122
No	58	55	
Surgical Site Infection			
Yes	11	8	0.452
No	47	50	

DISCUSSION

The ultimate objective of maxillofacial surgeons in the management of mandibular fractures is the restoration of the physical integrity and early functioning with minimal morbidity The age ranged from 18 to 65 years during this study with a mean age 29.92 ±9.54 years. The commonest age group was between 18 and 35 years (64,65%), followed by between 36 and 65 years (35.34 percent). 72% of patients were male (n=84) and 28% female (n=32) with gender distribution. The ratio of men to women was 2.62:1. A research carried out by Abbas I and coworkers in Punjab Dental Hospital Lahore in 2003 published similar findings on the distribution of age and gender in mandibular fractures [2]. Similar studies of age and gender distribution in mandibular fracture have been published by Hussain S(2005)[13], HussainSetal(2003)[14],SawhneyCP(1988)[15],Khan AA(1988)[16]and Wong KH(2000)[17].

RTA is the leading cause in this analysis, followed by falling from height. The results of RTA, as the leading cause of mandibular fractures, are consistent with earlier studies[18,19], and subsequently fall from height. The most common site of mandibular fracture was a 41.2 percent parasymphysis followed by the angle (25 percent). The findings are similar in Renton TF et al. (1996)[20] and Moreno JC et al. (2000)[21], which registered a higher percentage of RTA body and condylar fractures with the predominance of parasymphysis at other ofmandable locations, whereas Adil M etal[22].

The current study showed the opening of the mouth as the common complication in both classes, total 17.24% (n=20), 12.06% in Group A, and 22.41% in Group B. The higher number of rigid fixed infections can be due to contamination of the fracture site from intra-oral or extra-oral incision, fracture patterns, technological failure, lack of prophylactic antibiotics and patient non-compliance [23]. The second most frequent complication was infection at the surgical site. The low infection rate in the non-rigid community could be due to the preservation of less serious fractures which require no exposures to the fracture site and thus minimum chance of contamination. Post-surgical malocclusion was the third most common complication observed, occurring in 26% of total cases. The occurrence of post-operative malocclusion depends on the dental condition of the patient, number of fractures, fracture form, fracture displacement, reduction, attachment and immobilizations. In Group A malocclusion was observed in 15.51% (n=9) of patients and 10.34% (n=6) in group B. The same rate of malocclusion in rigid fixation recorded by Iizuka T and LindqvistC [12] and Cawood JI [23], which is in keeping with this analysis. The observed malocclusion rate was less (17%) in the traditional process, which corresponds to previous studies [24].

Malunion was found in both groups of the study and needed no operation. Delayed union was described as excessive mobility of the fracture site after 4-6 weeks of treatment. There was no single case of delayed union in group A, although 7.5% (n=3) delayed union in group B occurred. The literature published similar findings with regard to the delayed union[25]. The X-rays show an abrupt end of the bone and sclerosis called eburnation. Fortunately, none of our patients have faced this. This result corresponds to studies by Abbas [26], Wong KH [27] and Akhtar MU et al [28]. Sensory disturbances were reported as lower nerve, mental nerve andlingualnerveaccording patient complaints.

The mouth opening of the treatment was assessed for all treatment groups at the end of the treatment. It is the distance between the upper and lower incisors when the mouth is opened. In this analysis, the mean mouth opening in group A and group B was 42,1±3,36 mm and 27,2±4,43 mm. The findings of Amaratunga NA [293] agree with the present analysis, which includes 44±2mm for rigid fixation and 28±2mm for non-rigid fixation. Shah AA et al;[30] noted a considerably higher level of opening of the mouth in patients following therapy with early mobilization. Kyosti O et al [31] found a mean opening of the mouth of 42.08 mm in patients treated with rigid fixation. This trism will probably be caused by the long immobilization of the mandible in intermaxillary fixation, which leads to a weakening of the chewing muscles[32]. Trismus in Group B was relieved in a week to 10 days by informing these patients of a wooden stick exercise.

CONCLUSION

The conclusion is that rigid and non-rigid fixation provides optimum healing stability and permits immediate operation of the system but high complication rates. Statistically, the non-significant difference between the two treatment groups was seen in postoperative infections, malocclusion, nervous injury, minimal opening of the mouth.

REFERENCES

1. 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.
2. Muzzafar K. Management of maxillofacial trauma. AFID Dent J 1998; 10:18-21.
3. Schon R, Roveda SIL, Carter B. Mandibular fractures in Townsville, Australia: incidence, aetiology and treatment using the 2.0 AO/ASIF miniplatesystem. Br J Oral MaxillofacSurg 2001; 39:145-8.
4. Perkin CS, Layton SA. The etiology of maxillofacial injuries & the seat belt law. Br J Oral MaxillofacSurg 1998; 26:353-63.
5. Telfer MR, Jones GM, Shepherd JP. Trends in the aetiology of maxillofacial fractures in the United Kingdom (1977-1987). Br J Oral MaxillofacSurg 1991; 29:250-5.
6. Hussain S, Ahmad M, Khan I, Anwar M, Amin M, Ajmal S, etal. Maxillofacial trauma: current practice in management atPakistan Institute of Medical Sciences. J Ayub Med Coll Abbottabad 2003; 15: 8- 11.
7. 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.
8. Lawoyin DO, Lawoyin JO, Lawoyin TO. Fractures of the facial skeleton in Tabuk North West Armed Forces Hospital. A five year review. African J Med & Med Sci 1996; 25:385-7.
9. Kaplan BA, Hoard MA, Park SS. Immediate mobilization following fixation of mandible fractures: a prospective, randomized study. Laryngoscope 2001; 111:1520-4.
10. Jaques B, Richter M, Arza A. Treatment of mandibular fractures with rigid osteosynthesis: using the AO system. J Oral MaxillofacSurg 1997; 55:1402-6.
11. Iizuka T, Lindqvist C. Rigid internal fixation of fractures in the angular region of the mandible: an analysis of factors

contrib- uting to different complications. Plast and Reconst Surg 1993; 91:265-71.
12. Hussain S. Single plate management of mandibular fractures with immediate postoperative functional recovery. Pak Oral Dent J. 2005; 25:145-50.
13. Hussain S, Ahmad M, Khan I, Anwar M, Amin M, Ajmal S, etal. Maxillofacial trauma: current practice in management at Pakistan Institute of Medical Sciences. J Ayub Med Coll Abbottabad 2003; 15: 8- 11.
14. Sawhney CP, Ahuja RB. Faciomaxillary fractures in North India a statistical analysis and review of management. Br J Oral Maxillofac Surg 1988; 26: 430-34.
15. Khan AA. A retrospective study of injuries to the maxillofacial skeleton in Harare, Zimbabwe. Br J Oral Maxillofac Surg 1988; 26:435-39.
16. Wong KH. Mandible fractures: a 3 –year retrospective study of cases seen in an oral surgical unit in Singapore. Singapore Dent J 2000; 23: 6-10.
17. Renton TF, Wiesenfeld D. Mandibular fractures osteosynthesis: a comparison of three techniques. Br J Oral Maxillofac Surg 1996; 34:166- 73.
18. Moreno JC, Fernandez A, Ortiz JA, Montalvo JJ. Complica-tions rates associated with different treatments for mandibular fractures. J Oral Maxillofac Surg 2000; 58:273-80.
19. Adi M, Ogden GR, Chisholm DM. An analysis of mandibular fractures in Dundee, Scotland (1977-1985). Br J Oral Maxillofac Surg. 1990; 28:194-99.
20. Faleh WA, Zahrani AA. Observer agreement on radiographic assessment of mental foramen appearance in panoramic radiographs. Pak Oral Dent J 2005; 25:225-8.
21. Cawood JI. Small plate osteosynthesis of mandibular fractures. Br J Oral Maxillofac Surg 1985; 23:77-91.
22. Horowitz I, Abrahami E, Mintz SS. Demonstration of condylar fractures of the mandible by computed tomography. Oral Surg Oral Med Oral Pathol 1982; 54:263-8.
23. Kyosti O, Mikko A, Heini K. A retrospective analysis of 279 patients with isolated mandibular fractures treated with titanium miniplates. J Oral MaxillofacSurg 1994; 52:931-5.
24. 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 MaxillofacSurg 1990; 48:362-6.
25. Hussain S. Single plate management of mandibular fractures with immediate postoperative functional recovery. Pak Oral Dent J 2005; 25:145-50.
26. Hussain S. Single plate management of mandibular fractures with immediate postoperative functional recovery. Pak Oral Dent J. 2005; 25:145-50.
27. Wong KH. Mandible fractures: a 3 –year retrospective study of cases seen in an oral surgical unit in Singapore. Singapore Dent J 2000; 23: 6-10.
28. Akhtar MU, Shah AA. Unusual mandibular fractures of very young children and their management at tertiary dental care centers. Pak Oral Dent J 2005; 25:135-8.
29. Amaratunga NA. The relation of age to the immobilization period required for healing of mandibular fractures. J Oral MaxillofacSurg 1987; 45:111-3.
30. Shah AA, Akhtar MU. Rotated or displaced developing tooth crypts at mandibular fracture sites and their management. Pak Oral Dent J 2005; 25:125-30.
31. Kyosti O, Mikko A, Heini K. A retrospective analysis of 279 patients with isolated mandibular fractures treated with titanium miniplates. J Oral MaxillofacSurg 1994; 52:931-5.
32. Patel MF, Longdon DJ. Titanium mesh (Timesh) osteosynthesis: a fast and adaptable method of semi-rigid fixation. Br J Oral MaxillofacSurg 1991; 29:316-24.