

Post Operative Outcomes of Single Versus Two Miniplates for Management of Condylar Fractures

GEETA DEVI¹, USMAN MANZOOR², MUHAMMAD HAMZA HASHIM³, SUNEEL KUMAR PUNJABI⁴, KHURSHEED AHMED⁵, BHARTI⁶, SALMAN SHAMS⁷

¹Resident, Oral and Maxillofacial Surgery Department, Liaquat University of Medical and Health Sciences, Jamshoro

²Senior Registrar, Department of Oral and Maxillofacial Surgery, Avicenna Dental College, Lahore

³Assistant Professor, Department of Oral and Maxillofacial Surgery, Avicenna Dental College, Lahore

⁴Associate Professor, Oral and Maxillofacial Surgery Department, Liaquat University of Medical and Health Sciences, Jamshoro

⁵Resident, Oral and Maxillofacial Surgery Department, Pakistan Institute of Medical Sciences PIMS, Islamabad

⁶Lecturer, Oral and Maxillofacial Surgery Department, Bibi Aseefa Dental College, Larkana

⁷Senior Lecturer, Oral and Maxillofacial Surgery Department, Liaquat University of Medical and Health Sciences, Jamshoro

Correspondence to: Salman Shams, Email: salman.shams@lumhs.edu.pk, Cell: 03332602810

ABSTRACT

Objective: To compare the outcomes in patients with single versus two miniplates for condylar fracture.

Study Design: Cross-Sectional Study

Place and Duration of Study: The study took place in Department of Oral & Maxillofacial Surgery, Institute of Dentistry LUMHS, Jamshoro. The duration of study was 6 months after the approval of the synopsis.

Methodology: 40 people in all were included in the trial. A single miniplate was used for Group A's treatment, whereas two miniplates were used for Group B's treatment. Clinical assessment, orthopantomogram (OPG), a P.A. image of the face, and, if necessary, a 3D CT scan will be used to make the diagnosis of condylar fracture. The data was analysed by SPSS version 21

Results: Results of this investigation indicated that the preoperative evaluation of the variables including malocclusion, mouth opening, protrusive movement, and lateral movement revealed greater values, but much less means were found in postoperative examination. ANOVA is done one method to compare the means between preoperative and postoperative malocclusion. The statistical comparison is significant at less than 5%. The examination of platform fracture or bending occurs after the operation, which demonstrates that 92.5% of the population without platform fracture, while 7.5% exhibit platform fracture after surgery.

Conclusion: In conclusion, it is indicated that two miniplates with less complicated fixing are superior to a single miniplate.

Keywords: condylar fracture, single miniplates, double miniplate, treatment of condylar fracture, post-operative outcomes of condylar fracture.

INTRODUCTION

The mandibular condyle is a key component of mouth opening and closing, and its fracture may result in both functional and cosmetic issues such facial disproportion. A third of all occurrences of condylar fracture, which is prevalent among other mandibular fractures and accounts for 30% to 40% of all cases of mandibular fracture, include patients who are typically between the ages of 25 and 34. Furthermore, mandibular condylar fracture occurs in 40% of children who suffer injuries.¹ Road traffic incidents, childhood trauma, and assault, particularly against women, are the main causes of condylar fracture.²

There are many classifications for condylar fractures. Spiessl and Scroll classification, which divided condylar fractures into types I through VI, is one of them. the sigmoid notch is crossed by the fracture line in this high condylar neck fracture. On panoramic radiography, a low subcondylar fracture was described as a fracture of the condylar neck that was beneath a horizontal line formed from the right to left sigmoid notch.^{3,4} Diagnosis is confirmed by thorough history, physical examination and radiological imaging (OPG, CT scan coronal section if required).^{5,6}

The question of whether to handle adult condylar fractures with an open reduction or a closed reduction is yet up for debate.⁶ Adults who have a dislocated or displaced condylar fracture outside of the mandibular fossa should consider surgery.⁷ The degree of fracture displacement also influences the need for open reduction. Closed methods should be used to treat mild displacement, which is defined as ramal height reduction of less than 2 mm or deviation of less than 10 degrees, while surgical methods should be used to handle heavily displaced cracking, defined as ramal height shortening of more than 15 mm or deviation of more than 45 degrees.⁸

Mandibular condylar fractures may be fixed using a variety of techniques, including the pin-in-groove approach, wires, miniplates, lag screws, three-dimensional plates, and trapezoidal plates.⁴ The advantages of early mobilisation provided by the miniplate method has caused surgeons to shift their attention to open reduction⁹

One vs two small plates for low condylar fracture have been the subject of several investigations. Owing to the research, two plates give superior stability than one plate.¹⁰ According to research, two miniplates have shown to be more stable than a single miniplate in terms of screw slipping and plate breaking.¹¹

According to various research, sufferers who received a single plate experienced plate bending, loosening of screws, unsatisfactory reduction, lateral deviation on mouth opening, and malocclusion, while patients who received two miniplates experienced little to no insufficient reduction, lateral deviation on mouth opening, or infection.¹² Two plate fixation (1 plate parallel to the condylar axis and second plate parallel to the condylar notch) provide dynamic osteosynthesis.¹³

The key to fracture healing is rigid fixation with excellent bone to bone contact, any movement at fracture site lead to malunion or non union. Several factors act on mandibular condylar process in different direction during function. It is essential for re-establishment of pre traumatic occlusion and for the normal mandibular movements.¹⁴

MATERIAL AND METHODS

The study was a randomized, controlled double blind trial. It consists of a cross-sectional comparative study design. The sampling technique of research in this study is a convenient non-probability sampling procedure. The analysis was carried out for 1 year from November 2020 to October 2021.

The sample size is taken from EPI Tools epidemiological www.epitools.ausvet.com.au/

The sample size is 36⁴, to compensate the loss, we have added 10% for non-respondents, hence sample size is 40 in each group patients will be divided by chit method.

The sample is divided into the following groups:

Group A: Single Miniplate (20 patients)

Group B: Two Miniplates (20 patients)

Inclusion Criteria

- Patients having unilateral non communicated low condylar fracture of mandible.

- Patients at the age of 18 years or older.
- Both genders are included.

Exclusion Criteria:

- Patients having comminuted bilateral, high condylar fracture of mandible.
- Medically compromised patient for general anaesthesia.
- Patients with insufficient dentition to reproduce occlusion.

Data Collection Procedure: Individuals who met the requirements for the research and arrived to Liaquat University of Medical & Health Sciences' OPD (Outdoor Patient Department) or Emergency Department in Jamshoro or Hyderabad were chosen for the research with their agreement. The chit technique was used to divide the patients into two groups. Group B received treatment with two miniplates, whereas Group A received treatment with a single miniplate. Each patient and caretaker gave the investigator their signed informed permission. Performa was used to record the patient's full medical history, which included the patient's name, age, gender, hospital registration number, presenting complaints, and clinical characteristics such as signs, symptoms, and the location of the condylar fracture. After receiving clearance from the university's ethical review committee, the study was conducted. Diagnosis of condylar fracture was made through clinical examination, Orthopantomogram (OPG) and P.A view of face and 3D CT Scan where indicated.

Procedure: Patients were admitted in hospital for evaluation and baseline investigations, clinical and radiographic examination.

Following reports, patients were instructed to refrain from eating or drinking for six hours before to surgery, and on the day of the procedure, patients were made ready for anaesthesia according to accepted international guidelines. Prior to local anaesthesia with Xylocaine 2% Adrenaline 1:100,000, Medicine, sufferers were initially given general anaesthesia by nasal intubation on the day of operation. Additionally, five eyelets were placed through the upper and lower jaws to produce the typical functional occlusion. Blade No. 15 was used to make an extra oral incision after accomplishing optimum functional occlusion in order to visualise the fracture. Following fracture reduction and a second occlusion check, plates were fixed with either a single miniplate or two miniplates by drilling with generous irrigation of normal saline (0.9%). According to the needs of the case, the incision was sealed using a three-layer approach using Vicryl surgical sutures 3-0 and prolene surgical sutures 4-0, 5-0.

In order to keep the patient on the opposite side of the operation for the next six hours, the intermaxillary fixation was removed after the operation, and the patient was transferred into a room with a maintained IV line. In addition to using post-operative radiological pictures, clinical examinations were used to evaluate mouth opening, malocclusion, lateral and protrusive motions, and plate fracture or bending. After the fracture was treated, the responses were noted, followed by patient follow-ups at intervals of day 1, day 3, day 7, day 14, and day 21.

Data Analysis Procedure: SPSS 21 was used to analyse the data. The frequency and percentages of quantitative factors such as treatment method, lateral movement, protrusive movement, and malocclusion were provided. Age, malocclusion, and mouth opening are quantitative factors that were provided as mean and standard deviation. To examine the statistical significance, the independent t test was used with the treatment approaches (Single Miniplate and Two Miniplates) to measure malocclusion and mouth opening both pre- and postoperatively. Chi square test was applied with treatment approach (Single Miniplate and Two Miniplates) and Lateral movement, Protrusive movement and Malocclusion preoperatively and postoperatively. The p value < 0.05 was considered as significant at 95% confidence interval.

RESULTS

Demographics and descriptive statistics of the study variables including gender are distributed into the table 4.1, while the group of respondents and treatment approach is also distributed in the

table below. The table percentage for each variable is given as well.

Pre-operative Assessments: Pre-operative assessment of the following variables including Malocclusion, Mouth Opening, Protrusive Movement and Lateral Movement is given in the table 4.2, as can be seen below.

Post-operative Assessment: Post-operative frequency distributions of malocclusion are given in the table 4.3 along with the table n% which represents the percentage distributions of the frequency on day 1, 3, 7, 14, and 21 as can be seen below.

Frequency distributions for the mouth opening are given in the table 4.4 on day1, 3, 7, 14, and 21 as below.

Likewise, frequency distribution of the Protrusive Movement post-operative assessments shows the following distributions in the below table 4.5, along with table n percentage.

Frequency distributions of the respondents with lateral movement evaluation after the surgery is given in the table 4.6 as can be seen below.

In the end, the frequency distributions of the plate fracture or bending post-operative assessment shows the 92.50% for 'NO' while 7.50% counts for 'Yes'. See table 4.8

One-way ANOVA is performed to compare the means between pre-operative

malocclusion and post-operative, the results of the analysis show high means of the malocclusion while post-operative assessment shows very less, or zero means suggest almost no malocclusion after the surgery.

Table 1: Frequency Distribution of Demographics and Treatment Approach

	N	Minimum	Maximum	Mean	Std. Deviation
Gender	40	1.00	2.00	1.2000	.40510
Fracture of Condyle Diagnosed	40	3.00	3.00	3.0000	.00000
Treatment Approach	40	1.00	2.00	1.5000	.50637
Valid N (list wise)	40				

Table 2: Pre-Operative Frequency Distribution of Variables

	No	Count	Table N %
Malocclusion	No	0	0.0%
	Yes	40	100.0%
Mouth Opening	Normal	0	0.0%
	Limited	0	0.0%
	<35mm	40	100.0%
	35-45mm	0	0.0%
Protrusive Movement	Normal	0	0.0%
	Limited	0	0.0%
	<10mm	40	100.0%
	10mm	0	0.0%
Lateral Movement	Normal	0	0.0%
	Limited	0	0.0%
	<10mm	40	100.0%
	10mm	0	0.0%

Table 3: Frequency Distribution of Malocclusion

Malocclusion	Count	Table N %	
Day 1	No	38	95.00%
	Yes	2	5.00%
Day 3	No	40	100.00%
	Yes	0	0.00%
Day 7	No	40	100.00%
	Yes	0	0.00%
Day 14	No	37	92.50%
	Yes	3	7.50%
Day 21	No	37	92.50%
	Yes	3	7.50%

Table 4: Frequency Distribution

Mouth Opening	Count	Table N %	
MO Day1	Normal	26	65.00%
	Limited	0	0.00%
	<35mm	14	35.00%
	35-45mm	0	0.00%
MO Day3	Normal	32	80.00%
	Limited	0	0.00%
	<35mm	8	20.00%

MO Day7	35-45mm	0	0.00%
	Normal	30	75.00%
	Limited	0	0.00%
	<35mm	9	22.50%
MO Day14	35-45mm	1	2.50%
	Normal	25	62.50%
	Limited	0	0.00%
	<35mm	15	37.50%
MO Day21	35-45mm	0	0.00%
	Normal	23	57.50%
	Limited	0	0.00%
	<35mm	17	42.50%
	35-45mm	0	0.00%

Table 5: Frequency Distribution of Protrusive Movement

Protrusive Movement		Count	Table N %
PM Day1	Normal	24	60.00%
	Limited	0	0.00%
	<10mm	15	37.50%
	10mm	1	2.50%
PM Day3	Normal	33	82.50%
	Limited	0	0.00%
	<10mm	7	17.50%
	10mm	0	0.00%
PM Day7	Normal	31	77.50%
	Limited	0	0.00%
	<10mm	9	22.50%
	10mm	0	0.00%
PM Day14	Normal	24	60.00%
	Limited	0	0.00%
	<10mm	16	40.00%
	10mm	0	0.00%
PM Day21	Normal	23	57.50%
	Limited	0	0.00%
	<10mm	17	42.50%
	10mm	0	0.00%

Table 6: Frequency Distribution of Lateral Movement

Lateral Movement		Count	Table N %
LM Day1	Normal	23	57.50%
	Limited	0	0.00%
	<10mm	16	40.00%
	10mm	0	0.00%
	11	1	2.50%
LM Day3	Normal	33	82.50%
	Limited	0	0.00%
	<10mm	7	17.50%
	10mm	0	0.00%
LM Day7	0	1	2.50%
	Normal	29	72.50%
	Limited	0	0.00%
	<10mm	9	22.50%
	10mm	1	2.50%
LM Day14	0	1	2.50%
	Normal	22	55.00%
	Limited	0	0.00%
	<10mm	16	40.00%
	10mm	0	0.00%
LM Day21	11	1	2.50%
	0	1	2.50%
	Normal	22	55.00%
	Limited	0	0.00%
	<10mm	17	42.50%
	10mm	0	0.00%

Table 7: Frequency Distribution of Plate Fracture/Bending

Plate Fracture or bending		Count	Table N %
PF	No	37	92.50%
	Yes	3	7.50%

DISCUSSION

The objective of this pilot project was to compare the results for condylar fracture in patients with single compared to two miniplates, the purpose was to evaluate the effectiveness in the fixation of the a sub condylar fracture with two non-compression miniplates as compared to one single non-compression miniplate. Results of this investigation indicated that two miniplates with less complicated fixing are superior than a single miniplate.

The literature mentions many problems when a single mini-plate is employed for fixing a condylar fracture. According to Hammer et al¹⁵, 35% of patients suffered either plate failures or screw loosening with a single mini-plate after the fracture was stabilized. The single plate sometimes resulted in insufficient attachment.

The two-miniplate attachment approach offers functionally stable stabilization for condylar neck fractures, according to Choi et al¹⁶. It also suggests that applying a miniplate to the back and front of the condylar neck seems to benefit from restoring the trajectories of tension and compression. Pilling et al¹⁷ concludes that two miniplates osteosynthesis is the most stable approach to repair a condylar fracture after comparing 10 alternative procedures of condylar basis fracture osteosynthesis. Choi et al¹⁶ proved in an in vitro model that a two-miniplate system was more stable in the condylar neck's anterior and posterior areas than a single-plate system. In our patients, we had no issues treated with two plates.

In the Pilling trial, the average time necessary for Groups I and II was respectively 2, 22 hours and 2,48 hours, while in Group II the time necessary was longer. The Rallis G¹⁸ also showed a longer operating time for two-plated patients, while the cost of treating patients with two miniplates similarly increased compared with group I in our group II series of implants.

The small sample size and the restricted follow-up might be regarded the research's constraint, but the findings of our pilot research suggest that the use of two plates for sub condylar fractures constitutes the optimal option compared to a single miniplate in obtaining stable osteosynthesis.

CONCLUSION

This research is targeted at determining the comparative results in single patients against two condylar fracture miniplates. It was concluded that that two plate system is better treatment modality for condylar fracture in terms of reducing post-operative side effects.

REFERENCES

- Shakya S, Zhang X, Liu L. Key points in surgical management of mandibular condylar fractures. Chin J Traumatol 2020; 23 (02) 63-70
- Chrcanovic BR, Abreu MH, Freire-Maia B, Souza LN. 1,454 mandibular fractures: a 3-year study in a hospital in Belo Horizonte, Brazil. J Craniomaxillofac Surg. 2012 Feb;40(2):116-23
- Merlet FL, Grimaud F, Pace R, Mercier JM, Poisson M, Pare A, Corre P. Outcomes of functional treatment versus open reduction and internal fixation of condylar mandibular fracture with articular impact: A retrospective study of 83 adults. J Stomatol Oral Maxillofac Surg. 2018 Feb;119(1):8-15.
- Rai A. Comparison of single versus double non compression miniplates in the management of subcondylar fracture of the mandible:Ann Maxillofac Surg . 2012; 2(2):141-145.
- Mahgoub MA, El-Sabbagh AH, Abd El-Latif EA, Elhadidy MR. Condylar Fractures: Review of 40 Cases. Ann Maxillofac Surg. 2018 Jan-Jun;8(1):19-27
- Patil RS, Gudi SS. Management of subcondylar fracture through intraoral approach with rigid internal fixation.JMaxillofac Surg 2011;10(3):209-215.
- Kang DH. Surgical Management of a Mandible Subcondylar Fracture. Arch Plast Surg 2012;39:284-290.
- Asim MA, Ibrahim MW, Javed MU, Zahra R, Qayyum MU. Functional outcomes of open versus closed treatment of unilateral mandibular condylar fractures. J Ayub Med Coll Abbottabad 2019;31(1):67-71.
- Kinisci R. Management of fractures of the condyle, condylar neck and coronoid process. Oral Maxillofac Surg Clin. 2013;25(4):573-90.
- Lee W, Kang DH. Study of the plating methods in the experimental model of mandibular subcondyle fracture. J Korean Cleft Palate-Craniofac Assoc 2011;12:12-6.
- Ashraf U, Ahmed S, Shaikh AH, Iqbal N, Zaidi SJA, Hasan U, Ali A. Condylar fracture; correlation of treatment outcomes of condylar fracture fixation with single and multiple miniplates. Professional Med J 2019; 26(3):416-420.
- Malhotra A, Borle R, Bhola N, et al. Comparison of postoperative outcomes in mandibular condylar fracture treated with single versus double non-compression miniplates. IOSR-JDMS. 2014;13(10):89-93.

13. Singh G, Mohammad S, Das S, et al. Trapezoidal condylar plate: Report of 15 cases In The Management of Mandibular Subcondylar Fracture. *J Adv Med Dent Scie* 2013;1(2):13-18.
14. Kurtadikar K, Singhvi N, Shetty JN, et al. Evaluation of mechanical resistance after fixation of mandibular condylar fracture with single and double miniplates: A comparative in vitro study. *J Maxillofac Oral Surg.* 2015;14(2):441-447.
15. Hammer B, Schier P, Prein J. Osteosynthesis of condylar neck fractures: A review of 30 patients. *Br J Oral Maxillofac Surg.* 1997;35:288-91.
16. Choi BH, Yi CK, Yoo JH. Clinical evaluation of 3 types of plate osteosynthesis for fixation of condylar neck fractures. *J Oral Maxillofac Surg.* 2001;59:734-7.
17. Pilling E, Eckelt U, Loukota R, Schneider K, Stadlinger B. Comparative evaluation of ten different condylar base fracture osteosynthesis techniques. *Br J Oral Maxillofac Surg.* 2010;48(7):527-31.
18. Rallis G, Mourouzis C, Ainatzoglou M, Mezitis M, Zachariades N. Plate osteosynthesis of condylar fractures: A retrospective study of 45 patients. *Quintessence Int.* 2003;34:45-9.