

# Comparison Between Mini Plate Versus Trapezoidal Plate in Management of Condylar Fracture

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## ABSTRACT

**Objective:** To compare the clinical outcomes between the Miniplates versus Trapezoidal plates in terms of pain, mouth opening and malocclusion.

**Methodology:** A total of 34 patients were categorized into two Groups according to convenient Sampling Methods. Group A was treated with Miniplates and Group B was treated with Trapezoidal Plates. Diagnosis of condylar fracture was made through clinical examination, Orthopantomogram (OPG), P.A view of face and 3D CT scans where indicated. After surgery postoperative pain, mouth opening and malocclusion were recorded at interval of 3, 7, 14 and 21 days.

**Results:** Mean age of the patients of group A was 30.39+10.91 years and mean age of patients of group B was 29.05+7.25 years. Males were in majority in both groups as 70.6% were in group A and 88.2% were in group B. Preoperatively most of the patients were presented with severe pain in both groups as 47.1% in group A and 52.9% in group B. Post-operative pain on day 3 was in moderate presentation in both groups, on day 7 and day 14 pain was mild in both groups and on day 21 there was no pain in either groups. Malocclusion in Group A on day 3 was in 29.4% and 11.85% in group B. At Day 21 both groups were recorded with no malocclusion. But patients treated with trapezoidal plate achieved stability earlier than those treated with miniplates.

**Conclusion:** Trapezoidal plate has been found to be more effective. There was an improvement in mouth opening and occlusion in the immediate postoperative period. However findings were statistically insignificant.

**Keywords:** Condylar fracture, Miniplates, Trapezoidal plates, Pain, Mouth Opening, Malocclusion

## INTRODUCTION

Condylar fracture is a common mandibular injury because the neck of the condyle is the weakest part of the entire jaw, making it particularly vulnerable to fracture. It is fracture with the fracture line superior to the sigmoid notch.<sup>1,2</sup>

The most frequent mandibular fractures are mandibular condylar fractures, which account for 17.5–52 % of all mandibular fractures.<sup>3,4</sup> Subcondylar fractures are the more frequent unilateral fracture, while condylar head fractures are the most prevalent bilateral fracture, both of which are induced by direct trauma but can also be produced by indirect pressures.<sup>4</sup>

The management of condylar fracture is one of the most challenging subjects of maxillofacial surgery in today's scientific era. Maxillo-mandibular fixation (MMF), functional treatment, or open reduction and internal fixation (ORIF) were all used to treat condylar fractures. Although choosing the optimal treatment method is still under debate, the absolute indications and advantages of ORIF of the fractured segments with the use of titanium plates and screws remains constant by most surgeons.<sup>5-6</sup>

Different plates can be implanted in the bones during the surgical treatment of Condylar fractures, depending on the severity of the damages. Although a solitary mini plate would be enough if the fragments are oriented appropriately and functional forces surpass the stiffness of one mini plate, the employment of two has been advocated because it gives greater strength than transosseous wire.<sup>7-8</sup>

Farmand created titanium 3D plating methods to satisfy the needs of semi-rigid attachment while minimizing the amount of difficulty.<sup>9</sup> To satisfy these biofunctional requirements in the condylar area, trapezoidal condylar plates (3D plates) were designed. As a result, the trapezoidal condylar plate (TCP) was employed as a 3D plate intended for adaption in the anatomically restricted condylar neck, thereby meeting the criterion of two single miniplates with little hardware.<sup>10</sup> However, it is still questioned whether mini plates are more suitable or trapezoidal plates.

## METHODOLOGY

This Comparative Cross Sectional research with non probability (by Convenient Sample) was carried out at Department of Oral &

Maxillofacial Surgery, Institute Of Dentistry, Liaquat University Hospital, and Hyderabad from January 2021 to December 2021. The sample size is 30<sup>2</sup>; to compensate the loss, we have added 10% for non-respondents, and hence sample size is 34 in each group patients were divided by simple convenient method.

The sample is divided into the following groups:

**Group A:** Mini plates (17 Patients)

**Group B:** Trapezoidal plates (17 patients)

**Inclusion Criteria:**

- Age Group 18 to 50 years.
- Either Gender.
- Patients having clinical and radiographic evidence of mandibular condyle fracture.

**Exclusion Criteria:**

- Patients not willing to participate in study.
- Mentally retarded patients.
- Patients who are medically compromised for general anesthesia.
- Patients with exceptional clinical symptoms or other skeletal fracture.

**Data Collection Procedure:** The patients were selected with the consent of patient for this study which was in the criteria of this study coming via OPD (Out Patient Department) or Emergency Department of Liaquat University of Medical and Health Sciences Hyderabad. A written informed consent was taken from every patient/ attendant by researcher. Complete history of patient including name, age, gender, hospital registration number, presenting complaints and clinical features including sign, symptoms and site of condylar fracture were recorded on Proforma. Study was carried out after the approval of ethical review committee of university.

Diagnosis of condylar fracture was made through clinical examination, Orthopantomogram (OPG), P.A view of face and 3D CT Scan where indicated.

**Procedure:** Patients were admitted in hospital for evaluation and base line investigations; clinical and radiographic examination.

After reports patients were advised for nil per orally (NPO) for six hours before the surgery and on the day of surgery patients

were prepared for surgery under the standard universal protocols. On the day of Surgery, first of all General anesthesia was given to patients with nasal intubation then local anesthesia containing Xylocane 2% Adrenaline 1:100,000, Medicaine. In addition, five eyelets on upper and lower jaw were passed in order to achieve the normal functional occlusion.<sup>14</sup> After achieving maximum functional occlusion incision was made extra-orally (as per the case requirement) with Blade No#15(Feather, made in Japan) to visualize the fracture, fracture was reduced and occlusion was checked again, after reduction the fracture, plates were fixed with either 2.0 Mini plate or Trapezoidal plate by during drilling copious irrigation through normal saline (0.9% Searle, Made in Pakistan). Incisions were closed by three layers technique using Vicryl surgical sutures 3/0 (Johnson and Johnson International, made in USA) and Prolene surgical suture 4/0, 5/0 (Johnsons and Johnson International, made in USA) as per the requirement of case. After procedure intermaxillary fixation was released.

The pre and postoperative responses were recorded before and after the treatment of fractures and then at follow ups of patients which was made at interval of day 3, day 7, day 14 and day 21.

**Data Analysis:** The data was analyzed by SPSS Version 21. Quantitative variables like gender diagnosis of condylar fracture, treatment approach, were presented as frequency and percentages. Quantitative variables like age, pain and mouth opening were presented as mean and standard deviation. The independent t test was applied with treatment approach (Mini plates and Trapezoidal plates) was evaluated as pain, mouth opening at preoperatively and postoperatively to check the statistical significance.

**RESULTS**

Mean age of the patients of group A was 30.39+10.91 years and mean age of patients of group B was 29.05+7.25 years, as shown in table.1

Table 1: Descriptive Statistics Of Age As Per Study Groups

Study groups	N	Mean	Std. Deviation	p-value
Group A	17	30.93	10.91	0.559
Group B	17	29.05	7.52	

Table 2: Gender Distribution According To Study Groups

Gender	Study groups		p-value
	Group A	Group B	
Male	12	15	0.147
	70.6%	88.2%	
Female	5	2	
	29.4%	11.8%	
Total	17	17	
	100.0%	100.0%	

Table 3: Pre-Operative Findings Among Both Study Groups

Pre-operative findings		Study groups		p-value
		Group A	Group B	
Pain	Mild	2	2	0.934
		11.8%	11.8%	
	Moderate	7	6	
		41.2%	35.3%	
	Severe	8	9	
Mouth opening	Limited	17	17	1.000
		100.0%	100.0%	
	Normal	00	00	
		00	00	
Malocclusion	Yes	17	17	1.000
		100.0%	100.0%	
	No	00	00	
		00	00	

Table 4: Descriptive Statistics Comparison Of Post-Operative Pain (Vas) In Both Study Groups

Post-operative pain	Study group	N	VAS		P-value
			Mean	Std. Deviation	
Pain at day3	Group A	17	5.58	2.26	0.789
	Group B	17	5.41	1.46	
Pain at day 7	Group A	17	2.47	2.52	1.000
	Group B	17	2.47	1.94	
Pain day14	Group A	17	1.29	1.61	0.249
	Group B	17	0.64	1.61	
Pain day21	Group A	17	0.00	0.00	0.325
	Group B	17	0.35	1.45	

Table 5: Descriptive Statistics Of Mouth Opening In Both Study Groups

Mouth opening		Study groups		p-value
		Group A	Group B	
Day three	Limited	6	3	0.244
		35.3%	17.6%	
	Normal	11	14	
		64.7%	82.4%	
Day seven	Limited	00	00	1.000
		00	00	
	Normal	17	17	
		100.0%	100.0%	
Day fourteen	Limited	00	00	1.000
		00	00	
	Normal	17	17	
		100.0%	100.0%	
Day twenty one	Limited	00	00	1.000
		00	00	
	Normal	17	17	
		100.0%	100.0%	

Table 6: Descriptive Statistics Of Malocclusion In Both Study Groups

Malocclusion		Study groups		p-value
		Group A	Group B	
Day three	Yes	00	00	1.000
		00	00	
	No	17	17	
		100.0%	100.0%	
Day seven	Yes	00	00	1.000
		00	00	
	No	17	17	
		100.0%	100.0%	
Day fourteen	Yes	1	0	0.310
		5.9%	.0%	
	No	16	17	
		94.1%	100.0%	
Day twenty one	Yes	1	0	0.310
		5.9%	.0%	
	No	16	17	
		94.1%	100.0%	

Males were in majority in both groups as 70.6% were in group A and 88.2% were in group B, while 29.45 females were in group A and 11.8% were in group B, see table.2

As per pre-operative pain assessment, most of the patients were presented with severe pain in both groups as 47.1% in group A and 52.9% in group B. Pre-operative mouth opening was seen limited in all cases. Obvious pre operative malocclusion was seen in both groups. Table 3 shows detailed pre operative findings.

Post-operative pain on day 3<sup>rd</sup> was in moderate presentation in both groups on day 7 and day 14<sup>th</sup> pain was mild in both groups and on day 21<sup>th</sup> there was no pain in both groups, p-values were quite insignificant, see table 4.

As per post-operative mouth opening, on third post-operative day it was found normal in 64.7% cases of group A and 17.6% cases of group B. However on 7<sup>th</sup> post-operative days mouth

opening was observed normal in all cases of both groups and then it was seen normal till 21<sup>st</sup> post-operative day as shown in table 5.

In terms of malocclusion, on day third it was not found in all cases of both study groups, but on day 14 and 21, one case of Group A was having malocclusion as shown in table 6.

## DISCUSSION

Since the development of different osteosynthesis technologies and procedures in the last few decades, open reduction of mandibular condyle fractures has grown increasingly desirable and acceptable.<sup>11</sup>

The average age of the sufferers in group A was 30.39+10.91 years, whereas the average age of the patients in group B was 29.05+7.25 years in this research. According to Chaudhary M<sup>12</sup>, more over half of the patients (66.7 %) were between the ages of 21 and 40, with a mean age of 29.07 ± 14.19 years. El-Mahdy MA I<sup>13</sup> and Ganguly A<sup>14</sup>, on the contrary side, revealed that the patients' ages ranged from 18 to 40 years, with a mean of 29 years.

Males were the dominant in both groups in this experiment, with 70.6 % in group A and 88.2 % in group B. Lata J<sup>15</sup> also stated that the proportion of male patients was larger than the number of female patients, i.e., 15 (75 %). However Ganguly A<sup>14</sup> also found males in majority as compared to females. Majority of males may because of males more involvement in outdoor activities in our societies and these types of the fractures mostly caused by road traffic accidents.

In this study trapezoidal plate has been found to be more effective in the management of condylar fracture in terms clinical as stability, malocclusion as compared to miniplates. Consistently Saikia J<sup>16</sup> reported that in their study the trapezoidal plate performed better than the 2-miniplate osteosynthesis for forces in posterior-anterior and medial- lateral directions and the better result of the trapezoidal plate compared to the delta plate may be because of its trapezoidal shape itself. Moreover, Chaudhary M<sup>12</sup> reported that trapezoidal-shaped plates can be a decent substitute for osteosynthesis in the mandibular subcondylar region, and that significant reductions in posterior facial height and crazed occlusion can be effectively handled by open reduction of condylar fracture and its fixation utilising trapezoidal plates.

In this study malocclusion was found in 5 cases of group A and 2 cases of group B on 1<sup>st</sup> postoperative day and on day third it was not found in all cases of both study groups. On re inspection on day 21, 1 individual treated with miniplate showed occlusion disturbance. On the other end, Lata J<sup>15</sup> observed that both categories experienced transitory malocclusion after surgery at 72 hours and 6 weeks, but that at the completion of the third month, all participants in both groups had acceptable occlusion, with the exception of one patient (10%) in group A who had a displaced condyle. Lauer et al<sup>17</sup> stated that participants exhibited transient postoperative malocclusion, which disappeared after 2 to 5 weeks of functional therapy with elastics. In this study stability and malocclusion were statistically insignificant postoperatively in both groups, however Trapezoidal plate showed some better early outcome.

Mean mouth opening in this study was seen normal when followed up on day 21. In this comparison Lata Jet al<sup>15</sup> reported that postoperative mouth opening, right and left was statistically non significant in both group A and group B. Passi D et al<sup>11</sup>, on the other hand, executed a research on trapezoidal plates in the treatment of mandibular condyle fractures, and discovered that all cases were placed on intra-maxillary fixation for 2 weeks and were followed up for at least 6 months, with functional specifications returning to usual and a median mouth opening of 35 mm.

## CONCLUSION

The findings of this research demonstrate that using trapezoidal-shaped 3-D plates to treat a mandibular condylar fracture gives three-dimensional strength and reduced morbidity. The report's shortcomings include a limited sample size and short follow-up, however all incision places healed without incident and were less noticeable at follow-up. However, for superior postoperative evaluation, a greater number of patients should be evaluated over a prolonged period of time.

## REFERENCES

1. Danda AK, Muthusekhar MR, Narayanan V, Baig MF, Siddareddi A. Open versus closed treatment of unilateral subcondylar and condylar neck fractures: a prospective, randomized clinical study. *Journal of oral and maxillofacial surgery*. 2010 Jun 1;68(6):1238-41.
2. Memon Z, Naz S, Shaikh AG, Siyal ZH, Shams S. Treatment of mandibular condyle fracture - a comparison of two protocols. *Professional Med J* 2020; 27(10):2176-2181.
3. Bhagol A, Singh V, Kumar I, Verma A. Prospective evaluation of a new classification system for the management of mandibular subcondylar fractures. *J Oral Maxillofac Surg* 2011; 69(4):1159-65.
4. Ellis III E. Condylar process fractures of the mandible. *Facial Plast Surg*. 2000; 16:193–206.
5. Ellis, E. III, Throckmorton, G.S. Treatment of mandibular condylar process fractures: biological considerations. *J Oral Maxillofac Surg* 2005 ; 63: 115- 134
6. Oliveira R, Pagnoncelli R , and Nascimento D. The Treatment of Condylar Fractures: To Open or Not to Open? A Critical Review of this Controversy. *International Journal of Medical Sciences* 2008 ; 5 (6): 313–18.
7. Marbon Joevitson et al. A New 3D Strut Plating In Management of Subcondylar Fractures – A Prospective Study. *Saudi J Oral Dent Res*, May, 2020; 5(5): 245-249.
8. Malhotra, K., Sharma, A., Giraddi, G., & Shahi, A. K. (2012). Versatility of titanium 3D plate in comparison with conventional titanium miniplate fixation for the management of mandibular fracture. *Journal of maxillofacial and oral surgery*, 11(3), 284-290.
9. Farmand M. Three-dimensional plate fixation of fractures and osteotomies . *Facial Plast Surg Clin North Am*. 1995, 3:39-56
10. Christophe M, Martin E, Kahn J and Zink S. Development and Biomechanical Testing of a New Osteosynthesis Plate (TCP) Designed to Stabilize Mandibular Condyle Fractures. *Journal of Cranio-Maxillo-Facial Surgery* 2008; 35 (2): 84–90.
11. Passi D, Gupta R, Chandra L, Singh A, Bhardwaj P, Yadav G. Newer condylar trapezoidal plate in treatment of mandibular condyle fractures: short clinical study. *International Journal of Dental Research*, 5 (1) (2017) 52-54.
12. Chaudhary M, Pant H, Singh M, Vashistha A, Kaur G. Evaluation of trapezoidal-shaped 3-D plates for internal fixation of mandibular subcondylar fractures in adults. *Journal of oral biology and craniofacial research*. 2015 Sep 1;5(3):134-9.
13. El-Mahdy MA, Ezz MK, Shindy MI. Assessment Of Subcondylar Fracture Treated Using Two Four-Hole Straight Miniplates Versus The Synthes® Matrixmandible Trapezoidal Plate: Randomized Controlled Trial. *European Journal of Molecular & Clinical Medicine*. 2020 Dec 5;7(9):692-708.
14. Ganguly A, Mittal G, Garg R. Comparison between 3D delta plate and conventional miniplate in treatment of condylar fracture: A randomised clinical trial. *J Craniomaxillofac Surg*. 2021 Nov;49(11):1026-1034.
15. Lata J, Verma N, Mahajan S. Evaluation of Efficacy of 3-Dimensional Delta Versus Trapezoidal Condylar Plates in Internal Fixation of Mandibular Subcondylar Fractures: A Clinical Study. *The Traumaxilla*. 2019 Apr;1(1):11-21.
16. Saikia J, Kumar S, Jain H, Gupta A. Biomechanical Study of Trapezoidal Plate, Delta Plate and Miniplate in Subcondylar Fracture. *Journal of Clinical & Diagnostic Research*. 2018 Oct 1;12(10).
17. Lauer G, Pradel W, Schneider M, Eckelt U. A new 3-dimensional plate for transoral endoscopic-assisted osteosynthesis of condylar neck fractures. *J Oral Maxillofac Surg*. 2007; 65(5): 964–971.