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ORIGINAL ARTICLE

COMPARISON OF SINGLE VERSUS TWO PLATE FIXATION OF MANDIBULAR SUBCONDYLAR FRACTURE

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ABSTRACT

Non compression monocortical miniplate fixation of the mandibular sub-condyle is an accepted and reliable method for providing rigid internal fixation. The objective of this study was to compare the outcome of Single versus two plate fixation of mandibular sub-condylar fractures in terms of mouth opening and mandibular deviation. One hundred and twenty patients (120) coming to Mayo hospital, Lahore were selected and placed in two groups; group A (one miniplate fixation) Group B (two mini plates fixation). Postoperative results of single and two plate fixations were recorded after 3 weeks, 2 months and 6 months. Mouth opening was measured from upper central incisal tip to lower central incisal tip by using the metallic ruler in millimeters. The mandibular deviation was measured clinically. There were 40 (66.7%) males and 20 (33.3%) females in group A while in group B, 43 (71.7%) males and 17 (28.3%) females in group B with mean ages were 26.63±6.94 years in group A and 27.78±7.82 years in group B. Friedman test was applied in group A and B shows that there is a significant difference of mandibular deviation at a different time with P<0.001 Two miniplate fixation system on mandibular sub condylar fracture gives good stability, better mouth opening and absence of mandibular deviation as compared to single miniplate fixation.

Keywords: *Mini plate, Mouth opening, Mandibular deviation, Osteosynthesis*

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INTRODUCTION

The commonest fractures of the facial skeleton are in the areas of the mandibular condylar and sub condylar region.[1] The most common cause of mandibular condyle fracture is road traffic accidents[2], however inter personnel violence is the case in developing countries and western world.[3] The most common pattern of sub condylar fracture leads to medial luxation of a head of the condyle which results in shortening of mandibular ramus length and facial asymmetry. Though the incidence of condylar fracture is as high as 30%, the management is always controversial.[4] There are three modalities of treatment, observation, closed reduction with maxillo-mandibular fixation and open reduction with internal fixation.[5] Untreated condylar fractures might cause reduction in the height of the ramus, facial asymmetry, restriction of the function of the temporo-mandibular joint, difficulties in chewing, chronic pain, and malocclusion, which can decrease the quality of life of injured patients.[6]Treatment of condylar fracture with rigid internal fixation has made significant advances over the past years due to improved understanding of biomechanical principles and advances in the plate and screw fixation devices.[7,8]

The fixation of sub condylar fractures with a single plate provides insufficient resistance against torsional strain. In two plate fixation, the second plate protected the first plate from the damaging mechanical strains that could cause its fracture and prevent a secondary displacement of mandibular condylar fragments.[9]

According to Rao et al[10], mouth opening increased in all the patients with double plate fixation of subcondylar

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fractures. Maximum of 44mm mouth opening achieved 6 months postoperatively. According to Trost et al[11], mouth opening increased in 97% of the patients with single plate fixation of sub condylar fractures. Mouth opening up to 40 mm achieved 6 months postoperatively. In 84.4% of the patients, there was no mandibular deviation, while 15.6% of patients have deviation towards the fracture side. (Reference)

The basic objectives of treating sub condylar fractures are to ensure the presence of teeth in occlusion, restoration of masticatory function, prevention of mandibular deviation, correction of internal derangement of the temporomandibular joint. (Reference)

Ths study aimed to assess the outcome and complications of rigid internal fixation in patients suffering from sub condylar fractures with single plate versus two plate fixation.

METHODOLOGY

One hundred and twenty patients (120) of sub condylar fractures coming to Mayo Hospital, Lahore, Punjab were selected in this study. The study design followed was Cross sectional comparative. The Sample size was calculated by using 5% level of significance and 95% power of test and by using expected percentage of absence of mandibular deviation with single and double plate as 84% and 100%. Adopted From: Sample Size Determination for in Heath Studies (WHO) 2.2(a): Hypothesis Test for Two Population Proportions (One-Sided Test)

P1= Population proportion I= 100%

P2= Population proportion II = 84%

Z1-α = Level of significance =5%

Z1-ß= Power of test = 95%

Non probability purposive sampling technique was used to include simple random for grouping. Informed consent was obtained from all patients. Routine investigations including PA view face and OPG view were done for every patient. Patients were selected according to inclusion criteria which includes patients having age 15-60 years,Unilateral/bilateral condylar fracture without gross communication of fracture segments,Unilateral/bilateral condylar fracture with / without associated mandibular fracture.Patient fit for general anesthesia. and exclusion criteria which includes patient with Intracapsular fracture, previous genetic anomalies of the facial skeleton, fractures associated with firearm injuries and patient with history of occlusal disturbances or skeletal malocclusion. All patients were placed in two groups randomly using the lottery method. Group A: (60 patients) were treated with one mini-plate fixation. Group B: (60 Patients) were treated with two mini-plates fixations.Correction of fractures was done with proper reduction and fixation. Fixation of the fractured bones was done with mini-plates according to standard guidelines.

Mouth opening (Interincisal distance) and Mandibular deviation were recorded for every patient postoperatively on 3rd weeks, 2nd and 6th months.

Mouth opening was measured by using a metallic ruler in millimeters. It is measured between incisal edges of upper and lower central incisors. The bias effect was controlled by measuring the mouth opening with the same metallic ruler. The mandibular deviation was measured clinically.

All the data was recorded and analyzed in SPSS version 16. The mean, the standard deviation was calculated for a quantitative variable like age. Qualitative variable like sex was presented as percentages and frequencies. Repeated measure ANOVA/ Friedman test was used to see the mouth opening and mandibular deviation in both treatment groups from baseline till last follow-up.P-value less than 0.05 was taken as significant.

RESULTS

The majority of patients were in the age range between 15-25 years, 31 (51.7%) patients in group A and 25 patients (41.7%) in group B. The mean age was 26.63±6.94 years in group A and 27.78±7.82 years in group B. According to Repeated measure ANOVA/ Friedman test Statistically the difference between the ages was not significant [P>0.05] (Table 1).

According to gender, there were 40 (66.7%) males and 20 (33.3%) females in group A while 44 (73.33%) males and 16 (26.66%) females in group B. Female to male ratios was 1:2 in group A and 1:2.5 in group B .

A one-way repeated-measures analysis of variance was conducted at time 1 (Baseline), time 2 (week 3), time 3 (2-month follow-up) and time4 (6-month follow-up). The means and standard deviations are presented in Table 2. The results suggest that status of mouth opening reported by patients significantly increased. This variable is calculated because of follow up visits of patients after time intervals.

According to Friedman test in group B showed that there is significant difference of mandibular deviation at different time with P<0.001 (Table 3).

As response of mouth opening differ at different level to see the difference at different period of time Post hoc analysis (Bonferroni) of pairwise comparison repeated measure ANOVA was also performed. This shows mouth opening response significantly increase at increasing level of follow up response (Table 4).

TABLE 1: FREQUENCY AND PERCENTAGE OF AGE IN BOTH GROUPS

Age (years)	Group A (n = 60)		Group B (n = 60)	
	No.	%	No.	%
15 -25	31	51.7	25	41.7
26 – 35	22	36.7	24	40.0
36 – 45	7	11.6	11	18.3
Mean±SD	26.63±6.94		27.78±7.82	

TABLE 2: DESCRIPTIVE STATISTICS OF TIME IN GROUP A

Time (Factor 1)	Mean	Std. Error	95% Confidence Interval	
			Lower bound	Upper bound
Baseline	18.33	0.28	17.78	18.89
Week 3	24.88	0.19	24.51	25.26
2 Month	29.57	0.15	29.26	29.87
6 Month	32.82	0.14	32.53	33.10

TABLE 3: MANDIBULAR DEVIATION AT DIFFERENCE TIME IN GROUP B (FRIEDMAN TEST)

Mandibular deviation	Mean rank	Chi square	Df	P value
Baseline	1.83	65.45	3	0.001
3 weeks	2.83			
2 months	2.76			
6 months	2.59			

TABLE 4: PAIRWISE COMPARISON OF TIME OF MOUTH OPENING IN GROUP B

Paired	Mean difference	Std. Error	P value	95% Confidence Interval for Difference	
				Lower bound	Upper bound
Baseline-3 week	-6.767*	0.178	0.002*	-7.254	-6.279
Baseline-2 Months	-14.683*	0.186	<0.001*	-15.192	-14.174
Baseline-6 Months	-18.967*	0.209	<0.001*	-19.536	-18.397
3 week-2 Months	-7.917*	0.172	0.002*	-8.386	-7.447
3 week-6 Months	-12.200*	0.176	0.001*	-12.68	-11.72
2 Month-6 Month	-4.283*	0.151	<0.001*	-4.694	-3.872

TABLE 5: PAIRWISE COMPARISON OF TIME OF MOUTH OPENING IN GROUP A

Paired	Mean difference	Std. Error	P value	95% Confidence Interval for Difference	
				Lower bound	Upper bound
Baseline-3 week	-6.550*	0.205	<0.001*	-7.11	-5.99
Baseline-2 Months	-11.233*	0.236	0.002*	-11.877	-10.59
Baseline-6 Months	-14.483*	0.249	<0.001*	-15.162	-13.804
3 week-2 Months	-4.683*	0.105	<0.001*	-4.97	-4.397
3 week-6 Months	-7.933*	0.134	0.002*	-8.3	-7.567
2 Month-6 Month	-3.250*	0.091	0.001*	-3.498	-3.002

As response of mouth opening differ at different levels to see the difference at different period of time, Post hoc analysis (Bonferroni) of pairwise comparison repeated measure ANOVA was also performed in group A. This shows mouth opening response significantly increase at increasing level of follow-up response (Table 5).

DISCUSSION

Condylar fractures are a unique subset of traumatic injuries to the maxillofacial skeleton. While their management remains a source of ongoing controversy, it appears that many fractures can be managed well non-surgically and others require surgical intervention for a better outcome. The goal of this study was to identify a better method of fixation after subcondylar fracture of the mandible. Specifically, the intent was to see the efficacy of two non-compression mini-plates in comparison to a single non-compression mini-plate, in the fixation of a subcondylar fracture.Two plates for subcondylar fracture represent the best solution to obtain osteosynthesis.[12]

Out of 120 patients, the male to female ratio was 2.3:1 with a mean age of 27 years. These results are more or less comparable with these of Marker et al[13], Smets et al[14] and Rutges et al[15]; however, this ratio is slightly higher due to that males spent in our country much more time outside the home.

We observed plate bending and screw loosening in group A of our study. Sargent and Green[16] also reported plate fracture in their study and they suggested that the mechanical forces applied were more powerful than the elastic limit of one mini-plate. To avoid plate fracture in cases of condylar fracture Ellis and Dean[17] used mini-dynamic compression plates, however, they also reported deformation of mini plates and slackening of screws.

According to Choi et al[18] the two-mini-plate fixation technique provides functionally stable fixation for fractures of the condylar neck. Pilling et al[19] after comparative evaluation of ten different condylar base fracture osteosynthesis techniques, concluded that osteosynthesis with two mini-plates would be the most stable way of treating a condylar fracture. Using an in vitro model, Choi et al[20] demonstrated that a two-mini-plate system applied to the anterior and posterior regions of the condylar neck was more stable than a single-plate system. Our study results correlate with the above mentioned results.

When patient opened their mouth, there was deviation towards the mechanically reduced side of the joint, after 2 months postoperatively. 11 patients had deviation in group A and 2 patients had deviation in group B at 6 months. 27 patients had deviation in group A and 7 patients had deviation in group B post-operatively after six months. This is consistent with the findings of Sugiura et al[21] and Villarreal et al.[22]

According to john Patrick et al [23] the adaption of a single titanium miniplate does not seem to be sufficient to achieve stable fixation.

According to Tajamul Ahmad Hakim et al [24] The mean maximal interincisal opening for Group I was 35.27 mm, 36.07 mm, and 36.87 mm at 4 weeks, 3 months, and 6 months, respectively, and for Group II, the mean maximal interincisal opening was 37.93 mm, 39.13 mm, and 39.73 mm at 4 weeks, 3 months, and 6 months, respectively. The results were statistically significant at 4 weeks .The results of above mentioned study co relates with our study.

CONCLUSION

The results of this study confirmed that two mini-plates were better than a single mini-plate for fixation with less complication.

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6 Riaz Warraiach:	Results And Conclusion Written, Re-chechking of Article