Management of Condylar Fractures;Comparative Outcomes of Conservative Closed Versus Open Reduction

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Abstract

Objective: To compare the frequency of complications after closed and open reduction management of condylar fractures.

Methods: This is a casual-comparative study conducted in the Out-patient & ward, Department of Oral & Maxillofacial Surgery, Nishter Institute of Dentistry, Multan, over a period of six months. Through non-probability consecutive sampling 178 patients were recruited and randomly allotted to two groups, Group 1 for closed reduction and Group 2 for open reduction. A non-rigid mandibular splint was applied for one month in Group 1 whereas, a pre-auricular incision was given and fracture was reduced and fixed by mini-plates in Group 2. Patients of both the groups were given antibiotics intravenously and were followed up clinically for complications such as pain and mandibular deviation after one month by employing "The Visual Analog Scale". Data was analyzed using SPSS version (21) employing descriptive statistics and Chi-square test.

Results: Mean age was found to be 26.48 ± 4.62 years in Group 1 and 24.85 ± 6.05 years in Group 2. Male to female ratio, mean weight, height and BMI were almost similar in both the groups. Mean duration of fracture was 7.101 ± 2.24 days in Group 1 and 6.898 ± 2.21 days in Group 2. Mandibular deviation was seen in 33.7% and 16.9% patients (p=0.009) respectively in Group 1 & 2. Pain was seen in 41.6% patients in Group 1 and 24.7% in Group 2 (p=0.016).

Conclusion: Considering the complications encountered, patients treated by open reduction gave better clinical results in comparison to close reduction management of condylar fractures.

Key words: Complications,Mandibular Condyle, Mandibular Fractures, Mandibular Reconstruction Pain

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Introduction

Condylar fracture of mandible occurs very commonly and takes place in about 30% to 40% cases reported with mandibular fractures. In children receiving facial injuries, approximately 40% of them were found to have mandibular condylar fracture[1]. Mouth opening and closing process is basically dependent on the mandibular condylar region and any trauma to this area results in severe dysfunctional consequences. Also, such injuries may accompany facial asymmetry for which accurate reduction is mandatory[2]. Multiple treatment modalities have been explored for the complete functional retrieval of oral cavity and perfect occlusion following condylar fracture treatment. To date the most endorsed and comprehensive treatments for repairing condylar fractures are open reduction and con-servative closed reduction[3].

Ever since MacLennan supported closed reduction for 180 cases of mandibular condylar fracture patients in 1952, stating that "complications arisi-

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ng from mandibular condyle fractures are conspicuous by their absence", closed reduction has been the "conventional wisdom" of mandibular condylar fracture reduction for several decades[4]. Since 90s, many researchers reported the prospects of closed reduction in comparison to open reduction with mild complications including scarring associated with facial nerve partial paralysis next to open reduction whereas moderately severe problems such as malocclusion, chronic pain, facial asymmetry, and partial mobility after closed reduction[5].

After the findings of some classical studies, recent literature also provides evidences in this aspect. Ragupathy K has found that the deviation of mandible to the fractured side after treatment procedure was in 37.5% and 18% in patients treated with closed and open reduction respectively.In the same study, pain was reported in 44% and 27% of the patients in closed and open reduction groups respectively[6]. Han C. et al. concluded that surgical triangulation could upturn the precision of reduction during the surgical dealing of intracapsular condylar fractures[7]. Another similar study by Singh V has found out frequency of pain in 5.2% of patients with closed reduction and in 1.1% of patients with open reduction[8]. Al-Moraissi et al. described that open reduction of adult mandibular condylar fractures offered improved consequences than closed treatment[9]. Rastogi et al. identified that open reduction and internal fixation of displaced sub condylar fractures had superior clinical and radiographic consequences when matched with comparable fractures which were treated by closed reduction[10].

Controversies exist on selecting the treatment modality for mandibular condylar fractures. Results of many previous studies may not be generalized on all populations because of their weak study designs and therefore local evidence is of high time need in this specialty as every population has different genetic variations and confounding variables. Present study was based on the hypothesis that there will be fewer complications after open reduction management of condylar fracture in comparison to closed reduction. The objective of the current study was to compare the frequency of complications after closed and open reduction management of condyle fracture.

This Causal-Comparative study was spanned over six months from 1st December 2018 to 30th May 2019. Through non-probability consecutive sampling,178 patients were recruited from the Outpatient & ward of the Department of Oral & Maxillofacial Surgery, Nishter Institute of Dentistry (NID), Multan. Permission to conduct this study was obtained from the Institutional Review Board and Ethical Committee NID, Multan (NID/000/088/11-2018).

Patients between age 15-40 years of both genders with clinical and radiological diagnosis of mandibular condylar fracture of any side within last 14 days were included whereas, patients with history of occlusal disturbances, skeletal malocclusion and skull fracture were excluded from the study. Exclusion criteria also involved patients who were according to American Society of Anesthesiologists (ASA) in grade III (severe systemic disease, but not life threatening) and grade IV (severe systemic disease with constant threat to life)[11].

Demographic information of patients including name, age, gender, side of condylar fracture, weight on weighing machine, height on height scale and Body Mass Index (BMI) was entered on a pre-designed proforma. BMI for each patient was calculated using the formula: weight (in kilogram) divided by height (in meters) squared. Type of fracture was identified using panoramic radiographs, fracture will be stated as low if it is found below the sigmoid notch and vice versa. Informed consent was taken from each patient, ensuring confidentiality and the fact that there was no risk involved to the patient while taking part in this study.

A total of 178 included patients were then randomly allotted to two groups, 89 patients to Group 1 for closed reduction and 89 patients to Group 2 for open reduction. In Group 1 of closed reduction, impressions of both jaws were taken using alginate impression material. These were then poured with dental stone to obtain the working models.A 3 mm thick removable acrylic mandibular splint

was later made on these models. In order to remove the direct pressure on the fracture side of the mandible, a non-rigid mandibular splint was applied for one month with functional repositioning of the man-dible. In Group 2 of open reduction, a pre-auricular incision was given after general anesthesia and fractures was reduced and fixed by mini-plates aft-er maintaining normal occlusion.

All the procedures were performed by a single, trained and calibrated consultant dental surgeon wi-th 3 year post fellow ship experience. Intravenous antibiotics (Ampicillin 500 mg) postoperatively were given to all the patients four times a day for five days.

Patients were followed up and checked clinically for complications (in term of pain and mandibular deviation as per operational definition) after one month by employing “The Visual Analog Scale” which has scores range from zero (no pain) to 10 (maximum pain). Score 1-3 denote mild pain, 4-6 as moderate pain and pain was defined as severe if score is > 6. Mandibular deviation was defined as when on clinical examination (by millimeter ruler) midline deviation of upper and lower incisors (e” 4mm) was observed. All the readings were entered on a pre-designed proforma.

Data was analyzed with Statistical Package for Social Sciences (SPSS version 20). Frequency and percentage was computed for qualitative variables like age groups, gender, type of condylar fracture, side of fracture, ASA score, pain and mandibular deviation. Means were calculated for quantitative variables like age, weight, height, BMI, duration of fracture and pain score. Chi-square test was later employed to make comparison between both groups regarding complications. Stratification was done with regard to age, BMI, ASA score, duration of fracture, gender, type of sub condylar fracture and side of fracture to see the effect of these variables on complications such as mandibular deviation and pain. p-value of <0.05 was kept significant.

Results

A total of 178 patients were recruited for this study which were randomly allotted to two groups, 89 patients to Group 1 for closed reduction and 89 patients to Group 2 for open reduction.

Age range in this study was found out to be 18 to 35 years with mean age of 26.48 ± 4.62 years in Group 1 (closed reduction), while 24.85 ± 6.05 years in Group 2 (open reduction). In Group 1, 82% were male and 18% were females whereas, 80% were male and 20% were females in Group 2. Mean weight was found to be 77.685 ± 5.49 kg in Group 1 and 77.494 ± 4.71 Kg in Group 2. Mean height was 1.675 ± 0.07 and 1.665 ± 0.07 meters in Group 1 and 2 respectively. Mean BMI was 27.826 ± 2.99 Kg/m^2 in Group 1 whereas 28.107 ± 3.04 Kg/m^2 in Group 2. Mean Duration of fracture was 7.101 ± 2.24 and 6.898 ± 2.21 days in Group 1 and 2 respectively. Mean Pain score was higher in Group 1 (4.910 ± 2.58) as compared to Group 2 (4.224 ± 2.07).

Mandibular deviation was seen in 33.7% patients in closed reduction group as compare to 16.9% in open reduction group (p=0.009), however, pain was seen in 41.6% patients in closed reduction group and 24.7% in open reduction group (p=0.016). Percentages of the fractures appearing in the two respective groups according the five considered clinical variables that is, side and type of fracture, ASA, mandibular deviation and pain are compared in Table 1.

Table 2 describes the stratification of mandibular deviation with respect to the clinical and demographic variables including age, gender, BMI, duration of fracture, side of fracture, type of fracture and ASA score whereas, table 3 explains the stratification of pain with respect to the same clinical and demographic variables.

Table 1. Comparative findings of the clinical variables among the two observational groups

Clinical Variables	Group 1Close		Group2 Open Reduction n=89	Group2 Open Reduction n=89
Side of Fracture	**Left**		60 (67.4%)	67(75.3%)
	Right		29 (32.6%)	22(24.7%)
Type of fracture	**High**		65(73%)	71(79.8%)
	Low		24 (27%)	18(20.2%)
ASA	**I**		75 (84.3%)	78(87.6%)
	II		14 (15.7%)	11(12.4%)
Mandibular Deviation	**Yes**		30 (33.7%)	15(16.9%)
	No		59 (66.3%)	74(83.1%)
Pain	**Yes**		37 (41.6%)	22(24.7%)
	No		52 (58.4%)	67 (75.3%)

Table 2. Stratification of mandibular deviation with respect to clinical and demographic variables

Clinical & Demographic Variables	VariableSub-division	Mandibular Deviation	Group I Close Reduction	Group II Open Reduction	P-Value
Age	**15-27**	**Yes**	21(37.5%)	9(17.3%)	0.019
		No	35(62.5%)	43(82.7%)	
	28-40	**Yes**	9(27.3%)	6(16.2%)	0.260
		No	24(72.7%)	31(83.8%)	
Gender	**Male**	**Yes**	27(37%)	10(14.1%)	0.001
		No	46(63%)	61(85.9%)	
	Female	**Yes**	3(18.8%)	5(27.8%)	0.535
		No	13(81.2%)	13(72.2%)	
BMI	**BMI d" 25 Kg/m^2**	**Yes**	10(30.3%)	5(16.1%)	0.181
		No	23(69.7%)	26(83.9%)	
	BMI > 25 Kg/m^2	**Yes**	20(35.7%)	10(17.2%)	0.025
		No	36(64.3%)	48(82.8%)	
Duration of Fracture	**1- 7 days**	**Yes**	15(30.6%)	8(16.3%)	0.095
		No	34(69.4%)	41(83.7%)	
	8-13 days	**Yes**	15(35.5%)	7(17.5%)	0.045
		No	25(62.5%)	33(82.5%)	
Side of Fracture	**Left side**	**Yes**	20(33.3%)	11(16.4%)	0.026
		No	40(66.7%)	56(83.6%)	
	Right side	**Yes**	10(34.5%)	4(18.2%)	0.196
		No	19(65.5%)	18(81.8%)	
Type of Fracture	**High**	**Yes**	22(33.8%)	8(11.3%)	0.001
		No	43(66.2%)	63(88.7%)	
	Low	**Yes**	8(33.3%)	7(38.9%)	0.710
		No	16(66.7%)	11(61.1%)	
ASA score	**ASA I**	**Yes**	28(37.3%)	14(17.9%)	0.007
		No	47(62.7%)	64(82.1%)	
	ASA II	**Yes**	2(14.3%)	1(9.1%)	0.691
		No	12(85.7%)	10(90.9%)	

Table 3. Stratification of pain with respect to clinical and demographic variables

Clinical & Demographic Variables	Variable Sub-Division	Pain	Group I Close Reduction	Group II Open Reduction	P Value
Age	**15-27**	**Yes**	21(37.5%)	16(30.8%)	0.461
		No	35(62.5%)	36(69.2%)	
	28-40	**Yes**	16(48.5%)	6(16.2%)	0.003
		No	17(51.5%)	31(83.8%)	
Gender	**Male**	**Yes**	32(43.8%)	18(25.4%)	0.019
		No	41(56.2%)	53(74.6%)	
	Female	**Yes**	5(31.2%)	4(22.2%)	0.551
		No	11(68.8%)	14(77.8%)	
BMI	**BMI d" 25 Kg/m^2**	**Yes**	15(45.5%)	8(25.8%)	0.101
		No	18(54.5%)	23(74.2%)	
	BMI > 25 Kg/m^2	**Yes**	22(39.3%)	14(24.1%)	0.082
		No	34(60.7%)	44(75.9%)	
Duration of Fracture	**1- 7 days**	**Yes**	22(44.9%)	13(26.5%)	0.057
		No	27(55.1%)	36(73.5%)	
	8-13 days	**Yes**	15(37.5%)	9(22.5%)	0.143
		No	25(62.5%)	31(77.5%)	
Side of Fracture Left side		**Yes**	24(40%)	17(25.4%)	0.078
		No	36(60%)	50(74.6%)	
	Right side	**Yes**	13(44.8%)	5(22.7%)	0.101
		No	16(55.2%)	17(77.3%)	
Type of Fracture High		**Yes**	29(44.6%)	17(23.9%)	0.010
		No	36(55.4%)	54(76.1%)	
	Low	**Yes**	8(33.3%)	5(27.8%)	0.101
		No	16(66.7%)	13(77.2%)	
ASA score	**ASA I**	**Yes**	32(42.7%)	20(25.6%)	0.007
		No	43(57.3%)	58(74.4%)	
	ASA II	**Yes**	5(35.7%)	2(18.2%)	0.325
		No	9(64.3%)	9(81.8%)	

Discussion

This study was conducted to compare the frequency of complications after closed and open reduction management of mandibular condylar fracture and has identified better clinical results in patients treated by open reduction in comparison to close reduction mode of management.

In the past decades many investigations and study outcomes were reported in the literature that has compared closed and open reduction management of condyle fracture[12,-13].Ellis et al, in his multiple series of studies has described a comprehensive comparison of the consequences for closed and open methods in mandibular fractures.The outcome of open reduction and internal fixation (ORIF) has been associated with scar development and temporary (6 months) paralysis of facial nerve branches. However, the closed approach is associated with numerous problems which include chronic pain, malocclusion, asymmetry, limited mobility, and gross radiographic abnormalities. Considering the approaches for ORIF, Ellis et al' has also explained the benefits of retro mandibular style over the preauricular[9].

In present study Mandibular deviation was seen in 33.7% patients in closed reduction group as compare to16.9% in open reduction group (p=0.009). Pain was seen in 41.6% patients in closed reduction group as compare to 24.7% in open reduction group (p=0.016).Therefore, in present study retro mandibular approach provided safer and better reduction of condylar fractures. These findings are in line with the studies of Narayanan et al, Tang et al and Biglioli et al[14,-16].

A study by Ragupathy K has reported that the frequency of mandibular deviation towards fractured side after procedure was in 37.5% in cases with closed reduction and 18% open reduction group. Pain was noted in 44% of closed reduction group and in 27% patients of open reduction group[6]. Another study by Singh V has found that frequency of pain was in 5.2% of closed reduction group and in 1.1% patients of open reduction group[8].

In current study, when open reduction cases were compared with closed reduction, better opening of mouth post operatively was observed. This outcome is parallel with the literature of Kozakiewicz et al[17]. In this research, 37.5% of the cases treated with closed method showed mandibular deviation towards fractured side relating to decreased ramus height. This conclusion also associates with many other latest studies[18-20].

Present study has reported temporary facial nerve weakness in just two cases treated with open reduction which later recovered in 3-4 weeks. Moreover, no other clinical complication was observed along with any long-lasting impairment of the facial nerve or its branches. Neither any confounding factor nor any bias was identified in this study, however keeping the limitations of this study, more hierarchied, multi centered studies with increased sample size should be conducted in future to advocate improved treatment options in the modality of condylar fracture.

Conclusion

Considering the complications encountered, patients treated by open reduction gave better clinical results in comparison to close reduction management of condylar fractures.

Conflict of Interest

Authors have no conflict of interest and no grant/funding from any organization

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