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Treatment of condylar fractures: A retrospective cohort study

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Abstract

Objective: Evaluate routine alterations in patients submitted to treatment of unilateral fractures of the mandibular condyle. Patients and methods: The sample consisted of 30 patients of both sexes submitted to surgical and non-surgical treatment. All patients answered an evaluation questionnaire on perception of the Oral Impact on Daily Performances (OIDP) and underwent physical and imaging examination. The following aspects were evaluated in temporo mandibular join (TMJ) physical examination: maximum mouth opening, left/right lateral movements and protrusive movements. Vertical height measurements of right and left mandibular branches were evaluated by means of orthopantomography. Lateromedial and anteroposterior displacements were measured using Hirtz's axial radiography. Evaluation of diameter of the mandibular fossa and height of the glenoid fossa were measured by hypocycloidal tomography. Results: A minority (13.3%) answered the questions on OIDP positively, with a similar rate for both treatments. With regard to the vertical height variable, average vertical height was similar for both treatments. However, comparing fractured and nonfractured sides, the difference observed was statistically significant for both treatments. On the basis of the statistical results of this study, for both treatments there were no significant alterations in the maximum mouth opening variable, with an average of 43.35 mm for open treatment and 44 mm for closed treatment. Conclusion: In the present study there were no significant differences between open and closed treatment of unilateral fractures of the mandibular condyle.

Key words: *Life quality, temporomandibular joint disorders, temporomandibular joint dysfunction syndrome,dental occlusion.*

Introduction

The appropriate treatment of fractures of the mandibular condyle is a polemical issue in oral and maxillofacial traumatology that has sparked considerable controversy, especially regarding surgical and non surgical treatment. (1-3) This is due to the fact that there are many treatment methods for different presentations of the injury.

In selecting the treatment method it is important to analyze variables such as maximum mouth opening, left and right lateral movements, protrusion, fracture localization and tendency for hypertrophic scars and the impact of the chosen treatment on daily performance. It is also important that the patient be informed of all these variables and participate in the choice of treatment.

In this study the variables evaluated were perception of Oral Impacts on Daily Performance (OIDP), the perception of OIDP, mandibular movements and image alterations occurred in patients submitted to treatment of fractures of the mandibular condyle, treated at the Oswaldo Cruz Hospital, University of Pernambuco, Brazil.

Patients and Methods

Thirty patients presenting condylar fractures, with an average age of 32 years, were evaluated in this retrospective

cohort study. All patients presented unilateral fractures of the mandibular condyle, 19 patients being submitted to closed treatment and 11 to open treatment. Thus, all patients submitted to either treatment method were invited to take part in this study. Fractures were classified into condylar head, condylar neck and subcondylar.(4)
Functional alterations were evaluated through a synthetic questionnaire based on the International Classification of Impairment, Disability and Handicap of the World Health Organization (WHO), modified by Locker (1988) for oral health purposes, the OIDP. This questionnaire aims to evaluate: a) impairment; b) functional limitation; c) discomfort; d) disability and handicap.(5)
The OIDP evaluated whether, in the last six months, mouth, teeth or prosthesis had caused any difficulty in: 1) eating and enjoying food; 2) speaking and pronouncing words clearly; 3) cleaning teeth; 4) sleeping and resting; 5) smiling, laughing and showing teeth without embarrassment; 6) maintaining a normal without irritation; 7) continuing to live a normal life and working normally; 8) feeling satisfied in social meetings with other people. This index is thus an indicator of life quality concerning oral health, ilustrating to what extent dental and oral disturbances regulate and modify physical, psychological and social daily performance.
Maximum mouth opening, forced passive opening, left and right lateral movements were measured as well. Partially and totally edentate patients were excluded from this study due to the impossibility of obtaining such measurements.
The vertical heights of the right and left mandibular branches were evaluated by means of orthopantomography. One line was drawn in both mandibular angles and another perpendicular to the first, from the top of each condyle. This orthogonal distance indicated the length of the mandibular branch.(4)
The morphology of the condyle, glenoid fossa and articular eminence was evaluated by hypocycloidal tomography. Evaluation of lateromedial and anteroposterior displacements of the mandibular condyle was made using Hirtz's axial radiography. (6)
For data analysis, absolute distributions, percentage distributions and statistical measurements such as mean, standard deviation, minimum and maximum (descriptive statistical techniques) were calculated. Statistical tests such as t-Student for equal variances, t-Student for unequal variances, Fisher's Exact, t-Student paired test and McNemar's test were used. Data was typed into the Excel spreadsheet. Statistical measurements were obtained by statistical software SPSS (Statistical Package for the Social Sciences). The project was evaluated by the Committee on Ethics in Research on Human Beings of the University of Pernambuco, protocol number 099/2006.

Results

Of the 30 patients studied, 36.7% had been submitted to the open treatment and 63.3% had received the closed treatment. Analyzing the results of the question "In the last six months have, your mouth, teeth or prosthesis have been causing any difficulty?" regarding to perception of Oral Impacts on Daily Performance (OIDP), according to treatment, it was found that a minority (13,3%) answered the question positively, with similar rates between for treatments (9.1% in the open treatment group and 15.8% in the closed treatment group), which does not represent a statistically significant difference ($p > 0.05$) (Table 1).
Chewing foods and toothbrushing were recognized as the main causes of oral impacts on daily performance. OIDP was useful for measuring (physically, psychologically, and socially) the oral impacts on daily performance among the studied patients.
Table 2 presents the figures for the variables maximum mouth opening, forced passive opening, right lateral movement and left lateral movement. The information in this table shows no major differences between the two treatments. No significant difference between treatments is demonstrated for any of the variables ($p > 0.05$).
From Table 3 it is seen that vertical height means were similar for open and closed treatment. However, when comparing fractured and nonfractured sides, a statistically significant difference is observed between treatments ($p < 0.05$).
Regarding the measurements of lateromedial and ante-

Table 1. Evaluation of question "In the last six months have, your mouth, teeth or prosthesis have been causing any difficulty?", according to treatment. (1).

	TREATMENT						
Have your mouth, teeth of prosthesis have been causing any difficulty?	Open		Closed		Total Group		p -value
	N	%	N	%	N	%	
Yes	1	9.1	3	15.8	4	13.3	$p^{(1)} = 1.000$
No	10	90.9	16	84.2	26	86.7	
Total	11	100.0	19	100.0	30	100.0	

Obtained through Fisher's Exact test

Table 2. Results for variables maximum mouth opening and forced passive opening, according to treatment.

		TREATMENT			
Variables	Statistics	Open	Closed	Total group	p-value
• Maximum mouth opening (mm)	Mean	43.37	44.00	43.77	$p^{(1)}$ =0.851
	Standard deviation	9.81	8.30	8.72	
	Minimum	24.00	6.00	24.00	
	Maximum	55.00	61.00	61.00	
• Forced passive opening (mm)	Mean	44.45	45.68	45.23	$p^{(1)}$ =0.745
	Standard deviation	11.56	8.79	9.72	
	Minimum	26.00	26.00	26.00	
	Maximum	61.00	61.00	61.00	
• Right lateral movement limitation (mm)	Mean	6.45	7.00	6.80	$p^{(1)}$ =0.680
	Standard deviation	3.42	3.48	3.41	
	Minimum	2.00	2.00	2.00	
	Maximum	11.00	16.00	16.00	
• Left lateral movement limitation (mm)	Mean	6.32	7.32	6.95	$p^{(2)}$ = 0,439
	Standard deviation	3.93	1.73	2.72	
	Minimum	0.00	4.00	0.00	
	Maximum	12.50	11.00	12.50	

(1) Obtained through Student's t-test with equal variances
(2) Obtained through Student's t-test with unequal variances

Table 3. Mean and standard deviation for vertical height (mm), according to occurrence or non-occurrence of fracture and according to group.

	TREATMENT			
Occurrence of fracture	Open	Closed	Total group	p-value
	Mean ± SD	Mean ± SD	Mean ± SD	
Yes	6.91± 0.95	6.95 ± 0.81	6.94 ± 0.85	$p^{(1)}$ = 0.895
No	7.65 ± 0.62	7.43 ± 0.78	7.51 ± 0.73	$p^{(1)}$ = 0.435
Value of p	$p^{(2)}$ = 0.007*	$p^{(2)}$ = 0.002*	$p^{(2)}$ < 0.001*	

(*) Significant association at 5.0% level.
(1) Obtained through Student's t-test with equal variables.
(2) Obtained through Student's t paired test.

Table 4. Mean and standard deviation for variables lateromedial position and anteroposterior position (mm) according to occurrence or non-occurrence of fracture and according to group.

		TREATMENT			
Variables	Fracture	Open	Closed	Total group	p-value
		Mean ± SD	Mean ± SD	Mean ± SD	
• Lateromedial position	Yes	6.21± 0.49	6.03 ± 0.47	6.10 ± 0.48	$p^{(1)}$ = 0.337
	No	6.08 ± 0.43	5.92 ± 0.54	5.98 ± 0.50	$p^{(1)}$ = 0.392
Value of p		$p^{(2)}$ = 0.420	$p^{(2)}$ = 0.284	$p^{(2)}$ = 0.169	
• Anteroposterior position	Yes	1.42± 0.51	1.22 ± 0.37	1.29 ± 0.43	$p^{(1)}$ = 0.222
	No	1.18 ± 0.37	0.90 ± 0.40	1.00 ± 0.41	$p^{(1)}$ = 0.69
Value of p		$p^{(2)}$ = 0.077	$p^{(2)}$ = 0.003*	$p^{(2)}$ <0.001*	

(*) Significant difference at 5.0% level.
(1) Obtained through Student's t-test with equal
(2) Obtained through Student's t paired test.

Table 5. Evaluation of preservation of morphology of the mandibular fossa, mandibular condyle and articular eminence, according to occurrence of fracture at in the total group.

VARIABLE	FRACTURED	NONFRACTURED				TOTAL GROUP		P-VALUE
		Conserved		Non-conserved				
		N	%	N	%	N	%	
• Morphology of glenoid fossa	Conseved	19	63.3	-	-	19	63.3	p (1) = 0.005*
	Non – conserved	8	26.7	3	10.0	11	36.7	
	Total	27	90.0	3	10.0	30	100.0	
• Morphology of mandibular condyle	Conseved	8	6.7	-	-	8	26.7	p (1) < 0.001*
	Non – conserved	14	46.7	8	26.7	22	73.3	
	Total	22	73.3	8	26.7	30	100.0	
• Morphology of articular eminence	Conseved	62	53.3	3	10.0	19	63.3	p (1) = 0.132
	Non – conserved	8	26.7	3	10.0	11	36.7	
	Total	24	80.0	6	20.0	30	100.0	

(*) Significant association at 5.0% level.
(1) Obtained through McNemar's test.

roposterior positions (Table 4), no significant difference between treatments is observed. Nevertheless, in the comparison between the anteroposterior position of fractured and nonfractured sides, statistically significant different values are seen ($p < 0.05$).

From Table 5 it is evident in the majority of patients the morphology of the glenoid fossa was preserved. The percentage was higher among non-fracture cases than among fracture cases (90.0% x 63.3%). On the fractured side in only 26.7% was the morphology of the mandibular condyle not preserved, while on the nonfractured side most patients (73.3%) displayed a preserved morphology, evidencing a significant difference between the two sides regarding the percentage preservation rate ($p < 0.05$). In most patients the morphology of the articular eminence was preserved in both fracture cases (63.3%) and in non-fracture ones (80.0%). However, no significant difference between the two sides is noted at the 5.0% level.

Discussion

At the present time, there is no consensus in the world literature regarding the indication of treatment of condylar fractures and the clinical progression of patients treated by a closed (nonsurgical) or open (surgical) approach. There are many reasons for this, such as difficulties in obtaining uniform samples of patients, types of posttreatment control, which aspects are more important in postsurgical evaluation, and the abundance of variables, in addition to personal behavior and preferences, which motivated the present study.

This study, among other objectives, aimed to observe which is the best form of treatment for unilateral fractures of the mandibular condyle, in the quest for a treatment that causes the least impact possible on the patient's daily life, facilitating the professional's therapeutic decision by weighing the possible benefits and harm to the patient.

In this connection, functional alterations were evaluated through OIDP. (5) This index evaluates life quality measurements relating to oral health, showing how extensively tooth disorders regulate and modify daily physical, psychological and social performance. It is not possible to compare this study with others, since this is an original study on unilateral fractures of the mandibular condyle.

The majority of patients answered the OIDP questions negatively. There were therefore no significant differences between the open and closed groups, since there were few complaints from patients about their performance in normal activities.

Concerning the variables maximum mouth opening, maximum forced mouth opening and right and left lateral movements, no significant differences were observed between the two treatments. This conclusion is compatible with another comparative study (7) which evaluated 16 cases of condylar fractures treated surgically and 20 cases treated nonsurgically, all of which were followed up for an average of approximately two years with no significant differences being observed.

Regarding the question of posterior vertical height, patients with condylar fractures treated by closed methods had a significantly shorter vertical height as compared to patients treated by the open method with reduction and internal fixation of the fracture.(4) In this study, adopting the same criteria, it was observed that there was a decrease in posterior vertical height on the fractured side in most patients, irrespective of the method of treatment, with no significant differences between the groups.

TMJ is one of the parts of the cranium that have merited the attention of researchers in recent years. However, its radiographic imaging is difficult to interpret due to the overlapping images of the surrounding structures, while

lateral linear tomography achieves a better image quality for interpreting bone damage at the TMJ. (8) The epidemiological studies of TMJ alterations based on imaging analyses likewise have been unable to define a standardized pattern in the distribution of the disease.(9)

The clinical signs and symptoms of greatest semiologic value in temporomandibular joint disease (TMJD) are: muscle and joint pain, mandibular movement limitations and, joint sounds. Imaging studies of the joint are very useful for establishing diagnosis and discarding other disease processes, though in many cases diagnostic error results from detection of a large number of patients with imaging alterations without associated clinical manifestations. Panoramic X-rays and magnetic resonance imaging are the most commonly used complementary techniques for diagnosing TMJD. (10) It is important to use magnetic resonance (MR) for diagnosing TMJ soft tissue lesions specially in the trauma setting. Among MR disadvantages we can mention: the necessity of big and complex installations. These disadvantages limit its systematic use as a habitual diagnostic test in these processes. The non existence of these installations in many places, the high cost of each study, as well as, the impossibility of carrying it out in some patients, e.g.: claustrophobia (although there are open MR equipments), patients with ferromagnetic implants, pacemakers or any other neuroelectric stimulators, are among some inconveniences that force us to always investigate on their possible existence before the realization of the MR. (11)

In this study, hypocycloidal lateral linear tomography was used to analyze the following variables: morphology of glenoid fossa; articular eminence and mandibular condyle; height of glenoid fossa; anteroposterior diameter of glenoid fossa; condylar width and the presence of sclerosis of glenoid fossa; articular eminence and mandibular condyle. No significant alteration in these variables was observed. In another study, (12) these variables were evaluated based only on the open treatment. Fractured and contralateral nonfractured sides were evaluated through computer tomography images observed over an average of approximately 22 months. No statistically significant difference was found when comparing variables from the fractured side with variables from the nonfractured contralateral side, which indicates that condylar position and morphology of both articulations were almost identical. In this study, no significant differences were found between these variables in the two treatments. However, in relation to the mandibular condyle in fracture cases, it was noted that in most patients the morphology was not preserved, a difference that was slightly smaller in open treatments.

A more abrupt posterior declivity of the articular eminence predisposes to risk factors for disc displacement with the reduction, and a leveling of the articular evidence can progress with time, leading to the start of disc displacement without reduction. (13) Disk displacement may result in decreased joint space, clicking, popping, or crepitation during jaw function; inflammation and compression of the bilaminar tissue can cause pain and lead to analtered position of the teeth. (14) In the present study, the majority of patients did not present changes in articular eminence morphology or glenoid fossa due to traumatism or type of treatment. We therefore presume that patients evaluated in this study would not show any predisposition to alterations such as disc displacement with or without reduction.

Depending on the direction of the force, the position of the mandible at the time of the accident and lateral pterygoid muscle activity, the fractured fragment remain in place, be somewhat displaced or be completely displaced. Usually the direction of the displacement is medial or anteromedial, (15) although in this study no significant alteration of lateromedial displacement was observed in either group. The average rate of lateromedial displacements was higher in open treatment than in closed treatment. However, no significant differences were formed between the two treatments.

Conclusions

There are no significant differences in either treatment regarding questions evaluated by OIDP or the variables maximum mouth opening, left/right lateral movements, posterior vertical height, morphology of the glenoid fossa, condyle head and articular eminence.

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