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Original Research Article

Retrospective Study of Condylar Distraction between Two Groups of Facial Biotypes in the Population of Mexicali, Baja California, Mexico

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Abstract: The discrepancy between the Centric Relation (CR) position and the Maximum Intercuspation (MI) position is known as centric slide. This happens in occasions where the occlusion is not stable in the CR position and a displacement towards the more stable MI is generated, it differs a lot depending on the clinical use, most authors are in favor of the CR in the planning of occlusal rehabilitation and orthodontics. For this reason, it was decided to provide a retrospective study correlating the amount of condylar distraction prior to orthodontic treatment to analyze whether the hyperdivergent or hypodivergent facial pattern presents a greater amount of distraction in the 3 axial dimensions. The study was conducted by reviewing patient records from the orthodontic postgraduate program at the Mexicali School of Dentistry, which treats adolescents and adults. Subjects were initially selected based on age, followed by Jarabak cephalometric measurements of facial-skeletal characteristics to generate 2 matched groups of 10 subjects each: dolichofacial pattern and brachyfacial pattern. The final sample selected consisted of 20 patients between the ages of 14 and 32 years, with a mean age of 21.25 years. The data obtained from the present study conclude that the facial biotype where the greatest condylar distraction was observed in terms of the three axes; vertical, horizontal and transversal prior to orthodontic treatment, was in the dolichofacial pattern.

Keywords: Condylar distraction, centric relation, maximum intercuspation, cephalometrics, condylar displacement, facial biotypes.

I. INTRODUCTION

There has been ongoing debate among the different orthodontic philosophies regarding the use of certain diagnostic aids, such as the use of the articulator mount, the condylar position indicator, certain types of imaging, among others. However, the advantages provided by the use of these diagnostic aids make it possible to see and record the CR and the MI for comparative and planning purposes, taking into account that within the orthodontic objective the CR is the desirable position for treatment. That said, it is important to make professionals in the area aware of the use of these aids, allowing for the greatest possible and effective precision in dentofacial health [1, 2].

Several studies show that the ideal condylar position to finish orthodontic treatment is in the anterior, medial and superior position against the articular eminence, which is essential for an adequate coordination between the occlusal contacts and the temporomandibular joint (TMJ), and describe that it should be seen as a reference to obtain a physiologically desirable objective [3-5].

The Glossary of Prosthodontic Terms defines CR as the maxillomandibular relationship in which the condyles articulate with the thinner avascular portion of their respective discs with the condyle in anterosuperior position against the slopes of the articular eminence, this position is independent of tooth contact. The MI is defined as the complete intercuspidation of opposing teeth, regardless of condylar position [15].

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The discrepancy between the CR position and the IM position is known as centric slide [11]. This occurs in cases where the occlusion is unstable in the CR position and a displacement towards the more stable MI is generated, it varies greatly depending on clinical application, most authors are in favor of the CR in the planning of occlusal rehabilitation and orthodontics [12, 14]. Changes in condyle position have been correlated in patients with different malocclusions and facial biotypes, as it is relatively accepted that the majority of the population has this discrepancy [6-8].

Some clinicians believe that slide tolerance is very small, 0.5 mm in the transverse direction less than 1.0 mm in the vertical or horizontal plane is epidemiologically normal. However, a slide of more than 2.0 mm from RC to MI in the vertical or horizontal plane is a critical factor that should be considered when assessing relative risk factors for temporomandibular disease (TMD). The Panadent condylar position indicator (CPI) was designed to measure these discrepancies in 3 planes of space. To achieve meaningful results with this instrument, there must be very few technique and material errors [2, 9, 10].

In Mexico, some orthodontists limit the use of the semi-adjustable articulator to a small population of patients or decide to make only the diagnosis in (MI). Therefore, this study aimed to provide a retrospective study correlating the amount of condylar distraction prior to orthodontic treatment to determine whether hyperdivergent or hypodivergent facial patterns exhibit greater condylar distraction across the three axial dimensions.

II. METHODS

A search was carried out in the databases (Pubmed, Google Scholar, Elsevier) considering the keywords: condylar distraction, centric relation, maximum intercuspation, cephalometrics, condylar displacement, facial biotypes; the articles were selected only in the English language.

Subjects for the retrospective study were assembled by reviewing patient records from the orthodontic postgraduate program at the Mexicali School of Dentistry, which treats adolescents and adults. Subjects were selected first by age and then by cephalometrically measured facial-skeletal characteristics to generate 2 matched groups of 10 subjects each: dolichofacial pattern and brachyfacial pattern. The age was a criterion for the selection of the subjects, since the aim is to study young adult subjects with a completed or about to complete growth. The final sample selected consisted of 20 patients between the ages of 14 and 32 years, with a mean age of 21.25 years.

Facial biotype was determined by Jarabak cephalometric analysis. Subjects were considered to be facially hyperdivergent if the posterior-to-anterior height ratio of the face is 54 to 58%. Subjects were considered to be hypodivergent if the posterior-to-anterior height ratio of the face was 64 to 80% [13].

III. RESULTS

The original values corresponding to the study variables are presented in (Table 2) and (Table 3).

In dolichofacial patients the range in the right z-axis was 0.0 mm to 4.0 mm. The range in the left z-axis was -2.0 mm to 2.0 mm. For the right x-axis, the range was -1.5 mm to 1.25 mm. For the transverse plane, the range was 0.0 mm to 3.0 mm. In brachyfacial patients (Table 2). The range in the right z-axis was 0.0 mm to 1.5 mm. The range in the left z-axis was -1.5 mm to 1.75 mm. For the right x-axis, the range was -2.0 mm to 2.0 mm. For the transverse plane, the range was 0.0 mm to 2.75 mm.

The resulting mean values, standard deviations and medians are presented in (Table 4) and (Table 5).

After classifying patients according to Jarabak spheres, goniac angle and age within 14 to 32 years. The mean right and left vertical displacement in dolichofacial patients was (1.12 ± 1.17 mm; 0.80 ± 1.20 mm, respectively) and in brachyfacial patients was (0.65 ± 0.47 mm; 0.67 ± 0.47 mm, respectively). The right and left horizontal displacement in dolichofacial patients was (0.55 ± 1.05 mm; 0.60 ± 1.39 mm, respectively) and in brachyfacial patients (0.05 ± 1.32 mm; 0.30 ± 1.25 mm, respectively). The mean transverse displacement in dolichofacial patients was (0.70 ± 0.88 mm) and in brachyfacial patients (0.77 ± 0.82 mm).

Table 1: Description of gender, age, Jarabak percentage and gonial angle identifying the direction of growth and facial biotype according to Jarabak cephalometric parameters

Patient	Gender	Age	Jarabak (%)	Facial Biotype
1	Femenine	27	58	Dolichofacial
2	Femenine	20	54	Dolichofacial
3	Masculine	21	58	Dolichofacial
4	Femenine	24	55	Dolichofacial
5	Femenine	24	58	Dolichofacial
6	Femenine	22	58	Dolichofacial
7	Femenine	22	57	Dolichofacial
8	Masculine	16	56	Dolichofacial
9	Femenine	14	58	Dolichofacial

Patient	Gender	Age	Jarabak (%)	Facial Biotype
10	Femenine	18	54	Dolichofacial
11	Masculine	23	70	Brachyfacial
12	Femenine	17	73	Brachyfacial
13	Femenine	25	71	Brachyfacial
14	Femenine	27	78	Brachyfacial
15	Masculine	14	71	Brachyfacial
16	Femenine	32	65	Brachyfacial
17	Masculine	28	71	Brachyfacial
18	Masculine	16	75	Brachyfacial
19	Masculine	15	71	Brachyfacial
20	Femenine	20	68	Brachyfacial

Table 2: Condylar Position Indicator Readings in Dolichofacial Patients (mm)

	Transversal (y)	Vertical (z)		Horizontal (x)	
		Right	Left	Right	Left
A1	0,25	1,5	1,5	0	0,5
A2	0,5	1	1,5	1	1,5
A3	1	0	0	1	1,5
A4	0	1,5	1,5	-0,75	-1,25
A5	0,25	1,25	1,75	1,25	2
A6	3	1,25	1,5	1,25	1,5
A7	1	0	-2	-1,5	-1,5
A8	0,5	4	2	2	2,5
A9	0	0,25	0,25	0,25	0
A10	0,75	0,5	0	1	-0,5

Table 3: Condylar Position Indicator Readings in Brachyfacial Patients (mm)

	Transversal (y)	Vertical (z)		Horizontal (x)	
		Right	Left	Right	Left
B1	0,5	0,5	0,5	-0,5	0,5
B2	1,5	1	1	1	1
B3	1	0,5	1	1,5	1
B4	0,5	1	1	2	2
B5	0,5	1,5	0,5	-2	1,5
B6	2,75	0	1	1	0
B7	0,5	0,5	1	-1	-1
B8	0	0,5	0,5	-1,5	-1,5
B9	0,5	1	1,75	0	1
B10	0	0	-1,5	0	-1,5

Table 4: Dolichofacial patients

Measurements	Media ± S.D.	Median
CPI vertical right(z)	1,12 ± 1,17	1,12
CPI vertical left (z)	0,80 ± 1,20	1,5
CPI horizontal right (x)	0,55 ± 1,05	1
CPI horizontal left (x)	0,60 ± 1,39	1
CPI transversal (y)	0,70 ± 0,88	0,5

Mean, standard deviations and median values, in millimeters, of vertical (z) right and left condylar distraction, horizontal (x) right and left condylar distraction and condylar distraction in the transverse axis (y).

Table 5: Brachyfacial patients

Measurements	Mean ± S.D.	Median
CPI vertical right(z)	0,65 ± 0,47	0,5
CPI vertical left (z)	0,67 ± 0,85	1
CPI horizontal right (x)	0,05 ± 1,32	0
CPI horizontal left (x)	0,30 ± 1,25	0,75
CPI transversal (y)	0,77 ± 0,82	0,5

Mean, standard deviations and median values, in millimeters, of vertical (z) right and left condylar distraction, horizontal (x) right and left condylar distraction and condylar distraction in the transverse axis (y).

IV. DISCUSSION

In this study it was detected that there was a greater condylar distraction in the dolicofacial group in the 3 axial axes of the condyle coinciding with a study done by Girardot in 2001 where he refers that the clinician can generally assume that the hyperdivergent pattern will have better condylar distraction than the hypodivergent ones, indicating that they should be evaluated separately with this knowledge [3]. In a study by Ponces *et al*., (2014) All facial types, especially the hyperdivergent type, carried a significantly high risk of adaptive condylar distraction. Therefore, the possibility of condylar distraction should be carefully evaluated and considered in the assessment of all orthodontic cases in order to accurately assess jaw relationships and avoid possible misdiagnosis. Coinciding with the results of this study of the facial biotype that presented greater distraction [16]. Also in a study by Park *et al*., (2015) say that patients with the hyperdivergent skeletal pattern tend to have smaller and more superiorly positioned condyles than those with the hypodivergent skeletal pattern. They also have a narrower angle between the sagittal midplane and the condylar axis. Therefore, condylar position and morphology vary according to vertical facial morphology. It suggests that this relationship should be considered in predicting and treating TMDs during orthodontic treatment [17].

V. CONCLUSION

Knowing the difference in condylar position between RC and MI represents an auxiliary alternative for orthodontic diagnosis, which in turn is associated with the integration of new diagnostic and planning technologies. The data obtained from the present study conclude that the facial biotype where the greatest condylar distraction was observed in terms of the three axes; vertical, horizontal and transversal prior to orthodontic treatment, was in the dolichofacial pattern. Likewise, this allows us to make a more precise and beneficial orthodontic diagnosis for the patients studied. It is suggested that further research should be carried out with large and random samples in order to reach more objective conclusions about this correlation between variables.

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