

Mandibular condyle dimensions in Peruvian patients with Class II and Class III skeletal patterns.

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Receipt: 08/24/2017 **Revised:** 09/15/2017
Acceptance: 10/23/2017 **Online:** 10/23/2017

Conflict of interests: None.

Ethics approval: Ethics Committee of Universidad Peruana de Ciencias Aplicadas (UPC) CEI/032-04-16.

Funding: None.

Authors' contributions: This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

Acknowledgements: None.

Cite as: Zegarra-Baquerizo H, Moreno-Sékula K, Casas-Apayco L & Gheresi-Miranda H. Mandibular condyle dimensions in Peruvian patients with Class II and Class III skeletal patterns. *J Oral Res* 2017; 6(10):264-266.
[doi:10.17126/joralres.2017.077](https://doi.org/10.17126/joralres.2017.077)

Abstract: Objective: To compare condylar dimensions of young adults with Class II and Class III skeletal patterns using cone-beam computed tomography (CBCT). Materials and methods: 124 CBCTs from 18-30 year-old patients, divided into 2 groups according to skeletal patterns (Class II and Class III) were evaluated. Skeletal patterns were classified by measuring the ANB angle of each patient. The anteroposterior diameter (A and P) of the right and left mandibular condyle was assessed from a sagittal view by a line drawn from point A (anterior) to P (posterior). The coronal plane allowed the evaluation of the medio-lateral diameter by drawing a line from point M (medium) to L (lateral); all distances were measured in mm. Results: In Class II the A-P diameter was 9.06 ± 1.33 and 8.86 ± 1.56 for the right and left condyles respectively, in Class III these values were 8.71 ± 1.2 and 8.84 ± 1.42 . In Class II the M-L diameter was 17.94 ± 2.68 and 17.67 ± 2.44 for the right and left condyles respectively, in Class III these values were 19.16 ± 2.75 and 19.16 ± 2.54 . Conclusion: Class III M-L dimensions showed higher values than Class II, whereas these differences were minimal in A-P.

Keywords: Mandibular condyle; condyle dimension; cone-beam computed tomography; skeletal pattern.

INTRODUCTION.

Mandibular condyles, part of the temporomandibular joint (TMJ), may undergo morphological changes throughout the life mediated by functional adaptation. These changes occur more frequently after the age of 30, causing pathologies or condylar alterations.^{1,2}

Morphological changes of the mandibular condyle may be produced by: trauma (condylar wear), infections (osteomyelitis), genetic disorders (tumors, condylar hyperplasia) and ankylosis. These factors can alter dynamic functionality (opening and closing) or trigger problems such as occlusal instability, articular clicks, joint and muscle pains, TMJ alterations (reabsorption), functional problems, mandibular deviations and dislocations.^{2,3}

Class II and Class III facial skeletal patterns have distinct clinical, anatomical and functional characteristics.⁴ The mandibular condyle in a Class I skeletal pattern is centered in the glenoid cavity and normally measures around 8mm of anteroposterior diameter and 22mm of medial-lateral diameter.

Class II is characterized by a thinner condyle of anteroposterior diameter (less than 8mm), and Class III by a condyle greater than 22mm of medial-lateral diameter.^{3,4} However, there are few studies evaluating condylar dimensions in Class II and III patterns.

Cone Beam CT scans are radiological examinations that allow to visualize images in sagittal, coronal and axial dimensions, enabling a more accurate and detailed diagnosis of mandibular condyle dimensions and its alterations.³

The aim of this study is to compare condylar dimensions in young Peruvian adults with Class II and Class III skeletal patterns using CBCT.

MATERIALS AND METHODS.

A descriptive study was carried out to evaluate CBCT images from a diagnostic imaging center in Lima, Peru, from January to December 2016. Initial sample estimate was 58 CBCTs (power 80%, α of 0.05, sample size ratio of 1.70). Finally, a total of 124 CBCTs from 18-30 year-old patients were selected,⁵ and classified into two groups (n=62) for Class II and Class III skeletal patterns.

CBCTs from patients with bilateral molar occlusal contacts were included in the study. Patients diagnosed

with TMJ disorders were excluded.

All patients signed an informed consent form. The study was approved by the Ethics Committee of Universidad Peruana de Ciencias Aplicadas (UPC) CEI/032-04-16.

Measurements in mm of the mandibular condyle (anteroposterior and mediolateral) and anteroposterior profile (Steiner's analysis) were performed using Realscan 2.0 software (PointNix, Korea).

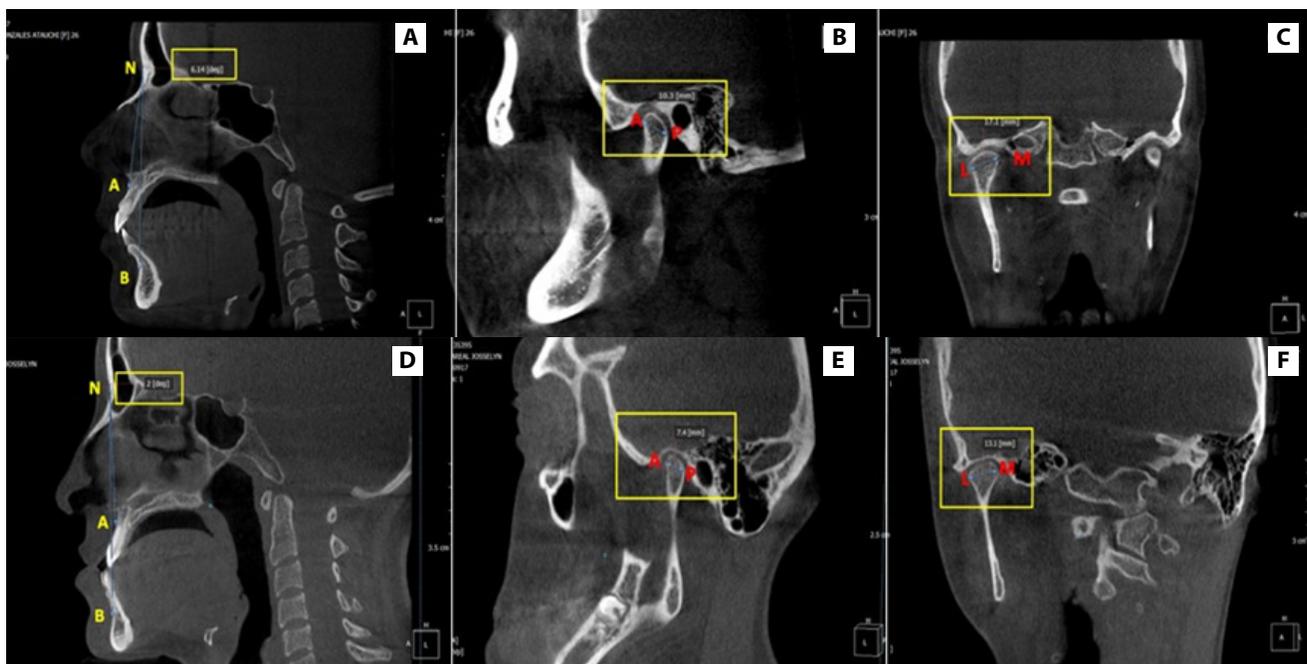
A line from the most prominent point of the inner curvature (point A) to the most prominent point of the external curvature (point B) of the condyle was drawn in sagittal view for the measurement of the anteroposterior diameter (largest diameter zone) of the condyles.

For the measurement of the mediolateral diameter, a line from the most prominent internal point (point M) to the most prominent external point (point L) was drawn in coronal view.

These lines form the A-P (anteroposterior) and M-L (mediolateral) diameters, respectively. (Figure 1)

Descriptive statistical analysis included the mean, median, standard deviation, minimum and maximum values of each of the A-P and M-L diameters. Statistical analysis was performed with the STATA 10 program (StataCorp, USA).

Figure 1. Anatomical views in CBT.



A. Sagittal view in CBT with ANB points identified to determine Class II facial skeletal pattern. B. Sagittal view of anteroposterior dimension of the right condyle, Class II facial skeletal pattern. C. Coronal view, mid-lateral dimension of the right condyle, Class II facial skeletal pattern. D. Sagittal view in CBT with ANB points identified to determine Class III facial skeletal pattern. E. Sagittal view of anteroposterior dimension of the right condyle, Class III facial skeletal pattern. F. Coronal view, mid-lateral dimension of the right condyle, Class III facial skeletal pattern.

Table 1. Characterization of condylar dimensions of young Peruvian adults with Class II and Class III skeletal patterns using CBT.

Skeletal pattern	Condyle (mm)		Mean	Median	Max	Min
Class II	Anteroposterior diameter	R	9.06±1.33	9.05	13.0	6.1
		L	8.86±1.56	8.8	13.3	5.3
	Mediolateral diameter	R	17.94±2.68	17.65	24.9	13.5
		L	17.67±2.44	17.45	24.2	13.2
Class III	Anteroposterior diameter	R	8.71±1.2	8.8	10.9	5.0
		L	8.84±1.42	8.9	12.4	5.4
	Mediolateral diameter	R	19.16±2.75	19.0	25.8	13.1
		L	19.16±2.54	19.1	25.6	12.9

RESULTS.

Table 1 shows the characteristics of the condylar dimensions of young Peruvian adults of Class II and Class III skeletal patterns using CBCT.

DISCUSSION.

A significant difference (greater than 1mm) of the M-L diameter was found between Class II and Class III patients. On the other hand, the difference in A-P diameter was not significant. The established age range (18-30 years) was based on studies such as that of Sacucci *et al.*,⁵ as patients frequently suffer degenerative conditions in the condyle, like erosion, sclerosis and osteoarthritis after the age of 30. Condylar dimensions and position in the fossa are more frequently affected in older compared to younger patients. Consequently, the sample was selected according to this criterion, in order to evaluate patients without condylar alterations. Some studies suggest that mandibular condyle dimensions are influenced by the masticatory function. Chen *et al.*,⁷ found that rodents on a hard diet had a higher degree of condylar development

compared to rodents on medium or soft diets. This can affect the condylar morphology of people with Class III skeletal pattern, since these patients usually have a greater development of masticatory muscles. In his “Functional Matrix” theory, Dr. Melvin Moss suggests that some bones need neuromuscular action for their development. That is, the greater the functionality of the muscle, the greater the development of the condyle and vice versa.^{6,8} Bong Kuen *et al.*,⁹ found that Class III patients presented greater temporal muscle activity than those with other skeletal patterns.

Results indicate that masticatory functionality is related to condylar development. This is consistent with the finding that patients with a Class III facial skeletal pattern have a larger M-L diameter than those of Class II. On the other hand, one of the reasons why no differences were found in the A-P diameter is the age range of the patients included in the study.^{1,3}

CONCLUSION.

Class III M-L dimensions showed higher values than Class II, whereas these differences were minimal in A-P.

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