

Relationship between the inner intercanthal distance and the mesiodistal dimension of maxillary anterior teeth in a peruvian population with facial harmony.

Relación entre la distancia intercanthal interna y la dimensión mesiodistal de dientes anterosuperiores en una población peruana con armonía facial.

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Abstract: Objective: To determine the relationship between the inner intercanthal distance and the mesiodistal dimension of the maxillary anterior teeth in a Peruvian population with facial harmony. Material and Methods: A cross-sectional study on a sample of 75 Peruvian subjects with facial harmony, with ages ranging between 18 and 30 years, was conducted. The inner intercanthal distance and the mesiodistal dimension of maxillary anterior teeth of each subject were measured with a digital vernier caliper. The relationship was evaluated by simple linear regression analysis. Results: A statistically significant direct relationship was found between the dimension of the inner intercanthal distance with the mesiodistal width of the lateral incisors ($p=0.040$, $R^2=5.65\%$), canines ($p=0.032$, $R^2=6.17\%$), and the total mesiodistal sum of the six anterior teeth ($p=0.040$, $R^2=5.63\%$), but not with the central incisors ($p=0.273$, $R^2=1.64\%$). Conclusion: The inner intercanthal distance showed a direct relationship with the total mesiodistal linear dimension of the maxillary anterior teeth, with the mesiodistal dimensions of the lateral incisors and canines in a Peruvian population with facial harmony.

Keywords: Incisor; cuspid; odontometry; cephalometry; face; Perú.

Resumen: Determinar la relación entre la distancia intercanthal interna y la dimensión mesiodistal de los dientes anterosuperiores en individuos peruanos con armonía facial. Material y métodos: Se realizó un estudio transversal en una muestra de 75 individuos peruanos con armonía facial entre 18 a 30 años. Se midió la distancia intercanthal interna y la dimensión mesiodistal de dientes anterosuperiores de cada sujeto con un calibrador vernier digital. La relación fue evaluada mediante análisis de regresión lineal simple. Resultados: Se encontró relación directa estadísticamente significativa entre la dimensión de la distancia intercanthal interna con el ancho mesiodistal de los incisivos laterales ($p=0.040$, $R^2=5.65\%$), caninos ($p=0.032$, $R^2=6.17\%$) y la suma total mesiodistal de los seis dientes anteriores ($p=0.040$, $R^2=5.63\%$), más no con los incisivos centrales ($p=0.273$, $R^2=1.64\%$). Conclusión: La distancia intercanthal interna mostró relación directa con la dimensión lineal mesiodistal total de los dientes anterosuperiores, con las dimensiones mesiodistales de los incisivos laterales y de caninos en individuos peruanos con armonía facial.

Palabras Clave: Incisivo; diente canino; odontometría; cefalometría; cara; Perú.

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INTRODUCTION.

Maxillary anterior teeth play an important role in facial aesthetics. The shape, color and size of the teeth must be in harmony with the supporting facial structures.¹ The mesiodistal dimensions of teeth differ in each person due to a number of factors,² warranting the acquisition of individualized information for dental treatment.³

Various methods have been used to evaluate the relationship of the mesiodistal dimensions of the maxillary anterior teeth with certain facial structures.⁴⁻⁶ These include anthropometric measurements, which were considered as reliable guides.^{5,6} Sayed *et al.*,⁷ concluded that intercomisural width and interalar width measurements are the only predictable methods to estimate the initial reference value for the width of anterior teeth. However, Gupta *et al.*,⁸ found a statistically significant relationship between the intercanine width with the inner intercanthal distance and other facial measures, concluding that the inner intercanthal distance can be used as an anatomical reference for missing maxillary anterior teeth when they have been extracted.

Troncoso *et al.*,⁹ studied the relationship between intercanthal distance and width of upper anterior teeth in young Chilean subjects, finding a linear and proportional correlation between both variables. In contrast, Mishra *et al.*,¹⁰ studied the relationship between inner intercanthal distance and other facial parameters with the combined width of the upper anterior teeth in two ethnic populations in Nepal, finding that intercanthal distance was not associated with the mesiodistal width of the upper anterior teeth. Similar results were found in an Indian population by Deogade *et al.*,¹ The presence of these contradictory results in the literature and the lack of reports that evaluate the relationship of these variables in Peruvian subjects makes research in this population necessary.

MATERIALS AND METHODS.

The present cross-sectional study was conducted on a sample of 75 subjects between 18 and 30 years of age (21.28±3.75 years), 33 females (21.24±3.23 years) and 42 males (21.31±4.15 years). The subjects, residents of the cities of Trujillo and Cajamarca, Peru, attended to hospitals and universities in these locations, between the

months of May and June 2018. The sample selection was for convenience, not probabilistic. Sample was calculated using the formula for correlation of variables, considering a statistical power of 95%, a confidence of 97.5% and a correlation of 0.463, obtained from data of a pilot study conducted in fifteen subjects.

The inclusion criteria were: subjects were at least third generation of Peruvian ancestry, with 6 healthy anterosuperior permanent teeth and clinical evidence of facial harmony (straight profile, with Glabella angle-subnasal (vertex). —Soft pogonion between 165° and 175° and lips at normal position in relation to the columella line— soft pogonion, distance of 0mm), central midline centered with the anterior teeth and chin, parallel bipupillary and commissural planes. The exclusion criteria were: subjects with moderate or severe dental crowding, using or having used orthodontic appliances, with a history of surgery or maxillary orthopedic procedures, anterior teeth with spacing, facial alterations and/or gingival inflammation.

The present research was approved by the Permanent Committee of Scientific Research, School of Stomatology of Antenor Orrego Private University (Code No.: 0177-2019-FMEHU-UPAO). Each participating subject signed an informed consent. The inner intercanthal distance was measured in millimeters, using a digital vernier caliper taking as reference from the right endocanth to the left. (Figure 1)

To measure the mesiodistal dimensions of the upper incisors and canines, an impression was made of the upper arch with alginate (Tropicalgin-Zhermack, Mapledent Co., Guandong, China), using partial steel buckets. Dental casts were obtained immediately after the impression was taken, using type IV extra-hard plaster (Elite Rock, Fast-Zhermack, Badia Polesine, Italy). The largest mesiodistal dimension of each tooth was obtained, placing one end of the caliper on top of the curvature of the mesial face and the other end on top of the curvature of the distal face, parallel to the incisal surface.

The error of the method was evaluated in 15 subjects, making the measurements two weeks apart for intra-examiner calibration. Inter-examiner calibration was performed comparing the initial measurements performed by

the researcher (VSC) with the measurements made by a specialist (MCH). The Intraclass Correlation Coefficient (ICC) was used to assess the reliability of measurements of mesiodistal dimensions of upper anterior teeth and intercanthal distance. Reliability was found between the measurements, obtaining highly significant agreement ($p < 0.01$) between the measurements, with an intra-examiner ICC of 0.992 and an inter-examiner of 0.959 for the intercanthal dimension, and a minimum intra-examiner ICC of 0.865 and minimum inter-examiner of 0.769 for mesiodistal widths.

Statistic analysis

Data collected were processed with the statistical program Stata version 14 (StataCorp, Texas, USA).

To evaluate the relationship between the intercanthal distance and the mesiodistal dimensions of the upper anterior teeth, simple linear regression analysis was used, considering the intercanthal width as an independent variable. A level of significance of 5% was considered.

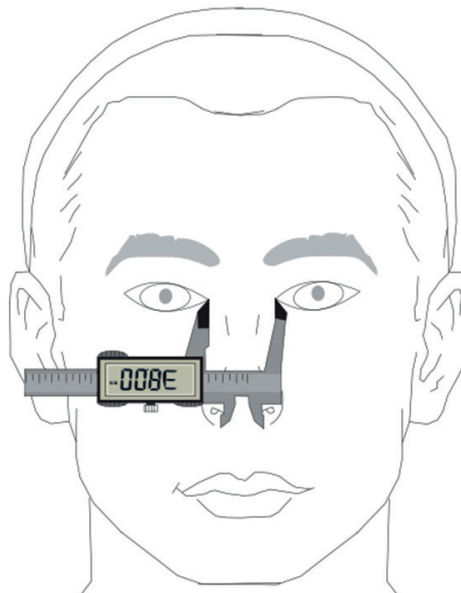
RESULTS.

A direct relationship was found between the inner intercanthal distance with the mesiodistal widths of the lateral incisors ($p = 0.040$, $R^2 = 5.65\%$), canines ($p = 0.032$, $R^2 = 6.17\%$) and the total mesiodistal sum of the six anterior teeth ($p = 0.040$, $R^2 = 5.63\%$), but not with the mesiodistal widths of the central incisors ($p = 0.273$, $R^2 = 1.64\%$). (Table 1)

Table 1. Relationship between the inner intercanthal distance and the mesiodistal width of the upper anterior teeth in Peruvian subjects with facial harmony (n=75).

Tooth/group (dependent variable)	Independent variable	Characteristic	β	p-value	95% confidence interval		R2 (%)
Central incisor		Variable value	0.027	0.273	-0.022	0.075	1.64
		Constant	7.600	0.000	5.944	9.256	
Lateral incisor	Intercanthal distance	Variable value	0.049	0.040	0.002	0.096	5.65
		Constant	5.298	0.000	3.695	6.901	
Canine		Variable value	0.045	0.032	0.004	0.085	6.17
		Constant	6.588	0.000	5.202	7.975	
Anterior group		Variable value	0.242	0.040	0.011	0.473	5.63
		Constant	38.947	0.000	31.058	46.836	

Figure 1. Schematic representation of the inner intercanthal distance measurement.



DISCUSSION.

The data of the present study suggest that there is a relationship between the inner intercanthal distance and mesiodistal dimension of upper anterior teeth in a Peruvian population with facial harmony. These results differ from those reported by Mishra *et al.*,¹⁰ who found no relationship between the variables under study in Nepal, and those of Deogade *et al.*,¹ in an Indian population.

This would be an indication that race or ethnic background play an important role in the morphology of the upper anterior teeth,³ since the present study was conducted in a South American population and not Asian or Indian, as in the case of the abovementioned studies.^{1,10}

For Deogade *et al.*,¹ intercanthal distance cannot be used as a preliminary method to determine the width of the upper anterior teeth since Pearson's correlation coefficients were relatively small. However, based on the results of this study, where a significant relationship was found, it would be feasible to predict the total sum of the anterior teeth, of the canines and lateral incisors from the intercanthal dimension, using simple linear regression models.

Troncoso *et al.*,⁹ calculated the dimension of the upper anterior teeth using the intercanthal distance in a young adult population in southern Chile, proving this to be a reliable prediction guide. Similar results were found in the present study, and the individuals who participated in this study also of South American origin.

A limitation of the present study is the univariate analysis performed. It is suggested to conduct more studies assessing the intervention of other variables in this relationship. Likewise, having selected the sample

for convenience limits the extrapolation of the results. However, since the subjects evaluated have facial harmony, these results can be used as a guide for diagnosis and treatment planning. On the other hand, one of the greatest advantages of inner intercanthal distance is dimensional stability over time, which becomes an advantage for the clinician, since it could be taken as a reference to estimate the mesiodistal dimensions of the upper anterior teeth in the rehabilitation plan.

The results of the present study suggest that given the direct relationship found, intercanthal distance could be used as a reference for the rehabilitation of the maxillary anterior teeth. However, further studies in other populations are needed.

CONCLUSION.

There is a direct relationship between the inner intercanthal distance with the total mesiodistal linear dimension of the maxillary anterior teeth, with the mesiodistal dimensions of the lateral and canine incisors in a Peruvian population with facial harmony.

Conflict of interests: The authors declare no conflict of interest of any kind.

Ethics approval: Research Committee of the Stomatology School at the Antenor Orrego Private University. Código Nro: 0177-2019-FMEHU-UPAO.

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