ORIGINAL ARTICLE

Comparison between Obando´s anthropometric formula and Mondelli´s formula to estimate central incisor width.

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Abstract: Objective: to compare Mondelli's formula with Obando's anthropometric formula in order to determine the mesiodistal width of maxillary central incisor. Materials and Methods: 100 adults (50 women) were selected. The mesiodistal width of maxillary central incisor was measured. Maximum smile was used for Mondelli's formula. Inter-alar distance and longitudinal axis of the ear were used for Obando's formula. Correlations and differences between estimates of both formulas and the actual mesiodistal width of the central incisor were estimated. Results: Obando's formula presented a strong correlation (r=0.8846) with the mesiodistal width, with no statistically significant differences between the two measures (p>0.05). Mondelli's formula presented a moderate negative correlation with the mesiodistal width (r=-0.3401) and a statistically significant difference with respect to the mesiodistal width (p<0.0001), in both men and women. Conclusion: Obando's formula estimated more accurately the mesiodistal width of the central incisor in comparison to Mondelli's formula in the Peruvian population.

Keywords: *Dental aesthetics, Incisor, Anthropometry.*

DOI: *10.17126/joralres.2016.025.*

INTRODUCTION.

A harmonious smile is an important component of facial aesthetics[1] and one of the main considerations among patients seeking dental treatment[2]. However, what can be considered harmonic according to a specific culture or person may not be right for another, and may affect social interactions[2]. It should be noted that the mouth is the center of communication and the focus of attention in the face of a person[3].

The restoration of maxillary anterior teeth is a complex process, especially when people have lost incisors and canines[4]. An important factor contributing to a harmonious dentition is size, shape and arrangement of maxillary central incisors seen from the front[5]. Different techniques have been proposed to optimize the harmonious shape of maxillary anterior teeth[1,4-8]. These are based on the work of Levin, who

introduced the golden ratio in dental aesthetics[9]. However, the clinical use of these techniques is limited to smile design[10] when some or all of the upper front teeth are in place. On the contrary, it is difficult to reconstruct the anterior superior area if there is edentulousim in the upper anterior zone.

Mondelli has proposed two formulas to find the personalized width of the upper or maxillary central incisor. Mondelli's formulas are based on the measurement of the distance of the maximum smile; the second formula is the most frequently used[11]. It estimates the maxillary central incisor width measuring the distance of the maximum smile and multiplying it by the constant 0.155[11,12].

Many anatomical landmarks (head diameter, inter-commissural, inter-alar, interpupillary and bizygomatic distance) have been proposed to determine the personal distance and measures for the restoration of maxillary

anterior teeth in the case of total and/or partially edentulous people. In this study Obando's anthropometric formula is proposed to determine the width of the maxillary central incisor based on inter-alar distance from the nose and the maximum length of the ear. The aim of this cross-sectional study is to compare Mondelli's second formula and Obando's anthropometric formula to determine the width of the maxillary central incisors.

MATERIALS AND METHODS.

Patient selection

One hundred young adults between 20 and 25 years old were selected for the study. Patients were divided into two groups: 50 men and 50 women. They were all fourth and fifth grade students at the Escuela Profesional de Odontología at Universidad Católica de Santa María, Arequipa, Perú. Helsinki ethical principles were followed and all participants were included after signing an informed consent. Inclusion and exclusion criteria described by Kumar *et al*. were used[6].

Figure 1. To obtain maximum smile, the patient should keep a forced smile and measurement is performed from commissure to commissure (black line).

Dental measurements

A previously calibrated researcher performed the measurement in a dental practice having the patient sitting at 90 degrees with his/her interpupillary axis parallel to the floor. The researchers obtained the actual measurements of the individual maxillary central incisors using a vernier caliper (Stanley, Germany). Models of the upper anterior area were also registered. To determine the width of the maxillary central incisor by Mondelli's second formula, the maximum smile (Figure 1) was measured and the following formula was applied:

$$WCI = 0.155 \times MS$$

where: WCI = width of maxillary central incisor.
MS = maximum smile.

To determine the width of the maxillary central incisor by Obando's anthropometric formula, inter-alar distance of the nose and the mean of the longitudinal axis of the ears (Figure 2) were measured. The following formula was then applied:

$$WCI = \frac{\left(\overline{X}MLO \big/ IAD \right)}{2}$$

where: WCI = width of maxillary central incisor.
$\overline{X}$MLO = mean of the maximum length of the ears.
IAD = inter-alar distance.

Figure 2. Inter-alar distance is obtained when the patient is with his/her mouth closed and a relaxed face (black line). The measurement of the maximum length of the ears is obtained by measuring the distance from the top to the lower part of the ear (black line).

Statistic analysis

Analyses were conducted using the statistical package Graphpad Prism (GraphPad Software, USA). Comparisons of the two formulas and the real measure of the width of the central incisor were made using Pearson linear correlation between the two measurements. Student t test was used to determine differences between actual measurements and the formulas studied. Lin's concordance coefficient was used to determine the similarity in measuring the mesiodistal width of maxillary incisor. In all cases $p<0.05$ was considered statically significant.

RESULTS.

A strong positive correlation was observed between Obando's anthropometric formula (r=0.8570) and the actual measure of WCI in the group of women. A negative correlation between Mondelli's formula (r=-0.2730) and the actual measurement of the width of anterior incisor was observed. No statistically significant differences between the actual measure of WCI with respect to Obando's anthropometric formula (p=0.3612) were found. However, there was a statistically significant difference with respect to Mondelli's formula (p<0.0001). Concordance between Mondelli's and Obando's formula was low (Pc=-0.029), as well as with the real measure of WCI (Pc=-0.021). A high concordance between Obando's formula and the actual measure of WCI (Pc=0.822) was found.

A strong positive correlation was observed between Obando's anthropometric formula (r=0.9214) and the actual measure of WCI in the group of men. A negative correlation between Mondelli's formula (r=-0.3767) and the actual measure of the width of the anterior incisor was observed. No statistically significant differences between the actual measurement of WCI with respect to Obando's anthropometric formula (p =0.2232) were found.

However, there was a statistically significant difference with respect to Mondelli's formula (p<0.0001). Concordance between Mondelli's and Obando's formula was low (Pc=-0.016), as well as with the actual measure of WIC (Pc=-0011). A high concordance between Obando's formu-

la and the actual measure of WCI (Pc=0.877) was found.

The whole sample showed a strong positive correlation between Obando's anthropometric formula (r=0.8846) and the actual measure of WCI. A negative correlation between Mondelli's formula (r=-0.34) and the actual measure of the width of the anterior incisor was observed. No statistically significant differences between actual measurement of WCI with respect to Obando's anthropometric formula (p=0.1446) were found. However, there was a statistically significant difference with Mondelli's formula (p<0.0001). Concordance between Mondelli's and Obando's formula was low (Pc=-0.0236), as well as with the actual measure of WCI (Pc=-0017). A high concordance between Obando's formula and the actual measure of WCI (Pc=0.847) was found.

DISCUSSION.

The smile is the interaction of several structures. These include the lips, gingival soft tissue and teeth[13]. That is why any dental treatment should aim to achieve a natural and aesthetic appearance[14]. The smile must be in harmony with other parts of the face. The relationship between facial measurements and teeth should be an important factor in determining the harmony of the smile[2]. This can be changed by the natural wear and tear of the teeth or by dental treatments that do not respect their natural form[15].

The results of this study show that the formula proposed by Mondelli yields similar measures to WCI, which is consistent with other studies[12,16]. However, Mondelli's estimates showed statistically significant differences with respect to WCI.

On the other hand, Obando's anthropometric formula showed a better approach to WCI. This similarity can be explained because the inter-alar distance coincides with the cusps of upper canines[4]. In the study by Mahesh et al. the use of inter-alar and intercommissural distance showed a good concordance with WCI[7]. Similarly, Mishra *et al*. reported that inter-alar distance used to determine WCI is quite accurate when used in conjunction with in-

tercommissural or interpupillary distance[8].

The maximum length of the ears was used in this study. This is the first report describing the use of this anthropometric measure for determining WCI. The extent of the maximum length of the ear has been described here as a canon for facial reconstructions and aesthetic facial surgeries[17-19].

Obando's anthropometric formula uses measurements reported in the literature as facial aesthetic canons[17,19,20]. Instead, Mondelli's formula uses the distance of maximum smile, which is not described as a facial canon. This would explain the differences between the Mondelli's formula with respect to Obando's and the actual WCI.

Despite this, it should be considered that Obando's anthropometric formula could be compromised by the presence of aesthetic corrective surgeries, mutilated face or birth defects that alter inter-alar distance of the nose and the maximum length of the ear.

CONCLUSION.

Within the limits of this study, it is concluded that Obando's formula showed a significant correlation with the width of the maxillary central incisor in the Peruvian population. Diagnostic test studies are suggested to determine the sensitivity of the formula in choosing the size of the maxillary central incisor.

Comparación entre la fórmula antropométrica de Obando y la fórmula de Mondelli para estimar el ancho del incisivo central superior.

Resumen: Objetivo: comparar la fórmula de Mondelli con la fórmula antropométrica de Obando para determinar el ancho mesio-distal del incisivo central superior. Materiales y métodos: 100 adultos (50 mujeres) fueron seleccionados. Se procedió a medir el ancho mesio-distal del incisivo central superior. Para la fórmula de Mondelli se utilizó la sonrisa máxima y para la fórmula de Obando se utilizó la distancia interalar y el eje longitudinal de la oreja. Se estimaron correlaciones y diferencias entre las estimaciones de ambas fórmulas y el ancho mesio-distal real del incisivo central. Resultados: la fórmula de Obando presentó una correlación fuerte (r=0,8846) con el ancho mesio-distal, sin diferencias estadísticamente significativas entre ambas medidas (p>0,05). La fórmula de Mondelli presentó una correlación moderada y negativa con el ancho mesio-distal (r=-0,3401) y una diferencia estadísticamente significativa respecto al ancho mesio-distal (p<0,0001), tanto en mujeres como hombres. Conclusión: la formula de Obando logró estimar de manera más precisa el ancho mesio-distal del incisivo central en comparación a la fórmula de Mondelli en población peruana.

Palabras clave: *Estética dental, Incisivo, Antropometría.*

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