Nasal Width as a Guide for the Selection of Maxillary Complete Denture Anterior Teeth in Four Racial Groups

Fabiana Mansur Varjão, DDS, MSc, PhD[1] and Sergio Sualdini Nogueira, DDS, MSc, PhD[2]

Purpose: **Selecting artificial teeth for edentulous patients is difficult when pre-extraction records are not available. Various guidelines have been suggested for determining the width of the maxillary anterior denture teeth. This study was undertaken to evaluate the use of the nasal width as a guide for the selection of proper width maxillary anterior denture teeth in four racial groups of the Brazilian population.**

Materials and Methods: **One hundred and sixty subjects (40 Whites, 40 Mulattos, 40 Blacks, and 40 Asians) were selected. Using a sliding caliper, the nasal width and the intercanine distance were measured. The Pearson product-moment correlation coefficient was used to determine the relationship between the above measurements. A prediction was made of the percentage of subjects of the White, Mulatto, Black, and Asian populations in which the selection error due to the clinical application of the method of the nasal width would be within 0 to 2 mm, within 2 to 4 mm, and greater than 4 mm.**

Results**: The four racial groups showed a weak correlation between the intercanine distance and the nasal width. In 39.7% of the White, 55.7% of the Mulatto, 81.9% of the Black, and 48.2% of the Asian populations, errors greater than 4 mm would be present with the use of the nasal width.**

Conclusions: **The correlation found between the intercanine distance and the nasal width was not high enough to be used as a predictive factor. The relationship between natural tooth width and artificial tooth width as predicted by the nasal width showed that the nasal width method is not accurate for all the studied groups.**

J Prosthodont 2006;15:353-358. Copyright © 2006 by The American College of Prosthodontists.

INDEX WORDS: complete denture, dental esthetics, artificial teeth, race

SELECTING AND ARRANGING artificial teeth for edentulous patients is difficult when pre-extraction records are not available. Errors at this stage can often result in patient rejection of otherwise well-constructed, comfortable, and efficient dentures.[1-5] In an effort to solve this problem, various guidelines have been suggested for determining the width of the maxillary anterior teeth.

One of the available methods that can aid in the selection of the width of anterior teeth is the use of the nasal width, the so-called "nasal index."[2,6] In this technique, it has been suggested[7] that the projection of perpendicular lines downward from the alae of the nose to the buccal surface of the upper occlusal rim may be used to determine the position of the tips of the artificial canines. To select the correct size of the six anterior artificial teeth, the distance between the canine marks projected to the buccal surface of the maxillary occlusal rim is measured around the curve of the rim with a flexible ruler.[2,3,5] Since tooth mold charts for anterior teeth give dimensions from the distal of one canine to another, 8 to 10 mm should be added to this value to obtain the distance between the distal surface of the canines.[8]

From the Department of Dental Materials and Prosthodontics, São Paulo State University, Araraquara Dental School, Araraquara, São Paulo, Brazil.

[1]Private Practice, Former Graduate Student.

[2]Associate Professor.

Accepted June 23, 2005.

Correspondence to: Fabiana Mansur Varjão, DDS, MSc, PhD, Av. 22 de Agosto, 318, ap. 23, Araraguara-SP-Brazil, CEP 14810-125. E-mail: fabianamansur@uol.com.br

1059-941X/06

doi: 10.1111/j.1532-849X.2006.00134.x

Previous studies attempted to determine the nasal width dimension and its relation to the intercanine distance.[1-5,9,10] Most of them have shown no significant relationships between these two measurements.[1,2,4,5,8] However, most of the studies regarding the selection of complete denture teeth were conducted in Caucasian population samples,[1,3-5,11,12] and the findings have been extrapolated to other ethnic groups. In 1992, Johnson[13] pointed out that the prosthodontic literature seems to pertain only to the Caucasian race with little noted about other races. Furthermore, the author reported that the knowledge of racial norms for facial appearance might aid practitioners, since the treatment given would then be in harmony with the facial appearance for patients of different races.

The Brazilian society consists of a diverse mix of races, with some of the ethnic groups remaining racially homogenous while others have mixed with other races. The purpose of this article is to evaluate the use of the nasal width as a guide for the selection of proper width maxillary anterior denture teeth in four racial groups of the Brazilian population.

Materials and Methods

The research plan was prepared in accordance with guidelines appropriate to research involving human subjects, as set down in Resolution 196/96 of the National Health Council and approved by the Research Ethics Committee of São Paulo State University.

One hundred and sixty Brazilian subjects (40 Whites, 40 Mulattos, 40 Blacks, and 40 Asians—Japanese and Chinese) of mixed sex and age (ranging from 18 to 33 years) were selected for this study. The subjects met the following criteria: (1) they had all natural permanent maxillary teeth with no history of orthodontic treatment or extraction, (2) the canines and incisors were in good alignment without drifting or attrition in more than one third of incisal edge of the canines, and (3) they had no congenital or surgical facial defects.

Before any procedures, all subjects received detailed information about the research and were then asked to sign a Free and Clarified Consent Form.

The external width of the alae of the nose was measured at the widest point using a digital sliding caliper (Mitutoyo Sul Americana Ltda., São Paulo, Brazil). Artificial stone casts of the maxillary arches (Rock Plus, Polidental Ind. e Com Ltda, São Paulo, Brazil) were made from irreversible hydrocolloid (Jeltrate, Dentsply Ind. e Com. Ltda., Petrópolis, Brazil) impressions made in perforated stock trays. The maxillary intercanine distance was measured from the stone cast using the sliding caliper. Each measurement was made in a straight line from canine cusp tip to canine cusp tip on three occasions. The original cusp tip was considered to have been at the intersection of a line drawn with graphite along the mesial and distal cutting edge and a line along the buccal and lingual long axis of the tooth.

Figure 1. Sliding caliper positioned on the dental floss and mark made with graphite.

Each measurement was made on three separate occasions. The average of the three measurements was used. The same examiner carried out all procedures, performed all measurements, and recorded all information.

Analysis of variance was used to determine whether the nasal width and the intercanine distance were different in relation to race. To compare different means, the Tukey test ($p < 0.05$) was used. The Pearson product-moment correlation coefficient was used to determine the relationship between the intercanine distance and the nasal width in the four racial groups studied.

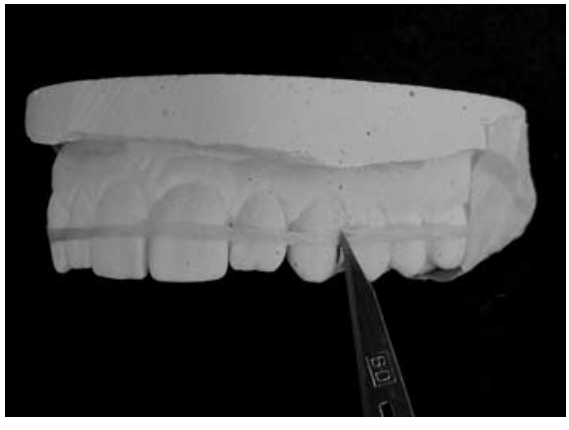

Figure 2. Dental floss sectioned by a blade at the mark location.

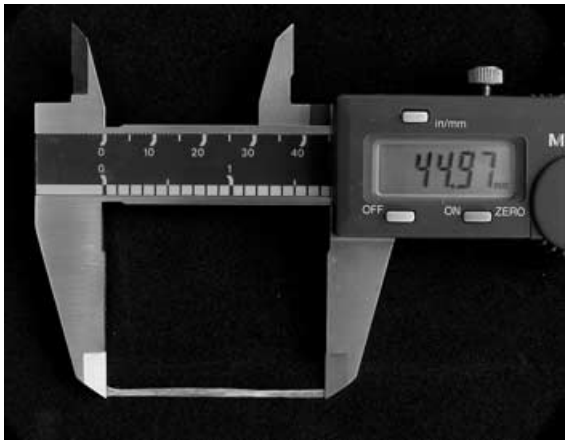

Figure 3. Dental floss measured with the sliding caliper.

The selection error due to the application of the method of the nasal width was also determined, in millimeters. First, the curve distance between the cusp tips of the canines (IcD) was measured. For that, dental floss was placed at the greatest facial curvature of the maxillary arch, sectioned with a blade at the location of the cusp tips of the canines, and then measured with the sliding caliper. Dental floss was also placed at the greatest curvature of the maxillary arch and fixed with adhesive tape. The sliding caliper was opened to the value obtained for the nasal width. The sliding caliper was positioned on the dental floss, and two marks were made with graphite, one each side (Fig 1). The floss was sectioned in the marks' locations (Fig 2) and measured with the sliding caliper (Fig 3). The value obtained for this measurement corresponded to the intercanine distance predicted by the nasal width (IcD′). Each measurement was made three times on three separate occasions. The selection error was defined as the difference between the width of the artificial teeth estimated by the nasal width and the real width of the natural teeth (IcD′ minus IcD).

In addition, a prediction was made of the percentage of subjects of the White, Black, Mulatto, and Asian populations (using a 95% confidence interval) in which this error would be within 0 to 2 mm, within 2 to 4 mm, and greater than 4 mm.

Results

The mean values of the intercanine distance and of the nasal width of the four racial groups and the result of the Tukey test are presented in Table 1. For the nasal width, the Black group was significantly different from the White, Mulatto, and Asian groups. Between the Mulatto and Asian groups, there was no significant difference. For the intercanine distance, the Black group was significantly different from the White, Mulatto, and Asian groups. The Mulatto group was not statistically different from the White and Asian groups.

Pearson correlation analysis showed a weak correlation between the intercanine distance and the nasal width in the four studied racial groups. It was not high enough to be used as a predictive factor. The following coefficients (r) were obtained: White = 0.238, Mulatto = 0.436, Black = 0.286, and Asian = 0.089. The correlation between the two measurements in the four races is shown in Figures 4 to 7. The dotted lines present the linear regression line for the values. In the White, Black, and Mulatto groups, although the coefficients were all weak, there was little tendency for the variables to increase linearly in the same way. The full lines indicate the position of the points in the diagram if there was equality between the variables.

Table 1. Values for the Nasal Width and the Intercanine Distance

Measurements	*Statistic (mm)*	*White*	*Mulatto*	*Black*	*Asian*
NW*	Minimum	30.07	30.40	34.39	30.68
	Maximum	40.57	45.29	53.80	43.07
	Mean	35.28[a]	36.89[b]	42.39[c]	37.27[b]
	SD	2.62	2.99	3.40	2.88
ID*	Minimum	29.01	28.67	30.67	29.95
	Maximum	39.26	39.19	39.97	38.75
	Mean	33.55[a]	34.31[ab]	36.03[c]	34.83[b]
	SD	2.30	2.49	2.07	1.77

Same superscript letters indicate that the Tukey test showed no significant difference ($p < 0.05$).
NW = nasal width; ID = intercanine distance.
*p Value = 0.0000.

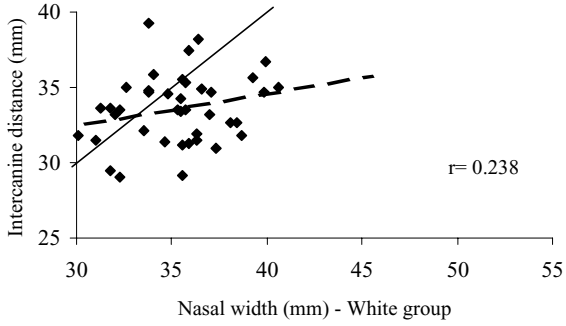

Figure 4. Correlation between the nasal width and the intercanine distance for the White group.

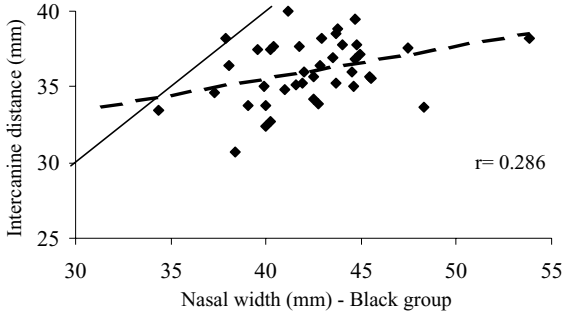

Figure 6. Correlation between the nasal width and the intercanine distance for the Black group.

Table 2 contains the information regarding the selection errors due to the use of nasal width for the selection of the six anterior teeth width. In all racial groups studied, the use of the nasal width would lead, in general, to the selection of wider artificial teeth.

Discussion

The mean nasal width dimensions were 35.28 mm for the White group, 36.89 mm for the Mulatto group, 42.39 mm for the Black group, and 37.27 mm for the Asian group. The White value is in agreement with the studies of Mavroskoufis & Ritchie (35.3 mm);[3] Scandrett et al (34.4 mm);[4] and Smith (33.5 mm).[5] However, Latta et al,[14] studying White edentulous patients, found a value of 40 mm. Other studies did not include races in their respective patient populations, although they found values for the nasal width close to those of the results of this study. Puri et al[10] found 37.13 mm for men and 33.05 mm for women, and Hoffman et al[1] found 34.28 mm.

In the Black group, the mean nasal width was statistically different from the White and Mulatto mean values. Latta et al,[14] studying Black edentulous patients, found a different value (47 mm), although this value lies between the minimum and maximum values found in this study.

The nasal width values obtained by Keng,[2] studying Chinese patients, were close to those of the results of this study: 39.60 mm for men and 36.41 mm for women.

For the intercanine distance, the White group presented a mean value of 33.55 mm, while the Mulatto group presented 34.31 mm, the Black group presented 36.03 mm, and the Asian group presented 34.83 mm. The White value was in agreement with the studies of Smith (33.2 mm);[5] Mavroskoufis & Ritchie (34.3 mm);[3] Hoffman et al (35.35 mm);[1] and Puri et al (36.5 mm for men and 33.67 mm for women).[10]

With respect to the intercanine distance of the Black group, the mean value obtained was statistically higher than the mean values of the White and Mulatto groups. One of the factors that may

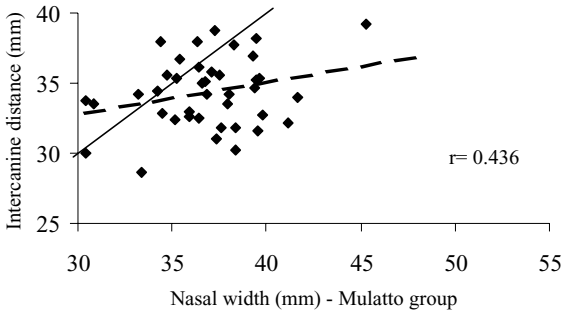

Figure 5. Correlation between the nasal width and the intercanine distance for the Mulatto group.

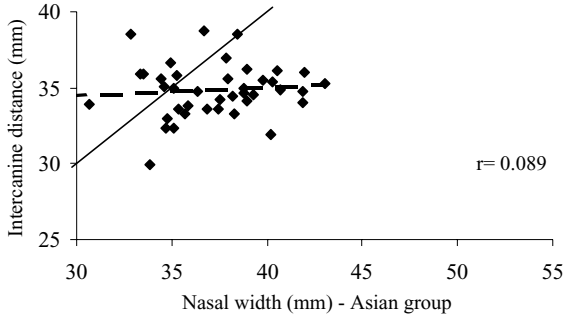

Figure 7. Correlation between the nasal width and the intercanine distance for the Asian group.

Table 2. Selection Errors Due to the Use of the Nasal Width for the Selection of the Six Anterior Teeth Width

	Race			
Information	*White*	*Mulatto*	*Black*	*Asian*
Error statistics (mm)				
Largest error for wider teeth	8.75	14.67	27.29	14.65
Largest error for narrower teeth	−8.25*	−9.24	−3.77	−9.08
Mean	0.17	2.39	9.85	1.73
SD	4.72	6.34	7.23	5.41
Prediction of errors %				
Within 0 to 2 mm	32.8%	23.1%	8.8%	27.4%
Within 2 to 4 mm	27.5%	21.2%	9.3%	24.3%
Higher than 4 mm	39.7%	55.7%	81.9%	48.2%

*The minus sign (−) demonstrates the selection of narrower teeth.

influence this distance is the width of the teeth. The studies of Grave,[15] Lavelle,[16] and Mack[17] demonstrated that Black subjects have wider teeth than other races, which may explain the greater intercanine distance found in the Black group.

In the Asian group, the intercanine distance obtained was in agreement with the values found in Keng's study (35.60 mm for men and 34.96 mm for women).[2]

The correlation coefficient (r) found in the White group (0.238) is in disagreement with those found by Smith (0.37)[5] and Hoffman et al (0.413).[1] Scandrett et al[4] obtained a coefficient of 0.366, although they determined the correlation between the nasal width and the curve distance between the distal of the canines, and not the straight distance between the tips of the canines.

The mean selection error due to the application of the method of the nasal width was calculated by subtracting the value obtained for the curve intercanine distance predicted by the nasal width from the value obtained for the real curve distance between the tips of the canines. Thus, the positive mean values (Table 2) indicate that the use of this method would lead to the selection of wider artificial teeth for all the racial groups.

The prediction of the percentage of subjects of each race in which the selection error would be within 0 to 2 mm, within 2 to 4 mm, and greater than 4 mm showed that errors greater than 4 mm would be present in 39.7% of Whites, 55.7% of Mulattos, 81.9% of Blacks, and 48.2% of Asians (Table 2). Since the method of the nasal width determines the position of the cusp tips of the canines, the addition of 8 to 10 mm is necessary to obtain the distance between the distal surface of the canines.[8] This addition could introduce an additional error.

The results of this study suggest that the method of the nasal width is not accurate for all the racial groups studied, rendering the worst result for the Black group; however, this method may aid in an initial selection of the width of the artificial anterior teeth for the White group, although other variables are needed to predict the width of the maxillary anterior teeth, such as the patient's physical size, jaw ridge size, and esthetic sensitivity.

Conclusions

From the results of this study, the following conclusions were drawn:

For all the studied racial groups, the measurements of the nasal widths showed a weak correlation with the intercanine distance, not high enough to be used as a predictive factor.

The relationship between natural teeth width and artificial teeth width as predicted by the nasal width showed that the nasal width method is not accurate for all the studied groups and would lead, in general, to the selection of wider artificial teeth.

References

1. Hoffman W Jr, Bomberg TJ, Hatch RA: Interalar width as a guide in denture tooth selection. J Prosthet Dent 1986;55:219-221
2. Keng SB: Nasal width dimensions and anterior teeth in prosthodontics. Ann Acad Med Singapore 1986;15:311-314
3. Mavroskoufis F, Ritchie GM: Nasal width and incisive papilla as guides for the selection and arrangement of maxillary anterior teeth. J Prosthet Dent 1981;45:592-597

4. Scandrett FR, Kerber PE, Umrigar ZR: A clinical evaluation of techniques to determine the combined width of the maxillary anterior teeth and the maxillary central incisor. J Prosthet Dent 1982;48:15-22
5. Smith BJ: The value of the nose width as an esthetic guide in prosthodontics. J Prosthet Dent 1975;34:562-573
6. Lee JH: The appearance of artificial dentures. Aust Dent J 1964;9:304-308
7. Scott JE: The Scott system of precision articulation in three-dimensional occlusion. J Prosthet Dent 1952;2:362-380
8. McCord JF, Grant AA: Registration: stage III—selection of teeth. Br Dent J 2000;188:660-666
9. al-el-Sheikh HM, al-Athel MS: The relationship of interalar width, interpupillary width and maxillary anterior teeth width in Saudi population. Odontostomatol Trop 1998;21:7-10
10. Puri M, Bhalla LR, Khanna VK: Relationship of intercanine distance with the distance between the alae of the nose. J Indian Dent Assoc 1972;44:46-50
11. Grove HF, Christensen LV: Relationship of the maxillary canines to the incisive papilla. J Prosthet Dent 1989;61:51-53
12. Lieb ND, Silverman SI, Garfinkel L: An analysis of soft tissue contours of the lips in relation to the maxillary cuspids. J Prosthet Dent 1967;18:292-303
13. Johnson PF: Racial norms: esthetic and prosthodontic implications. J Prosthet Dent 1992;67:502-508
14. Latta GH Jr, Weaver JR, Conkin JE: The relationship between the width of the mouth, bizygomatic width, and the interpupillary distance in edentulous patients. J Prosthet Dent 1991;65:250-254
15. Grave AM: The frequency of various molds in a sample of natural and artificial dentitions. J Prosthet Dent 1987;57:195-197
16. Lavelle CL: Maxillary and mandibular tooth size in different racial groups and in different occlusal categories. Am J Orthod 1972;61:29-37
17. Mack PJ: Maxillary arch and central incisor dimensions in a Nigerian and British population sample. J Dent 1981;9:67-70