Original Research

Evaluation Of Interalar, Inter Commissural And Intercanthal Distance In Determination Of The Width Of Maxillary Anteriors To Aid In Artificial Teeth Selection In South Indian Population

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Abstract

Aim: To select a approximate sized maxillary anterior teeth continues to be a challenge during complete denture construction. Facial measurements which have been used for section of teeth has proved to have sexual and ethnic differences.

Objective: To establish a correlation between the different facial measurements with the total width of maxillary six anteriors in the South Indian population to aid in teeth selection.

Materials and Method: 170 adults (85 males and 85 females) were chosen for measurements. The Interalar distance, the Intercanthal distance, the Inter commissural distance, the combined width of four maxillary incisors and maxillary six anteriors were measured using a Boley gauge. Data analysis was done with student "t" test and the mean and standard deviation were calculated on the basis of gender. The Correlation Coefficient was calculated to evaluate the relationship between the selected Anthropometric variants and the combined width of four maxillary incisors and maxillary six anteriors.

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Result: The obtained values found to show higher values in males compared to female subjects (p<0.01). A statistically significant correlation coefficient existed between the Interalar distance and the total width of four maxillary incisors and maxillary six anteriors in males. for the ICD, IAD tested, no statistical differences were observed between gender to IcoD (P<0.07).

Conclusion: The results suggests that gender variations exists and as correlation coefficients were relatively small the Interalar distance can be used one of the technique for choosing the maxillary anterior teeth width for South Indian males for fabrication of complete dentures.

Keywords: Artificial teeth selection; Facial measurements; Interalar distance; Intercanthal Distance; Inter commissural Distance

INTRODUCTION

To determine the shape and size of teeth for an edentulous patient is one of the most significant step and often a difficult facet in complete denture construction. During denture fabrication, the selection of teeth for an edentulous patient is carried out based on understanding of the facial characteristic of the patient [1].

There are several methods for the selection of artificial teeth. Pre-extraction records, facial guides, diagnostic casts, photographs, roentgenography, the size of the ridge, observation of teeth of close relatives and extracted teeth have been used for selection of artificial teeth [2].

Pre-extraction primary casts are excellent aids in selection of artificial teeth. Photographs of the patient realistically showing head – on facial view while smiling in which the natural teeth are visible is also of great help in selection of teeth [3]. Roentgenograph can be a selection guide for selecting the anterior teeth but they are subjected to elongation and foreshortening. However, in most cases pre-extraction casts, photography and radiographs are not available [2]. A planned approach is needed as certain anthropometric measurements have been found to be an useful tool in selection of artificial teeth [4].

Craniofacial anthropometry or facial measurements involve measurement of the skull and face. The various measurements useful in selection of anterior teeth are the bizygomatic width, interpupillary distance, interalar width, and inter commissural width, Intercanthal width, sagittal cranial diameter, inter buccal frenum distance, and philtrum width [5-9].

In 1992 Johnson pointed out one must have a thorough knowledge about the race, facial types for the selection of teeth [10]. However, most of the related studies were conducted in Caucasian, Blacks, Whites, and Saudi Arabian population samples. Detailed and extensive literature on racial diversities has proved that there are morphologic cranial differences among the various races and ethnic groups. Gender difference in tooth dimensions and various anthropometric measurements have also been noted within various ethnic groups.

Hence this study was carried out in South Indian Population to evaluate the difference in relation between the various anthropometric measurements and the anterior tooth dimensions, among the two genders in South Indian population to aid in selection of maxillary anteriors.

MATERIALS AND METHODS

This observational study was done among 170 adult south Indian adults (85 males and 85 Females) were chosen randomly from the general population. All the subjects included in the study were South Indian, above 21 years, with intact permanent maxillary anteriors, with no crowding or spacing. Subjects who have undergone orthodontic treatment, subjects with hereditary anomalies, orbital disease, trauma, or facial surgery, proximal restorations in maxillary anteriors, full veneer or partial veneer crowns in maxillary anteriors were excluded from the study.

Procedure for anthropometric measurements

The various Anthropometric measurements used were, the Interalar distance (IAD) is the distance between the widest part of the either ala (Figure 1); the Intercanthal distance (ICD) is the distance between the median (inner) angles (canthi) of the palpebral fissure (Figure 2); the Intercommissural Distance (ICoD) is the distance between the corners of the mouth (Figure 3) [6-8]. All the measurements were made using Boley Gauge's (Buffalo Dental Manufacturing Co, Brooklyn, N.Y), accuracy of the instrument is nearest tenth of a millimeter. The selected participants were made to sit in a dental chair in an upright position, participants were looked straight upon which the measurements were recorded. To eliminate the inter- examiner variability, subsequent bias a single operator did all the measurements.
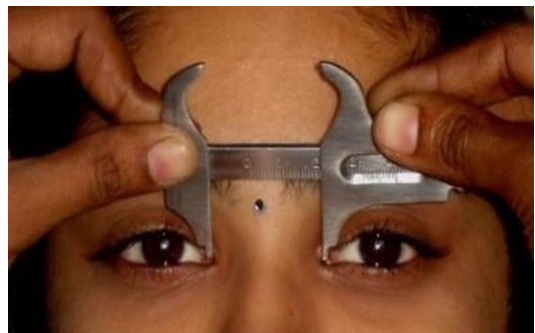

Figure 1: Inter Alar Distance

Figure 2 : Intercanthal distance

Figure 3: Inter commissural distance

Figure 4: Measuring Natural teeth

Natural tooth measurements

Maxillary casts were obtained from impressions of maxillary teeth using irreversible hydrocolloid impression material. The mesiodistal width the total width of the four maxillary incisors (WI) and the total width of the six maxillary anteriors (WA) were determined on the cast with dividers with finely pointed ends that could fit interdentally and could be fixed in position with a latch (Figure 4) [11].

Statistical analysis

Data Analysis was done with the Student "t" test and the correlation coefficient was calculated. Mean and Standard deviation of the selected variants were analyzed on the basis of gender and the Correlation coefficient between total width of maxillary incisors, the total width of maxillary anteriors and the Interalar distance, Intercommissural distance, the intercanthal distance were calculated.

RESULTS

Mean and Standard deviation of all the measurements (Table I). The values found to be higher for males than for females, with statistical difference ($P<0.01$) for the ICD, IAD tested, no statistically differences were observed between gender to IcoD ($P<0.07$).

Table I: Mean ± Standard deviation of the selected variants IAD, ICD, ICod ,WI, WA in relation to gender

Variants	Male		Female		"t"	P Value
	Mean	SD	Mean	SD		
IAD	39.36	2.91	35.52	2.03	9.95	<0.001
ICD	45.00	2.59	43.37	2.31	4.32	<0.001
Icod	32.99	2.32	32.39	2.13	1.77	<0.07
WI	32.93	1.62	32.40	1.48	2.25	<0.02
WA	49.16	2.26	48.32	1.98	2.60	<0.01

IAD= the interalar distance, ICD= Intercanthal distance, ICod= Inter commissural distance, WI= the combined width of four maxillary anteriors WA= the combined width of six maxillary anteriors

Table I. The Correlation coefficients for the IAD, ICD, ICoD and Combined width of four maxillary anterior, total width of six maxillary anterior demonstrated a positive correlation between IAD and the total width of four maxillary anterior and the combined width of six maxillary anterior in male subjects

Table II: The Correlation coefficient between WI, WA and IAD, ICD, ICod in male and female

Variants	Male			Female		
	IAD	**ICD**	**ICoD**	**IAD**	**ICD**	**ICoD**
WI	.273*	.147	-.024	.030	.157	-.018
WA	.289**	.158	-.010	.035	.089	-.012

IAD= the interalar distance, ICD= Intercanthal distance, ICod= Inter commissural distance, WI= the combined width of four maxillary anteriors WA= the combined width of six maxillary anteriors

Table II: The correlation coefficient reported in this study for Interalar distance was relatively small for predicting the mesiodistal width of maxillary anteriors, thus this method showed that this method can be used for selecting anterior artificial tooth size.

DISCUSSION

This study evaluated the relationship between the Interalar distance, the Intercanthal distance, and the Inter commissural distance to the total width of six maxillary incisors, and four maxillary anteriors, for using it as a tool in selection of maxillary anteriors during complete denture fabrication. The result of this study inferred that male exhibited greater values than females in the interalar distance, the intercanthal distance and the tooth dimensions. The ratio of the Interalar width to the total mesiodistal (MD) width of the maxillary incisors and the MD width of the maxillary anteriors was found to be statistically significant in male and not in female.

In the study the mean Interalar distance (IAD) of males is 39.36 mm and females is 35.52 mm which was statistically significant ($p < 0.001$). This result is consistent with Cesario [7] and greater than the value reported by Smith [4] is 33.6mm in male and 32.80 mm in females, Scandrett [6] is 34.4 mm in Caucasians and Mavroskoufis [5] reported 35.3 mm in White population. The present reported value was less than the values 43.93 mm reported by Latta [11] on Black and White population and 43.19 mm in male and 38.78 mm in females reported by Gomes et al in Brazilian subjects [12]. The variations in IAD found in this study to the other studies could be due to the population that was included in the study. A principle sexual dimorphic difference in the size and configuration of the nose exists and this in turn could have led to collateral difference in other topographic structures of the face. The male nose is proportionately more protrusive, longer, wider and fleshier with flaring nostrils than the female nose which is relatively thin and less protrusive. [13]

In the present study, the mean ICD of males is 32.99 mm and females is 32.40mm. The ICD measured were higher in males than in females and was statistically significant ($p < 0.001$). This value is in concordance to the values reported by Abdullah [10] is 32.00 mm in Saudi population, Murphy accumulated data from all the previous studies and reported 32mm with an SD of 3mm.The value of this study was lesser than the mean value reported by Murphy [14] (33.90 mm) in Black population and Zakiah Mohd Isa reported 34.36 mm in Malaysians representing 2 ethnic groups (Malay and Chinese) [15]. This variation found in the present study and to the study conducted in Black population may be due to the fact that the upper part of the face in the Black is less expanded and less protrusive [13].

The mean inter commissural distance (ICoD) of males is 45 mm and female are 43.37 mm. The ICoD measurements were the same in males and females with no statistical significance (p < 0.07). This finding is in concordance with the studies of Laestadius, Abdullah [10] and Freihofer. The mean value of the present trial has low when compared to the mean value reported by Scandrett [6] (48.5mm) in Caucasians. Latta [11] was 53.74 mm in Black and Whites population.

Many Studies were done on gender variations in various geographical location and different races, with males showing wider anterior teeth than females [3,16-18] . In the study the combined width of four anteriors (WI) for males is 32.93mm and for females is 32.40 mm, which was statistical significant (p <0.02) This value is higher than the WI value reported by Mavrokoufis as 31.7mm [5]

The total width of the six maxillary anterior (WA) teeth for men is 49.16 mm and females is 48.32 mm, which was found to be statistically significant (p <0.01). This variation in gender is in accordance with the study by Gillen [19] in both white and black populations and Sterrett [17] in white population, Hasanriesoglu [18] Al Wazzan [3]and Owens [16] in six racial groups. This finding found to be higher than the observed value given by Abdullah [10] was 43.00 mm in the Saudi Arabian population. However, the mean value was less than the value reported by Scandrett [6] (53.61mm) in Caucasians. These differences can be explained by differences in the race and ethnicities of the population studied.

The ratio of Interalar width in male to the total MD width of the four maxillary incisors and the combined MD width of the maxillary six anteriors was statistically significant. Wehner and Boucher et al have indicated that the IAD can be used as one of the guides for selection of teeth. Lee stated that Interalar width was equal to the intercanine distance within 0.5 mm of the interalar width of the nose. Kern [20] concluded that 93% of the skulls used in his study showed almost closer measurements, (within 0.5mm), between nasal width and the four maxillary incisors. Smith [4], Mavrokoufis [5] reported that the width of the nose cannot be a reliable guide for teeth selection. Dharap AS [21] reported a significant correlation between the nasal width and the intercanine distance in Malay females but not in male. Keng [22] reported there was no demonstrable correlation between interalar width of nose and intercanine distance.

In this study the ratio of ICD and ICod to the total MD width of the four maxillary incisors and the MD width of the maxillary six anteriors had no significant statistical correlation in both males and in females. This result is not consistent with the studies of Al Wazzan [3] and Abdullah [10] in the Arabian population. Several other digital techniques also have been evaluated for selection of the height, width of the teeth [23-26]

The result of the present study was inferred. The ratio of interalar distance to the total MD width of the four maxillary incisors and mesiodistal width of the six maxillary anteriors, was statistically significant in males with the intercanthal and intercommissural distance not showing significance in Indian male and female population.

CONCLUSION

The Interalar Distance can be utilized as one of the methods to select the the maxillary anteriors width in Indian males. However, the correlation coefficient reported in this study for Interalar Distance was relatively small. Therefore, the clinical implication is, the facial measurements used in this study may be used in verifying a size of the tooth selected by other means.

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