Original Article

Intercanthal distance of a Sudanese population sample as a reference for selection of maxillary anterior teeth size

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Abstract

Background: The choice of the size of artificial teeth takes an important place in the removable prosthodontic treatment. However, the standards or proportions commonly used as a guide have been developed mainly on Caucasian populations.

Objectives: to investigate the relationship between intercanthal distance and the anterior maxillary teeth size in Sudanese population.

Methods: This is a descriptive cross sectional study conducted in 114 subjects, (45 males - 69 females), from Khartoum and Juba Universities. The age range was from 18-46 years. The intercanthal distance (I.C.D) was the measurement taken between the median angles of the palpabral fissure. Maxillary intercanine distance was obtained by measuring a line from the tip of the canine on one side, to the canine on the other side. An electronic digital caliper (Narex – Czechoslovakia) was used for all measurements. Data were analyzed using Person chi–square test.

Results: a significant correlation is found between intercanthal distance and maxillary intercanine distance in all subjects (P-value 0.015), and in females who had a (P-value of 0.006). Maxillary intercanine distance may be estimated by dividing I.C.D by factor 0.9.

Conclusion: These results could be used as a helpful guide for selection of anterior teeth width in the Sudanese population.

Keywords: prosthodontic**,** palpabral fissure**,** denture.

During the past 50 years significant improvements have been made in the quality of denture teeth and materials that allow the final products to be more esthetic than ever before. A denture is usually considered esthetically acceptable when the teeth and bases are in harmony with the surrounding musculature, the shape and size of the face[1].

Several anatomic landmarks bear fixed positional relationships to some natural teeth. These landmarks serve as reliable guides in replacing natural teeth with artificial teeth[2].

A knowledge and understanding of a number of physical and biological factors directly related to the patient are required to appropriately select artificial teeth to rehabilitate the occlusion. The goals for this phase of therapy are to construct complete dentures that function well, allow the patient to speak normally; and are esthetically pleasing; and will not abuse the tissues over the residual ridge[3]. One of the primary concerns in denture esthetics is the selection of maxillary anterior teeth, especially the incisors[1,4].

When pre-extraction records are not available selection of proper anterior teeth size for edentulous patients will be very difficult. This is why many anatomical measurements have been suggested, such as, intercanthal distance (I.C.D), interpupillary distance, outercanthal distance, interalar width, bizygomatic distanc, intercommisural distance, intracodyler width and philtrum. Besides the anatomical landmarks which were used, the width and

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forms of natural teeth were determined to improve the selection of anterior artificial teeth. The width of the tooth is considered by some to be more critical than the length. Several authors have attempted to identify normal tooth dimensions[5]. Photographs, radiographs and computer imaging have also been used to help in tooth selections.

In this country none of the above methods have been used and applied, to determine any variation in these anatomic measurements related to ethnic and race variables, therefore a study was suggested to investigate this subject and look for a scientific correlation. The current study investigated the I.C.D. which is defined as a distance between the median angles of the palpabral fissure[6].

Methods

This is a descriptive cross sectional study conducted in a sample of Sudanese population. One hundred and fourteen Sudanese students from Khartoum and Juba Universities were selected for the study. Sample size was calculated according to the formula

$$N = \frac{z2\ pq}{d2}$$

N = Sample size, z = 1.96, p = Prevalence
q = Probability (100-p)
d = Desired margin of error.

The subjects were 69 females and 45 males, with ages ranging from 18-46 years. Participants were selected following certain criteria: all maxillary teeth present; no distemas, Angles Class I Relationship, Skeletal Class I Jaw Relation, regular intact anterior teeth, teeth free from filling, no history of orthodontic treatment; severe attrition and caries cases were excluded. Subjects with a history of congenital anomaly, orbital disease, trauma or facial surgery were also excluded.

Participants were informed about the study by the investigator and encouraged to participate in the study.

Dental casts were prepared by first taking impressions, with irreversible hydroclloid impression material (Alginate Cavex Holland), using suitable perforated trays. Following inspection these impressions were washed under running water to remove the saliva. Then impressions were casted immediately using stone (ZETA Muffle Italy).

Cast production: Irreversible hydroclloid was used to obtain maxillary impressions that were poured immediately with dental stone. Each cast was then mounted on a plaster base formed by placing the cast on a thin mixture of plaster of Paris being placed on a flat rubber base. Each cast was then oriented in a consistent position using the occlusal plane as the plane of reference to facilitate subsequent measurements to prevent dimensional changes. The study models were numbered to help in identification.

Measurements: Different measurements relevant to this study were taken. All measurements were made and recorded by one operator. The mean of three readings of these measurements, for each specimen was recorded. All measurements were carried out using an electronic digital caliper (Narex – Czechoslovakia), to the nearest tenth of a millimeter. The I.C.D, together with the width of the six maxillary teeth was measured for each subject.

Intercanthal distance: The patient was requested to sit in a dental chair in an upright position with the head straight. The patient was asked to close the eyes, and relax before the I.C.D measurement was taken. (Photo. 1)

Photo (1) Measuring intercanthal distance with electronic digital caliper

The intercanine distance was measured in a straight line between the canine's cusp tip of the right side and left side. (Photo. 2)

Photo (2) Measuring maxillary intercanine distance with electronic digital caliper

Data from the measurements were subjected to statistical analysis by using Person chi–square test, to assess quantitatively whether a set of frequencies follow a particular distribution.   A P-value of <0.05 was considered significant.

Results

The results of examination of 114 subjects (45 males, 69 females) and 114 maxillary casts are summarized in tables 1, 2 and 3.

Table 1: Relationship between the I.C.D; age and gender

I.C.D	Age / Gender	18-25 yrs	26-33 yrs	34-41 yrs	42-49 yrs	Total
25.01-	Male	4	2	1	1	8
30.00 mm	Female	7	2	2	0	11
30.01-	Male	12	11	0	1	24
35.00 mm	Female	26	15	6	0	47
35.01-	Male	4	5	1	0	10
40.00 mm	Female	5	6	0	0	11
40.01-	Male	1	1	1	0	3
45.00 mm	Female	0	0	0	0	0
Total of males		21	19	3	2	45
Total of females		38	23	8	0	69
Total		59	42	11	2	114

All subjects: P.value: 0.103
Male: P: 0.772.
Female: P: 0.458.

Table 2: The mean widths of I.C.D in relation to gender (mm)

Sample	No. of sample	Mean	Variance	S.D	S.E	Range	Min	Max	CV
Male	45	33.4	14.4	$\pm$3.8	0.07	15.4	28.4	43.7	11%
Female	69	32.4	6.8	$\pm$2.6	0.31	11.6	26.7	38.3	8%
Mixed	114	32.8	9.9	$\pm$3.02	0.30	17.1	26.7	43.7	9%

S.D: Standard deviation
S.E: Standard error
CV: Coefficient of variation

Table 3: Relationship between the I.C.D; the intercanine distance and gender (mm)

Intercanine distance I.C.D		25.01 30.00	30.01 35.0	35.01 40.00	40.01 45.00	Total
25.01-	Male	0	2	5	1	8
30.00	Female	0	7	4	0	11
30.01-	Male	1	3	19	1	24
35.00	Female	1	22	24	0	47
35.01-	Male	0	0	8	2	10
40.00	Female	0	3	5	3	11
40.01-	Male	0	0	3	0	3
45.00	Female	0	0	0	0	0
Total		2	37	68	7	114

All subjects :   P-value 0.015
   Male   :   P-value 0.682
   Female :   P-value 0.006

Discussion

In the last century there has been great work in order to determine the anterior teeth size. It has proved a difficult task finding a relationship between anterior teeth size and facial land marks. Several studies have found the mean range of I.C.D to range between 20-36 mm. I.C.D was also compared with age, gender and race[7-9].

In the present study, measurements of I.C.D and intercanine distance were all found greater in males than in females (table 1 and 3). This is in consistent with pervious reports[10,11].

The mean width of I.C.D (32.8 mm) was greater in this study when compared with the findings of Alwazzan[6] 31,92 mm, Abdulla [11] 32.00 mm, Freihofer[12] 31.20 mm and Gupta et al[13] 30.70 mm. However it was smaller than those reported by Murphy et al[14] (33.90 mm). No significant difference was found in the mean width of I.C.D when compared to gender (P 0.103), or age (P 0.384) (table 2). This finding is in accordance with those of others [11], [13].

In the present study, the mean of intercanine distance of all subjects was 35.93 mm, males 37.1 and females 35.19 mm. This was in agreement with Keng[15], and Hoffman et al[16]. However, lower measurements were obtained by Mavroskoufis et al[17] and El-Sheikh et al[18].

The differences in value are probably due to racial differences; different instruments used for measuring and different ways of taking measurement, i.e. intraorally or extraorally using casts.

In the present study, the relation between I.C.D and intercanine distance was significant in all subjects (P = 0.015). Females also showed a significant (P= 0.006), in contrast to males where the P was 0.682 (Table 3).

Conclusion

The   intercanthal distance had overall a significant relation to the width of the teeth and can be a reliable predictor for estimation of the tooth width. Maxillary intercanine distance may be estimated by dividing intercanthal distance by factor 0.9 in the Sudanese population.

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