

Innercanthal Distance and Inter Alar Width as a Predictor of Maxillary Anterior Teeth Width: A Clinical Study Among Young Adults in South Indian Population

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ABSTRACT

Aim: To determine the relationship of the Inner-Canthal distance with Inter-Alar width and the combined width of the maxillary six anterior teeth.

Material and Methods: 180 subjects who satisfied the inclusion and exclusion criteria were selected. The three parameters, Inner-Canthal Distance (ICD), Inter-Alar Width (IAW), and Inter-Canine Width (ICnW) of each subject were measured with digital Vernier caliper. Pearson's correlation coefficients were calculated to determine the relationship between ICD, IAW and the combined width of maxillary anterior teeth ($\alpha = 0.05$).

Results: The Pearson correlation coefficients shows a significant relationship between innercanthal width, IAW and combined width of maxillary anterior teeth ($P < 0.001$).

Conclusion: Within the limitations of this study, the results suggest that ICD and IAW can be used as a tentative indicator for determining the width of the maxillary anterior teeth for edentulous patients.

Keywords: Intercanthal distance, Interalar width, Total anterior teeth width, Esthetics, Complete denture, Teeth arrangement.

INTRODUCTION

Face, the most expressive part of the human body, determines an individual's social acceptance. The pursuit of beauty is based on numerous subjective factors, the concept of which arises from the custom, education and civilization. Loss of teeth not only affects facial appearance but also creates psychological trauma to the person, hence it is essential that an esthetically pleasing and functionally comfortable replacement of the missing teeth should be provided[1]. The concerns of a completely edentulous patient are primarily related to comfort, function and aesthetics. Failure to

achieve the esthetic appearance of an edentulous often results in the rejection of well constructed, comfortable and efficient denture. The artificial teeth restored successfully within the esthetic zone, results in a positive effect on patient's self esteem and quality of life[2]. It is difficult to determine the dimensions of the maxillary anterior teeth for an edentulous patient when pre extraction records are not available. Several anatomic measurements, including bizygomatic width (BZW), interpupillary distance (IPD), interalar width (IAW), innercanthal distance (ICD), and intercommissural width have been suggested to aid in the estimation of a combined width of the maxillary anterior teeth

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(intercanine width [ICW]). The medial junction of the two eyelids is called the medial angle (medial canthus). The ICD is the distance between the medial angles (canthi) of the palpebral fissure bilaterally. At 5 years of age, 93% of ICD growth has been achieved, maturity is reached between 8 and 11 years. The ICD is considered normal at a dimension of 28–35 mm. No differences related to sex, race or age, have been shown in the ICD. This makes ICD a reliable anatomic dimension that may provide a valid approach to anterior tooth selection.

According to the embryogenic philosophy, the nose has been considered as the most essential guide in selecting the size of the upper incisors. As it has been known that the nose and the four upper maxillary incisors develop from the same embryonic origin called the fronto nasal process. Furthermore the interalar width (IAW) is a facial landmark that is at the closest distance from the teeth. There are relatively few studies reported in a south Indian population to estimate an overall width of maxillary six anterior teeth by correlating several facial measurements[3]. The purpose of the present study was to evaluate the relationship between ICD, IAW and the combined width of the maxillary six anterior teeth in south Indian population.

MATERIALS & METHODS

One hundred and eighty (90 male and 90 female) subjects belonging to south andhra were included in this study, between the age of 18 and 26 years, with no facial or dental deformity. All the subjects had full complement of teeth with no history of orthodontic treatment, crowding, diastema, morphological deformity or any form of restorations. Informed consent was obtained from them. Ethical clearance was obtained from the institutional ethics committee and follows the Helsinki Declaration of 1975 that was revised in 2000.

The subject was seated in a relaxed, upright position during examination to ensure selection criteria mentioned above from each subject. The subject was seated in a relaxed, upright position during examination to ensure selection criteria mentioned above. All the measurements were made using a digital caliper having fine pointed end that fitted interdentally. Digital caliper was having the

precision of 0.1 mm and possibility of measuring distances from 0-200 mm.

Determination of InterAlar width (IAW): The participants were required to inhale and exhale rapidly and deeply several times and then to hold their breath and not to expand the alae of the nose during the measurements of interalar width. Interalar width was determined by measuring the external width of the alae of the nose at the widest point. With patient in relaxed position recording part of the caliper was brought in contact with the outer surface of both alae without applying pressure. Each measurement was recorded three times for accuracy and precision (Table/Fig 1).

Determination of Inner-Canthal Distance (ICD): The subjects were seated comfortably on the dental chair in a relaxed state in an upright position with the head resting firmly against the head rest. The ICD was measured from the medial angle to the medial angle of the palpebral fissure. The distance between these two points was measured using a digital vernier caliper without the application of pressure by bringing the recording parts of the caliper just in contact with the medial angle of the palpebral fissure (fig 2).



Fig 1: Interalar width in female subjects.



Fig 2: Inner canthal distance in female subjects.

Determination of Total Anterior Teeth Width (TATW): Maxillary anterior teeth width were measured interdentally at their contact point with the help of a divider (Table/Fig 3). After the measuring procedure, the pointed members of the divider were placed on a white paper, to make perforations on the white paper (Table/Fig 4). The distance between the perforations are joined with a straight line and the distance is measured with digital vernier calipers (Table/Fig 5). Each measurement was recorded three times for accuracy and precision. This procedure was followed for measurement of all six anterior teeth width.



Fig 3: Measuring anterior teeth width.



Fig 4: Joining perforations with straight line.



Fig 5: Measuring with vernier calipers.

OBSERVATION AND RESULTS: The data was analyzed using statistical software (SPSS, version 11). Results of facial measurements and the combined width of the maxillary anterior teeth for male and female are presented in (Table 1) & (Table 2) on the other hand represents both sexes together. (Graph 1) demonstrated the innercanthal distance, interalar width and total anterior teeth width (men and women).

When results were computed for the entire sample, Pearson correlation analysis showed a highly significant correlation between all the measurements as shown in following Table 4. The results showed that the mean ICD & IAW was higher in men compared with women and the difference between them was highly significant ($P < 0.001$). The mean total width of six anteriors was higher in men compared with women and the difference between them was also significant ($P < 0.05$).

Table 1: Facial measurement and combined width of the maxillary anterior teeth for both males and females.

		MEAN	SD
ICD	Male	32.572	2.632
	Female	29.561	2.455
IAW	Male	38.402	3.461
	Female	33.244	3.270
TOTAL WIDTH OF SIX ANTERIORS	Male	53.405	7.291
	Female	50.407	3.875

Table 2: Facial measurement and combined width of the maxillary anterior teeth for both sexes.

	N	Mean	SD
ICD	180	30.938	2.942
IAW	180	35.603	4.224
TOTAL WIDTH	180	51.778	5.868

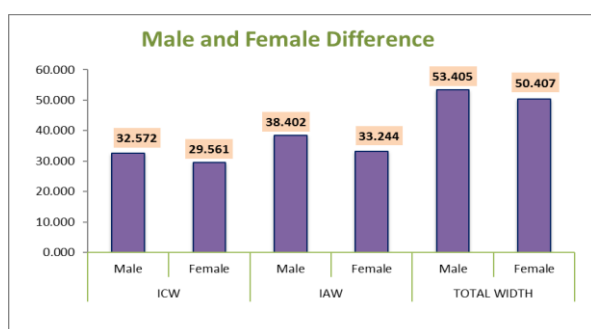


Table 3: Demonstrating the innercanthal distance, interalar width and total anterior teeth width (men and women).

MEAN , SD. AND RESULTS						
	SEX	N	Mean	Std. Deviation	t-test	p value
ICD	Male	90	32.572	2.632	6.717	0.000
	Female	90	29.561	2.455		
IAW	Male	90	38.402	3.461	8.689	0.000
	Female	90	33.244	3.270		
TATW	Male	90	53.405	7.291	2.979	0.003
	Female	90	50.407	3.875		

Table 4: Mean, SD AND RESULTS.

		ICD	IAW	TATW
ICD	Pearson Correlation	1.000	.515(**)	.405(**)
	Sig. (2-tailed)	.	0.000	0.000
IAW	Pearson Correlation	.515(**)	1.000	.501(**)
	Sig. (2-tailed)	0.000	.	0.000
TOTAL WIDTH	Pearson Correlation	.405(**)	.501(**)	1.000
	Sig. (2-tailed)	0.000	0.000	.

** Correlation is significant at the 0.01 level (2-tailed).

The Pearson's correlation coefficient (r) between ICD and IAW was found to be positive and strong ($r = 0.515$) with a high statistical significance ($P < 0.001$). The correlation coefficient (r) between IAW and ICD was Positive ($r = 0.501$) with a high statistical significance ($P < 0.001$), whereas between ICD and TATW was also positive ($r = 0.405$) with a high statistical significance ($P < 0.001$).

Multiplication factor of ICD and IAW to estimate TATW in all the subjects and in both the sexes are shown in Table 5.

Table 10: Correlation matrix (for all subjects) for ICD, IAW and TATW.

AVERAGE MULTIPLYING FACTOR		
	ICD	IAW
MALES	1.58	1.34
FEMALES	1.75	1.55
BOTH SEXES	1.67	1.45

DISCUSSION

It is generally agreed that selection of the width of anterior teeth should be based on facial measurements and proportions (Engelmeier 1996)[4]. It have been reported that the width of the nose may be used for selecting the size of the anterior teeth, for positioning the maxillary canines and for registering the curve of the anterior arch (Picard 1958[5], Lee 1962[6], Weh ner 1967[7], Smith 1975[8], Mavroskoufis 1981[9], Scandrett 1982[10], Hoffman 1986[11]). In the present study, all the three dimensions were significantly larger in men than in women. This is consistent with previously reported studies.

In this study ,the **mean Inner-Canthal distance** of all the subjects was (30.9 ± 2.9 mm) The mean inner canthal distance in the present study was greater than the value reported by Laestdius et al[12] (30.00 mm), Freihofer[13] (31.2 mm), Al Wazzan[14] (31.92 mm). The measurements being recorded in the population of different countries might be the reason for the variation in the values.

In this study, the **mean Inter-Alar width** of all the subjects was (35.6 ± 4.2 mm).This distance was smaller than the values reported by Latta et

al[15] (43.93 mm with a range from 29.0 mm to 63.0 mm) but was higher than the values reported by Smith[8] (33.5 mm), Mavroskoufis and Ritchie[9] (35.3 mm), Abdullah et al[16](34.0 mm), Hoffman et al[11] (34.28 mm), Scandrett et al[10](34.4 mm), al-el-Sheikh and al-Athel[17] (33.27 mm), and Ibrahimagic et al[18] (32.2 mm). The greater IAW seen in men reveals the influence of male dominance factor, as is also appreciable by the difference in size of jaws and teeth between the two sexes.

The mean **Total anterior teeth width** (51.7 ± 5.8 mm) of all the subjects was smaller than the values reported by Scandrett et al[10] (53.61 mm), al-el-Sheikh and al-Athel[17](52.22 mm). In this study, the mean combined width of the maxillary six anterior teeth was **53.4 mm** in male and **50.4 mm** in female The mean ICW in the present study supports the findings of mean reported by Scandrett et al[10] **in 1982 (53.61mm)**. The variation in the values can be attributed to the differences in measuring techniques and in the ethnicities of the population studied.

The present study was conducted in a south Indian population to determine the correlation between facial measurements and the combined width of maxillary anterior teeth. Measurements of ICD, IAW and the combined width of the maxillary anterior teeth were made on 180 subjects. The analysis of these measurements showed a strong correlation between ICD and IAW in both the sexes.The ICD or the IAW can be used as a tentative predictor for the selection of mesiodistal width of maxillary anterior teeth. Additional studies are required to replicate the present findings in Indian sub-population groups, so as to confirm the relationship among the anthropometric parameters investigated.

CONCLUSION

Within the limitations of the present study the following conclusions can be drawn:

1. The mean values of ICD, IAW and TATW were significantly higher for men than for the women.
2. The Pearson's correlation coefficient for the ICD, IAW and TATW were statistically

significant for both men and women. Hence, according to this study, the ICW and IAW can be used as anatomical landmarks to select the size of maxillary anterior teeth in edentulous patients.

3. The multiplying factor for ICD and IAW to calculate ICW was 1.67, and 1.45 respectively for both the sexes.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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