

CORRELATION BETWEEN INNERCANTHAL DISTANCE AND THE MESIODISTAL WIDTH OF THE MAXILLARY CENTRAL INCISORS

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ABSTRACT

OBJECTIVE: To establish whether a correlation exists between the innercanthal width and maxillary central incisors.

STUDY DESIGN: A Descriptive cross sectional study

PLACE AND DURATION: Department of Prosthodontics, Dr Ishrat ul Ebad Khan Institute of Oral Health Sciences, Dow University of Health Sciences Karachi and from 15th October 2012 to 25th March 2014.

METHODOLOGY: One hundred and seventy five dentate individuals with intact maxillary anterior teeth were investigated. The innercanthal space was calculated among the inner canthal angles utilizing computer software. The mean dimension of the two central incisors was determined extra orally at their widest dimension. Teeth measurement and inner canthal distance association in respect to gender was evaluated by paired t test. Pearson correlation coefficients test was premeditated to establish any association amongst innercanthal space and central incisors width, significance was set at $\alpha = 0.05$.

RESULTS: The mean value for male and female subjects was 33.24 ± 3.4 mm and 34.90 ± 3.8 mm correspondingly. The mean width of maxillary central incisors for male and female subjects was recorded 15.84 ± 1.4 mm and 15.92 ± 1.3 mm. The value ($P = 0.000$) for both estimations were significant. The Pearson correlation coefficient were positive ($r = 0.202$) and highly significant ($P = 0.008$) between innercanthal dimension and the maxillary central incisors. The results indicated that innercanthal ratio ratio of 1:0.462 may be used to calculate the combined width of maxillary central incisor teeth.

CONCLUSION: Mean of maxillary central incisor width and inner canthal distance were higher in females significantly. The results proposed that innercanthal distance is a good prognostic factor for determining the maxillary central incisors mesiodistal width.

KEYWORDS: Innercanthal Distance, Maxillary Central Incisors, Mesiodistal Width, Correlation/Association

INTRODUCTION

It is difficult to acquire the measurements of maxillary anterior teeth for an edentulous patient when pre-extraction records are not obtainable.¹ Although an array of techniques may facilitate the dental practitioners to choose suitable anterior teeth for the patient, an esthetically agreeable result is perhaps obtained by the dentist who believes that anterior teeth restitution is as much an art as it is a science.² It requires information and understanding of biophysiological factors that are directly interrelated to each patient as an entity.^{3,4}

In the recent years of this century, prosthodontists implicated "tryout approach" until both dental practitioner and patient agreed on relevant tooth size.⁵ Later on contemporary methods were introduced that emphasizes on dentofacial form for estimating the size of the maxillary anterior teeth, out of which

there appears to be few consistent guiding principles and several ambiguous views.⁶

Attempts have been made by the researcher to probe the steadiness of some of the regularly used anatomic landmarks including intercommisural width, nasal width, Interzygomatic width and interpupillary distance.⁷ All these relations may be used in combination and utilized as reference for determining central incisor width, although the measurements may be different considering race and gender differences.⁸ A value (1:16) of central incisor and interzygomatic width is preferred to determine tooth width.⁹ On the contrary investigators also revealed that bizygomatic measurement could not be used as an dependable tool for deciding the maxillary central incisors width.^{10,11} The association between interpupillary distance and width of maxillary incisor studied by Cesario and Latta¹² described a proportion of 1:6.5 to 1: 7.0 for both genders with white and black complexions.

The innercanthal distance (ICD), which is the width among an eyes inner canthus, it is used as a trustworthy prognosticator for the width of maxillary central incisor.^{12,13} The 93% growth of the innercanthal distance is achieved at 5 years of age; and completed to maturity between at approximately 11 years. The normal distance of ICD is recorded between 28 to 35 mm, no differences related to age, sex, race is found by investigators in relation to ICD.^{14,15}

This makes innercanthal distance a trustworthy biologic measurement which can be convincingly used in maxillary anterior teeth selection.¹⁶

Al Wazzan¹⁷ reported that the combined width of maxillary six anterior teeth may be estimated by using a ratio of 1: 0.267. He found a noteworthy association between innercanthal distance and mesiodistal width of the four maxillary teeth, and declared

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that innercanthal distance may help as a preliminary in front teeth selection. In another investigation by Abdullah et al.¹⁸ suggested that the inner canthal distance may be used as a valuable predictor for assessment of collective width of the maxillary anterior teeth, according to them the innercanthal width may be multiplied by a factor of 1.31 to acquire maxillary central incisor width.

The rationale of our study was to uncover the correlation between innercanthal space and width maxillary central incisors.

METHODOLOGY

The study was conducted at Dr Ishrat ul Ebad Khan Institute of Oral Health Sciences / Dow University of Health Sciences Karachi, within a period of 18 months from 15th October 2012 to 25th March 2014. A total of one hundred and seventy five subjects (122 females and 53 males) 18 to 30 years of age were selected by means of the following criteria, Pakistani nationals with intact natural maxillary anterior teeth, lacking history of orthodontic treatment and should not had restored maxillary anterior teeth.

A digital camera (Casio Exilim; EX-S5.Casio computer Corp, china. 10.1 megapixels with 100- mm macro lens and a point flash) was used to take facial images from the front with the subjects in a seated position. The camera was positioned at 12 o'clock, mounted on a tripod. This procedure is similar to the protocol described by Bidra et al.¹⁸

The perforated type of stainless steel maxillary impression tray was carefully selected and Impressions of maxillary arch was made of all subjects using irreversible hydrocolloid impression material (fast setting alginate hydrogum; Zharmack Spa).

The impressions were carefully visualized and inspected for errors, if air bubbles or voids were found the impression was repeated. After obtaining an adequate impression they were disinfected with glucoptamin solution (Sekusept by Ecolab) for 10 minutes and washed with water for 10 seconds to remove debris and allotted a serial number and were poured immediately with Type IV dental stone (Elite Rock Zharmack Spa) to avoid dimensional changes.

Innercanthal (ICD) measurement

The facial images obtained were processed in (Adobe Photoshop version 07; adobe Photoshop systems) the Intercanthal distance between medial Palpebral fissure fissures was measured on photograph using measuring tool of this software.

Dental cast measurement

A sharp-tipped digital caliper read to the nearest 0.02 mm was used to gauge mesiodistal width of each maxillary central incisor from the labial side using outer edges of caliper positioned between the contact points of teeth; the mean of measurements was than calculated.

The dental impression and images of all subjects was made by a single operator. The descriptive statistics and Pearson correlation coefficients were used to find any relationship between innercanthal distance and mesiodistal width of maxillary front teeth The data was analyzed statistically using. To recognize any considerable gender variations among inner canthal distance and tooth size, a t test was utilized. To control biasness during data collection a Pearson's correlation coefficient was used to check intra-examiner reliability.

RESULTS

The Minimum, Maximum values, Mean, standard deviation and Range of variables measured are given in (Table - I). Both gender's; descriptive statistics for mean ICD and CWCI values were documented and listed in (Table - II) the mean for both analysis were considerably greater in females than males ($p=0.00$).

Pearson correlation coefficients for the ICD and central incisors width variables verified a positive association ($r=0.202$) (Table III) The association was weak with a significant difference ($P=0.008$). The ratios among the mean innercanthal distance and the maxillary central incisors are presented in (Table IV) in this study the ratio was 0.462 for the central incisors. The reliability of examiner were found 0.932 and 0.963 for innercanthal distance and central incisors width by using the correlation test.

TABLE - I: DESCRIPTIVE STATISTICS OF STUDY VARIABLES (n=175)

	Minimum	Maximum	Mean	Std. Deviation	Range	P value
ICD	28.34	47.00	34.40	73	73	73
RCIW	6.20	10.00	8.10	22	22	22
LCIW	5.55	10.70	8.12	7	7	7
CWCI	12.10	19.70	15.90	102(87.93%)	102(87.93%)	102(87.93%)

ICD= Innercanthal distance, RCIW= Right central incisor width, LCIW= Left central incisor width, CWCI= Combined central incisor width

TABLE - II: COMBINED CENTRAL INCISORS AND INNER CANTHAL DISTANCE WIDTH IN RESPECT TO GENDER (n= 175)

	ICD \pm SD (95%CI)	CWCI \pm SD (95% CI)	t value	P value
All subjects	34.4 \pm 3.8 (33.8,34.9)	15.90 \pm 1.36 (15.6,16.1)	119.22 153.65	0.000 0.000
Male	33.24 \pm 3.4(32.6,34.21)	15.84 \pm 1.4(15.4,16.2)	48.88	0.000
Female	34.90 \pm 3.8(34.2,35.5)	15.92 \pm 1.3(15.6,16.1)	48.88	0.000

TABLE - III: PEARSON CORRELATIONS OF INNER INTER-CANTHAL DISTANCE AND SUM OF CENTRAL INCISORS (n=175)

		P value
Pearson correlation	0.202	0.008
N of Valid Cases	175	

DISCUSSION

The subjects were all native residents consequently the outcome of this research is more pertinent to the strata investigated. Comparison with facts of other countries could be undertaken but racial differences must be given consideration. In our study noteworthy distinction was set up among the mean tooth dimensions in relation to gender (Table II). This is in common with previous investigations¹⁹. The mean mesio-distal dimension of (8.1 mm) for maxillary central incisor is in accordance with the fallouts of Scandrett et al²⁰ (8.0 mm) this value is less than the investigation of Abdullah MA (8.7 mm), who studied on natural teeth using dental casts. The mean collective central incisors width (15.90 mm) is smaller than the result of Al Wazzan KA¹⁷ (17.2 mm) to some extent; the variation may be due to difference in ethnicity of strata and measuring techniques applied in our study.

The mean innercanthal distance (34.40 mm) in present research compares favorably with findings of Murphy and Laskin²¹ (33.90 mm), and more than research of Abdullah et al¹³ (32.00 mm) and Freihofer²² (31.20 mm) however they found no statistically significant gender difference while in our study a noteworthy variation was seen between the innercanthal distance with respect to gender, this judgment is in agreement with Abdullah MA.¹³

Al wazzan¹⁷ found that the width of anterior teeth may be estimated by using an ICD ratio of 1:0.267. In the present study, the recommended ratio for deterring the collective size of maxillary central incisor is 1:0.462 (Table IV). The existence of the factor suggests that ICD could be utilized to predict the central incisor width even in such cases, for example when other authenticated facial measurements cannot be used such as in syndromic patients where mid facial features are severally altered.²³

The Pearson correlation coefficient in the present study was positive and significant for central incisor width (Table III). Due to this coherent relationship, the Innercanthal distance could be utilized consistently for determining the width of maxillary central incisors.

TABLE - IV: RATIO OF ICD TO TEETH WIDTH FACTOR (n= 175)

	CWCI \pm SD (95% CI)
All subjects	0.462 \pm 1.36(15.6,16.1)
Male	0.475 \pm 1.4(15.4,16.2)
Female	0.455 \pm 1.3(15.6,16.1)

CWCI= Combined width of central incisors,
SD= Standard deviation, CI=Confidence interval

The innercanthal distance in light of the present study appeared to be an unailing tool for selecting maxillary central incisors width; it can be effectively utilized in combination with other techniques or to select an initial anterior teeth size. Ideally anatomic measurements should be utilized in combination to find out the size of central incisors. The ultimate decision on teeth selection must be carried out at some stage in the trial phase of denture and should be established through discussion with the patient.

CONCLUSION

1. The mean maxillary central incisors width and inner canthal distance were significantly higher for females than males.
2. The Innercanthal distance can be used as a trustworthy predictor for determining the mesiodistal width of maxillary central incisors.

LIMITATION

The sample size for this study was small, larger studies should be carried out to do away with any bias. Other ethnicities should be explored in the upcoming researches, studies which would evaluate the size of maxillary anterior teeth anticipated with the innercanthal distance and other facial measurements are necessary.

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