

A Study On Correlation Of Intercanine Width With Craniofacial Landmarks

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Abstract:

Many efforts were made to use the facial measurements like intercanine distance as a guide for selection of the anterior teeth for edentulous patients in the fabrication of complete denture. The aim of our study is to evaluate the correlation of horizontal cranial circumference, interzygomatic distance and interalar distance with maxillary anterior teeth (intercanine distance) to establish the proper fitting of missing teeth in edentulous patients.

The study was conducted during the period of October 2016 to June 2018, On 200 Indians. Among them 100 were male and 100 were female and their age group ranged from 21-30 years. They were students of Rama Dental College & Hospital. Methods A, B, C and D were followed to measure the land marks using a nylon tape, metallic scale, face bow and Vernier calipers. Various craniofacial land marks were used to determine horizontal cranial circumference, interzygomatic distance, interalar distance, mesiodistal width of maxillary anterior teeth. In this present study, we have done the Linear Regression analysis was applied for creation for equation for prediction of inter-canine distance in overall population for esthetic purpose. For this inter-canine distance (mm) was used as dependent variable and Horizontal cranial circumference, Interzygomatic distance as independent variables. Based on the coefficients equation created was Intercanine width (ICW) = $28.133+0.036x$ Horizontal Cranial Circumference and Intercanine width (ICW) = $32.911+0.114x$ Interzygomatic distance. In conclusion, measurements of the horizontal cranial circumference and interzygomatic

distance can be used for the selection of proper size of maxillary anterior teeth in edentulous patients in both sexes.

Key words: *Inter canine width, Horizontal cranial circumference, interzygomatic distance.*

INTRODUCTION:

Architecture of teeth indicates the proper shape of smile and expression in the face. For many years, the primary objective of the dental professionals has been restoration of health, function, and form of the teeth. Esthetics is one of the most important factors to be taken into consideration by prosthodontist in the selection of anterior teeth for an edentulous patient where no pre-extraction records are available.

Anterior teeth normally should extend mesiodistally upto the canine eminence of either side. Many efforts had been made to the use of facial measurements as a guide for selection of intercanine distance for complete denture¹. Since the face is the most visible part of human anatomy and it helps to determine one's dental² and facial appearance³ therefore, the selection of maxillary anterior teeth must be in relation with face measurements to succeed a good esthetic⁴. The aim of our study to see the correlation of horizontal cranial circumference, interzygomatic distance and interalar distance with maxillary anterior teeth (intercanine distance) to establish the proper fitting of missing teeth in edentulous patients.

MATERIALS AND METHODS:

The study was conducted during the period of October 2016 to June 2018, On 200 Indian People. Among them 100 were male and 100 were female and their age group ranged from 21-30 years. They were students of Rama Dental College & Hospital. This age group was selected keeping in view that all dentofacial growth is accomplished by this time.

Inclusion criteria:

- Subjects were selected between age group of 21 to 30 years having pleasant facial contour with all maxillary anterior teeth in good alignment without any diastema, restorations or marked attrition.
- Subjects who have not undergone surgical, orthodontic and plastic corrections, and did not have any pathology or developmental defect or any mark of injury either on the craniofacial region or in the oral cavity.

Exclusion criteria:

- Obese persons were not selected for this study as the anthropometric measurements on the soft tissue in such individuals were prone to error.
 - For this study the following methods were planned to measure fixed anatomical landmarks.
1. **Method A:** Horizontal cranial circumference was measured by passing a Nylon measuring tape from glabella toinion and then up to glabella to the accuracy of 0.1cm.
 2. **Method B:** Interzygomatic distance was measured by face bow from one Zygion to the other and then with metallic scale up to the accuracy of 0.1cm.
 3. **Method C:** Interalar distance was measured by Vernier Callipers up to the accuracy of 0.1cm.
 4. **Method D:** The mesiodistal width of maxillary anterior teeth were measured in the patient's mouth by vernier calipers and then on metallic scale up to the accuracy of 0.5mm.

From the above reference points we have obtained some consistent record obtained with that of mesiodistal width of upper anterior teeth which might give a constant relation. These findings are available in detail in corresponding headings.

Furthermore, the anthropometric on the living persons were also prone to be erroneous due to presence of hairs and soft tissues over the craniofacial structures.

Following the selections of the subjects' measurements of the horizontal cranial circumference, the interzygomatic distance, the interalar distance and the mesiodistal width of individual maxillary anterior teeth were directly recorded on the subject. Details of the measuring procedures for the different craniofacial points and maxillary anterior teeth were as follows.

All the above measurements were kept in tabular form for further mathematical and statistical analysis.

Results:**Table.1:** Measurements of method A, B, C and D in male and female subjects between 21-30 years of age group.

Methods	Male	Female	't' value	P Value*
	Mean \pm S.D(mm)	Mean \pm S.D (mm)		
A method	546.06 \pm 18.78	523.64 \pm 18.46	8.513	0.0001
B method	130.84 \pm 5.02	124.14 \pm 4.63	9.804	0.0001
C method	38.38 \pm 3.93	34.63 \pm 2.93	4.637	0.0001
D method	48.30 \pm 2.74	46.49 \pm 2.34	5.011	0.0001

***p<0.05 was statistically Significant**

In the present study, it was observed that mean of method A of male and female population was 546.06 \pm 18.78 and 523.64 \pm 18.46 respectively which was statistically highly significant (p=0.0001). Mean of method B of male and female population was 130.84 \pm 5.02 and 124.14 \pm 4.63 respectively which was statistically highly significant (p=0.0001). Mean of method C of male and female population was 38.38 \pm 3.93 and 34.63 \pm 2.93 respectively which was statistically highly significant (p=0.0001). Mean of method D of male and female population was 48.30 \pm 2.74 and 46.49 \pm 2.34 respectively which was statistically highly significant (p=0.0001).

TABLE-2: Correlations of methods A, B, C with method D in Male subjects

	Correlation	(D method)
A method (N=100)	Pearson Correlation	.260**
	Sig. (2-tailed)	.009
B method (N=100)	Pearson Correlation	.068
	Sig. (2-tailed)	.501
C method (N=100)	Pearson Correlation	-.041
	Sig. (2-tailed)	.689

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

TABLE-3:Correlations of methods A, B, C with method D in Female subjects

	Correlation	Dmethod
A method (N=100)	Pearson Correlation	.006
	Sig. (2-tailed)	.957
B method (N=100)	Pearson Correlation	.075
	Sig. (2-tailed)	.456
C method (N=100)	Pearson Correlation	-.040
	Sig. (2-tailed)	.692

TABLE-4:Correlations of methods A, B, C with method D in Overall study population

	Correlation	Dmethod
Amethod	Pearson Correlation	.289**
	Sig. (2-tailed)	.000
Bmethod	Pearson Correlation	.247**
	Sig. (2-tailed)	.000
Cmethod	Pearson Correlation	.127
	Sig. (2-tailed)	.074

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

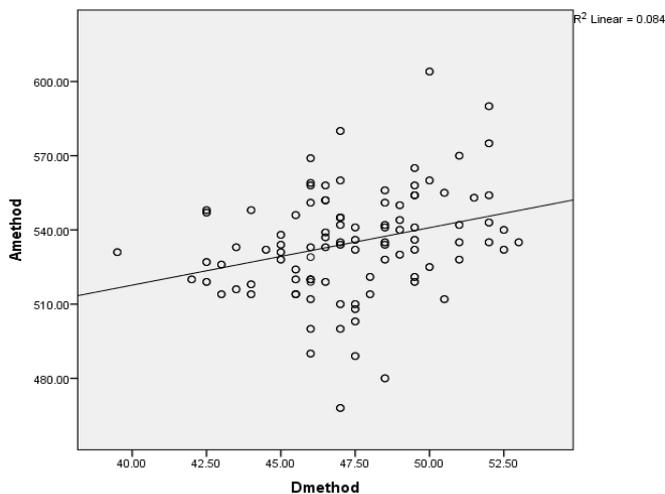


Fig.1. Correlation between intercanine width and horizontal cranial circumference in overall study population

In our study, it was observed that the correlation between horizontal cranial circumference, Interzygomatic distance and interalar distance with the intercanine width.

- A positive correlation was observed between Inter-canine width and horizontal cranial circumference among males. Though this correlation was statistically significant, it was weakly correlated (pearson's correlation coefficient = 0.260, $p < 0.05$) as shown in Table.2.
- A positive correlation was observed between Inter-canine width and horizontal cranial circumference among females, whereas it was weakly related and also statistically insignificant (pearson's correlation coefficient = 0.006, $p > 0.05$) as shown in Table. No.3 and Fig.2.
- However, Table no.4 and Fig.1 revealed that a positive correlation was observed between Inter-canine width and horizontal cranial circumference among overall study population. Although this correlation was statistically significant, it was weakly correlated (pearson's correlation coefficient = 0.289, $p < 0.05$).

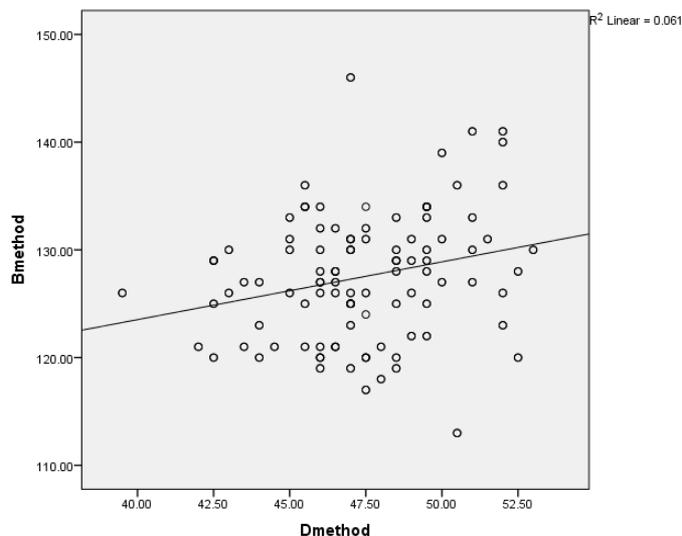


Fig.2 Correlation between intercanine width and interzygomatic distance in overall study population

- A positive correlation was noticed between Inter-canine width and interzygomatic distance among males and females (pearson's correlation

coefficient = 0.068 & 0.075 respectively). Although these were weakly related which were statistically insignificant ($p > 0.05$) as shown in Table. No.2 & 3.

- However, Table. No.4 and Fig. 2 revealed that Inter-canine width and interzygomatic distance among overall study population was positively correlated although it was weakly related which was statistically significant (pearson's correlation coefficient = 0.247, $p < 0.05$)

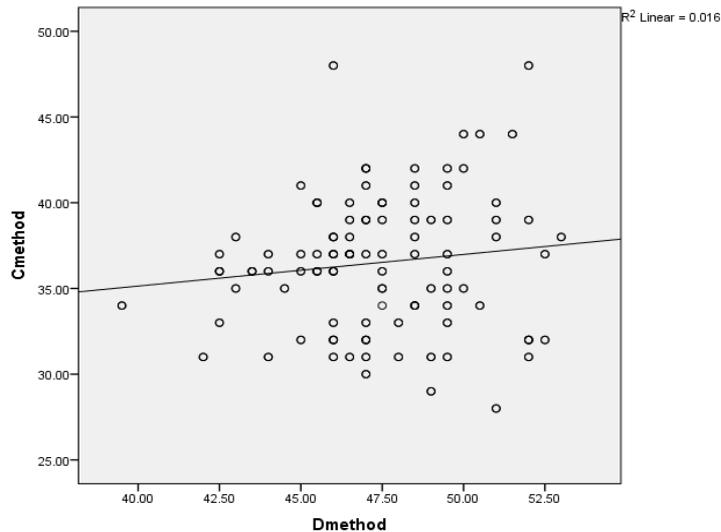


Fig.3: Correlation between intercanine width and interalar distance in overall study population

- A negative correlation was observed between Inter-canine width and interalar distance among males and females (pearson's correlation coefficient = -0.41 & -0.04 respectively,). Though it was weakly related which were statistically insignificant ($p > 0.05$) as shown in Table. No.2 & 3.
- However, Table. No 4 and Fig. 3 depicted that a positive correlation was seen between Inter-canine width and interalar distance among overall study population. Though it was weakly related which was statistically significant (pearson's correlation coefficient = 0.127, $p < 0.05$).

Table.5: : multiple linear regression analysis using inter-canine distance (mm) as dependent variable and horizontal cranial circumference as independent variables in overall sample (equation for prediction of inter canine distance).

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.289 ^a	.084	.079	2.59530

a. Predictors: (Constant), Amethod

Table.6 showing Regression coefficient^a

Model	Regression Coefficients		T	Sig.	95.0% Confidence Interval for B	
	B	Std. Error			Lower Bound	Upper Bound
(Constant)	28.133	4.536	6.202	.000	19.188	37.079
A method	.036	.008	4.250	.000	.019	.053

a. Dependent Variable: D method

Table.7: Table.5: : multiple linear regression analysis using inter-canine distance (mm) as dependent variable and Interzygomatic distane as independent variables in overall sample (equation for prediction of inter canine distance).

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.247 ^a	.061	.056	2.62721

a. Predictors: (Constant), A method

Table.8 showing Regression coefficient^a

Model	Regression Coefficients		t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error			Lower Bound	Upper Bound
(Constant)	32.911	4.046	8.134	.000	24.932	40.889
Bmethod	.114	.032	3.584	.000	.051	.176

a. Dependent Variable: D method

Linear Regression analysis was applied for creation for equation for prediction of inter-canine distance in overall population. For this inter-canine distance (mm) was used as dependent variable and Horizontal cranial circumference, Interzygomatic distance as independent variables.

Based on the coefficients equation created was:

Inter canine width (ICD) = $28.133 + 0.036x$ Horizontal Cranial Circumference.

Inter canine width (ICD) = $32.911 + 0.114x$ Interzygomatic distance.

Discussion:

The selection of maxillary anterior teeth is one of the most important procedures to fulfill the esthetic requirement during construction of complete denture. The selection of teeth denotes selection according to size and shape of tooth.

In our study, it was observed that the correlation between horizontal cranial circumference, interzygomatic distance and interalar distance with the intercanine width.

A statistically significant weak positive correlation was observed with Inter-canine width and horizontal cranial circumference among males (pearson's correlation coefficient = 0.260, $p < 0.05$). A statistically insignificant weak positive correlation was observed with Inter-canine width and horizontal cranial circumference among females (pearson's correlation coefficient = 0.006, $p > 0.05$). Prasanna Guru E & Dhanraj (2017), conducted a study which showed a strong correlation was observed between the cephalic circumference and the mesio-distal width of maxillary central incisors⁵. However, Inter-canine width and horizontal cranial circumference was observed among overall study population was positively correlated although it was weakly related which was statistically significant (pearson's correlation coefficient = 0.289, $p < 0.05$).

A statistically insignificant weak positive correlation was observed with Inter-canine width with interzygomatic distance among males and females (pearson's correlation coefficient = 0.068, $p > 0.05$). However, Table. No 6.13 and Fig. 6.13 revealed that Inter-canine width with interzygomatic distance

among overall study population was positively correlated which was statistically significant (pearson's correlation coefficient = 0.247, $p < 0.05$).

The results of our study are in accordance with the results of the study conducted by Jain AR et al., (2018) which had stated that the highest correlation was observed mainly with interzygomatic width, in males ($r = 0.50$) followed by females ($r = 0.447$) among Indian population and least correlation was found in British population ($r = 0.29$)⁶. Similarly significant correlation ($P < 0.001$) was found between interzygomatic width and Inter canine distance in the study conducted by Tripathi S and Singh RD (2018)⁷, where as a weak correlation with interzygomatic width and Inter canine distance was observed in our study.

In the present study it was observed that a negatively weak correlation between Inter-canine width and interalar distance among males and females (pearson's correlation coefficient = -0.41, $p > 0.05$) and (pearson's correlation coefficient = -0.04, $p > 0.05$) respectively which was statistically insignificant. However, Inter-canine width with interalar distance among overall study population was positively correlated although it was weakly related which was statistically significant (pearson's correlation coefficient = 0.127, $p < 0.05$). The results of Our study were not in accordance with the study conducted by Sharafat Hossain (2012) et al., where they had observed that interalar width had a weak correlation with the position of maxillary canine in Bangladeshi subject group⁸. According to the study of Attokaran G and Shenoy K (2018), there was a high significant correlation between interalar distance and the mesiodistal width of six maxillary anterior teeth in both males and females⁹.

So, In this present study, we have done the Linear Regression analysis was applied for creation for equation for prediction of inter-canine distance in overall population for esthetic purpose. For this inter-canine distance (mm) was used as dependent variable and Horizontal cranial circumference, Interzygomatic distance as independent variables.

Based on the coefficients equation created was:

- Intercanine width (ICW) = $28.133 + 0.036x$ Horizontal Cranial Circumference.
- Intercanine width (ICW) = $32.911 + 0.114x$ Interzygomatic distance.

The result thus obtained from collected data can be applied to the selection of proper size of maxillary anterior teeth in edentulous patients.

Conclusion:

- Within the limitations of the study, measurements of the horizontal cranial circumference and interzygomatic distance can be used for the selection of proper size of maxillary anterior teeth in edentulous patients in both sexes.
- This can be used as a starting point for determining the width of the anterior maxillary teeth for edentulous patients, which can be further confirmed with the esthetic appearance and with other facial measurements.

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