Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(3), 1306-1311 | ISSN:2251-6727

Correlation between Interpupillary and Intercanine Distances in various Facial Forms among Central India Population

Oshine Jha[1], Naveen S Yadav[2], Shweta Narwani[3], Puja Hazari[4], Kirti Somkuwar[5], Monali Bajaj[6]

[1]PG Student, Department of Prosthodontics, People's Dental Academy, Bhopal (MP), India

[2]Professor & Head of the Department, Department of Prosthodontics, People's Dental Academy, Bhopal (MP), India (Corresponding Author)

[3]Reader, Department of Prosthodontics, People's Dental Academy, Bhopal (MP), India

[4]Professor, Department of Prosthodontics, People's Dental Academy, Bhopal (MP), India

[5]Reader, Department of Prosthodontics, People's Dental Academy, Bhopal (MP), India

[6]Senior Lecturer, Department of Prosthodontics, People's Dental Academy, Bhopal (MP), India

Corresponding Author: Naveen S Yadav

(Received: 16 March 2025 Revised: 20 April 2025 Accepted: 01 May2025)

KEYWORDS

Intercanine Distance, Interpupillary Distance, Facial Form, Facial Form Indicator

ABSTRACT:

Background- In order to create a natural appearance, the lost tissue would be represented in roughly equal amounts and location. One way to mimic nature is to place the prosthetic teeth in the same spot as the natural teeth were before.

Aim- This study evaluated any association between the width of anterior maxillary teeth and interpupillary distance in different facial forms among Central India population.

Materials and Methods- Interpupillary and intercanine lengths were measured among 30 people with square facial form, 30 with tapering facial, and 30 with ovoid facial form. An electronic digital vernier calliper, which measures to the nearest 0.01 mm, was the instrument employed to take the measurements. The Excel sheet was updated with the data. IBM, Chicago's SPSS (Statistical Package for Social Sciences) 25.0 version was used to analyse the data. The Kolmogorov-Smirnov test was implemented to analyse the data for probability distribution. SD and mean values were computed. The post hoc and Pearson correlation tests were conducted after the ANOVA.

Result- P-value <0.05 was regarded as statistically significant. A confidence interval of 95 was set up. The groups differed statistically significantly (p-0.04), with mean interpupillary distances of 56.26, 56.97, and 62.68 mm, respectively.The average distance between canines was 56.12 mm, 56.07 mm, and 61.52 mm, respectively. The differences in the groups were statistically significant (p-0.031).

Conclusion- It was concluded that the interpupillary distance and the width of the anterior maxillary teeth in the various face shapes of the Central Indian population are shown to be positively correlated.

Introduction

Face shape has been used as a useful guide in many clinical prosthodontic procedures since Leon Williams' typical form theory was put forth in 1917.[1] The facial shapes were found to be able to match the designated oval, tapered, and square forms when they were turned over.[2] The maxillary central incisor is the most important tooth in the anterior teeth selection procedure as it is the most visible tooth from frontal aspect and provide best indication of patients age. The canine shows the patient's dynamism, whereas the lateral incisor shows the patient's gender.[3] The concept of typical form defines face form as a reference standard for associating facial harmony with central incisors. In order to create a natural appearance, many dentists think that a successful prosthesis should

Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(3), 1306-1311 | ISSN:2251-6727

replicate the lost tissue in precisely the same quantity and location. The prosthetic teeth should be positioned in the same spot as the natural teeth in order to mimic nature. "The only correct position of a tooth is the one in which it was placed by nature," according to Boucher (1960).[4] According to Martone (1963), in order to preserve the natural harmonics in functional performance, teeth have to be positioned in the same places as natural teeth.[5] One of the most important aspects of a person's self-esteem is their smile. From a clinical standpoint, mechanical concerns for denture stability and function sometimes appear to obscure conceptions of denture aesthetics.

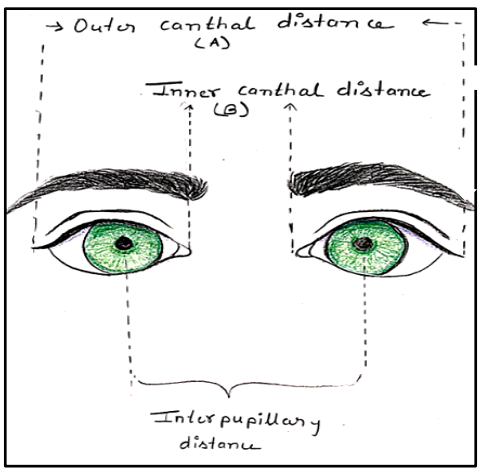
When treating patients who are edentulous, the prosthodontist must make sure that the dentures fulfil the patient's functional and aesthetic needs. In clinical prosthodontics, choosing and replacing anterior maxillary teeth without pre-extraction information has proven to be one of the biggest challenges. To obtain acceptable aesthetics, the anterior maxillary teeth must be chosen in proportion to the dimensions of the face.[6] The selection of anterior teeth has been done using a variety of methods. These techniques show a reliance on the dento-facial form's physical attributes. When determining the mesiodistal dimensions of upper front teeth, facial indicators such bi-zygomatic width, head circumference, face height, inter-canine distance, and interalar width were taken into account.[7] As a result, numerous attempts have been made to measure the anterior tooth portion for the entire denture; but, as of right now, no widely recognised technique has been chosen for the selection of denture teeth. Age-related variation can be seen in the procedures based on the soft tissue references. The hard tissue reference is repeatable and stable, nevertheless. To choose appropriately sized anterior maxillary teeth, the correlation between inter-canine distance to inter-canthal distance, interalar width, inter-zygomatic distance, and inter-commusural width might be preserved. In order to anticipate the appropriate width of maxillary anterior artificial denture teeth, this clinical investigation was carried out to assess the relationship between measures of maxillary anterior teeth and horizontal inter-papillary distance.

Materials and Methods

This descriptive observational study was conducted at People's Dental Academy's department of prosthodontics in Bhopal. The study sample consisted of dentate individuals from Central India population with various facial shapes who sought treatment in the prosthodontics department. The Purposive sampling technique was used to choose 90 participants in total. The following were the requirements for inclusion: Participants must be between the ages of 18 and 40, have a normal occlusion or Angle class I, be free of anterior tooth illnesses, and not have any orthodontic treatment, anterior tooth extractions, or artificial crowns or restorations on their anterior teeth.

Study Procedure

Following subject selection criteria, 90 subjects were chosen and placed into three groups. Thirty participants with square faces made up Group A, thirty subjects with tapering faces made up Group B, and thirty subjects with oval faces made up Group C. The inclusion and exclusion criteria were followed in the selection of each subject. All of the chosen participants were seated on the dentist chair in accordance with the guidelines for data collection, and a data collection sheet was kept for documentation's convenience. Callipers were used to measure the distance between the palpebral fissures, two outer angles (a) and interior angles (b). (figure1A) The interpupillary distance a−b/ 2 + b was calculated assuming that the pupils are centrally located and that the two eyes are of identical size under typical circumstances. The width of two eyes is given by a- b. The width of one eye or two eye halves is equal to half of this. The interpupillary distance was calculated by summing the two median angles (b). (figure 1B)



1. A

Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(3), 1306-1311 | ISSN:2251-6727

1. B

Figure 1A, 1B: Measuring Interpupillary Distance using Verniar Capllipers

Dental floss was positioned at the maxillary arch's greatest curvature, and one mark was then placed on each side at the canine's distal surface to measure the width of the anterior maxillary teeth. (figure 2)The distance between the marks was measured by digital calliper after straightening dental floss. (figure 3)

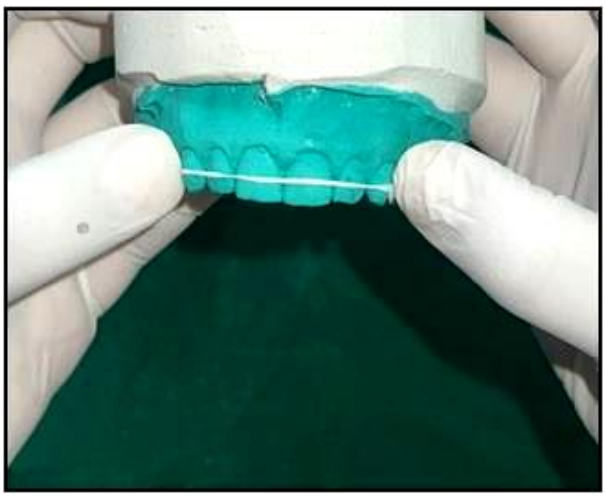


Figure 2. Intercanine distance on the cast on the cast by dental floss

Figure 3. Measuring intercanine distance after straightening

Through clinical evaluation, data was gathered

A customised facial form indicator, measuring 30 x 30 cm and composed of a flat, 2 mm-thick plexiglass sheet, was used to clinically determine the facial form of the patients who satisfied the inclusion criteria. Prominent face features were rendered in relief. The sagittal plane was defined by drawing a straight line in the middle of the sheet. The two sides of the plexiglass sheet were engraved with parallel lines that were spaced 5 mm apart.(figure 4) By contrasting these straight lines with the side of the person's face, each facial form was recognised. When it comes to treatment planning, the evaluation of various facial shapes is essential. Soft, well-balanced curves define an oval face shape. Properly angular characteristics, such as a large forehead and well-defined jawline, complement square facial proportions. A smaller forehead and slender chin are characteristics of tapering face shapes. The facial form indicator was placed perpendicular to the horizontal axis and comfortably against the face of the person being examined, who was seated upright. The facial form indicator's midline was parallel to the face's coronal and horizontal planes and in line with the facial midline. The greatest dimensions at the forehead of the face represents upper third of face denoted by point A and A1 on the either side,the zygoma represents middle third of face denoted by letters B and B1 on the either side of face, and the mandibular angles are denoted with C and C1.These reference markers were plotted on a translucent paper that was placed over the facial form indicator after it had been removed. Reference points A, B, and C were connected by a line. In a similar manner, the contour form of each subject's face was created by connecting A1, B1, and C1. By connecting these three points if the angle of convergence was <5 degree it was considered as square facial form, similarly if the angle of convergence 5-12

Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(3), 1306-1311 | ISSN:2251-6727

degree it was considered as ovoid facial form and if the angle of convergence was >13degrees it was denoted as tapering facial form. (figure 5) As a result, the study participant's diverse facial shapes were divided into three groups, designated A, B, and C. These groups included ovoid, tapering, and square facial shapes, respectively.

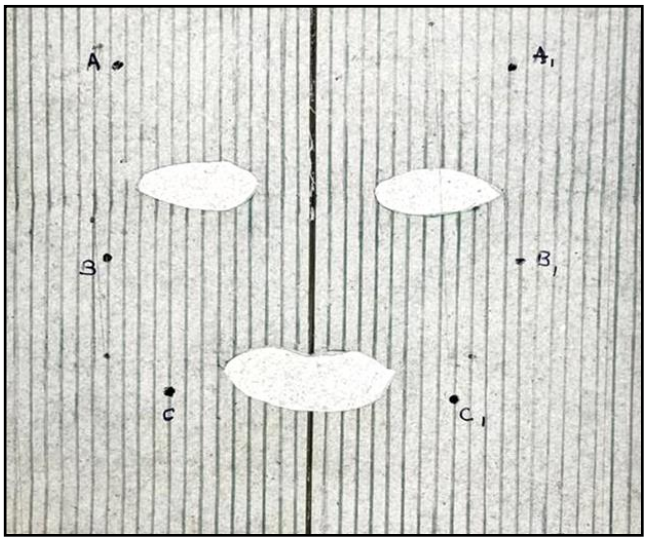


Figure 4. Facial form indicator

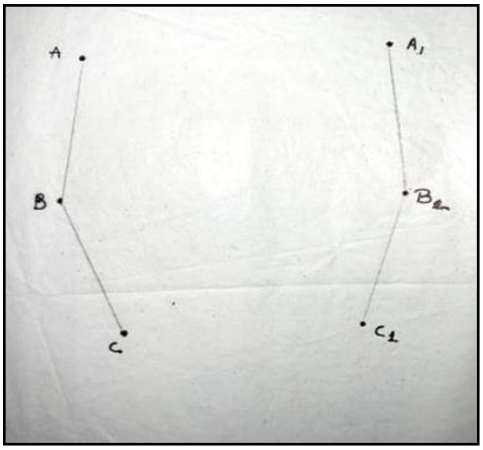


Figure 5. AA1 points represents points marked in the forehead, BB1 points represents zygoma, CC1 points represents angle of mandible

Result

Statistical Analysis

The data was entered into the excel sheet. The data was analyzed using SPSS (Statistical Package for Social Sciences) 25.0 version, IBM, Chicago. The data was analyzed for probability distribution using Kolmogorov-Smirnov test. Mean values and SD was calculated. The ANOVA followed by post hoc test and Pearson correlation test was performed. P-value<0.05 was considered statistically significant. Confidence interval was set at 95%.

Table 1- Comparison of mean interpupillary distance and inter canine distance in oval, squaretapering and square face form. tapering and square face form. [SD- Standard deviation, ** statistically significant]

Variables	Mean+ SD			F-value	p-value
	Oval	Square Tapering	Square		
Inter pupillary distance(mm)	56.26+8.04	56.97+2.09	62.68+5.12	1.796	0.04**
Inter canine distance (mm)	56.12+7.43	56.07+2.89	61.52+3.97	1.563	0.031**
t- value	-0.054	-0.668	-0.400		
p-value	0.957	0.517	0.699		

Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(3), 1306-1311 | ISSN:2251-6727

Table 2- Comparison of mean interpupillary distance and inter canine distance in oval, square tapering and square face form according to gender

			Gender			
		Male			Female	
	Oval	Square Tapering	Square	Oval	Square tapering	Square
Interpupillary distance (mm)	57.81+4.26	57.70+1.40	63.75+5.23	55.02+10.20	56.00+2.77	58.40+0.1
Intercanine distance(mm)	58.28+4.55	57.52+1.51	62.150+4.29	54.39+8.99	54.13+3.44	59.00+0.01
t-value	0.250	-0.29	-0.784	-0.212	-1.940	27.35
P-value	0.805	0.774	0.441	0.832	0.059	0.001

Result

The relationship between the interpupillary and intercanine distances in oval, square, and tapered face shapes is displayed in Table 1. The mean interpupillary distances were 56.26, 56.97, and 62.68 mm, respectively, and there was a statistically significant difference between the groups (p-0.04).The mean inter-canine distance was 56.12 mm, 56.07 mm, and 61.52 mm, respectively, and there was a statistically significant difference between the groups (p-0.031). **(Table 1)** The present data compares interpupillary and intercanine distances between males and females across different arch forms (oval, square tapering, and square). In males, the mean interpupillary distance was slightly higher in the square arch form (63.75±5.23 mm) compared to oval (57.81±4.26 mm) and square tapering (57.70±1.40 mm) forms. Among females, the square forms also had the highest mean interpupillary distance (58.40±0.1 mm) compared to oval (55.02±10.20 mm) and square tapering (56.00±2.77 mm) forms. Similarly, the mean intercanine distance was highest for the square arch form in both males (62.15±4.29 mm) and females (59.00±0.01 mm).Statistical analysis using t-tests revealed that the differences between males and females were not statistically significant for most arch forms, with p-values greater than 0.05 (e.g., p=0.805, 0.774, 0.441, 0.832, and 0.059). However, a statistically significant difference (p=0.001) was observed in the square arch form for the intercanine distance, with a notably high t-value of 27.35, indicating a strong gender difference in this particular group. **(Table 2)**

Discussion

Regardless of age or gender, everyone strives to appear presentable, and when they lose their teeth, they seek dental care to restore their appearance. Numerous attempts have been made to measure the anterior maxillary teeth chosen for full dentures. The methods based on the soft tissue references show age related variations. However the hard tissue reference such as the inter-pupillary distance is a stable and reproducible. The measurement of interpupillary distance was also recorded by using vernier caliper as done by Abdullah MA[8] when measured on the stone cast the intercanine distance showed a mean value of (46.01 ± 7.31 mm) to the total sample, and it is significantly high in male than female. Gomes et al[9] stated that the estimation of mesiodistal width of the maxillary frontal teeth is one of the most difficult aspects in complete denture therapy. Many studies have been performed to establish methods of estimating the combined mesiodistal width of upper anterior teeth to improve the complete denture esthetics. According to Waqar Hussain[10] the maxillary central incisors are the most crucial teeth to meet the patient's aesthetic needs; width is considered more significant than length. The maxillary central incisor is typically at the centre of the patient's complaint, which mostly concerns anterior aesthetics. Therefore, choosing artificial teeth necessitates knowledge of biological and physical aspects that are closely connected to the characteristics of each patient. Sheikh et al[11] investigated a study and found mean interpupillary distance was 64.14mm and the width of

Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(3), 1306-1311 | ISSN:2251-6727

anterior maxillary teeth 54.87mm, the values are nearly similar to our present study. Just similar to the present study the gender based variations were also reported in the literature.[12]Ramamoorthi M et al [13]in their study, the author used photographs of the subjects as study material to measure the distance, whereas we used an electronic vernier caliper. Rajib kumar Banik et al[14] concluded that there is a positive correlation between the interpupillary distance and width of anterior maxillary teeth in different face forms of the Bangladeshi population. The mean ± SD of the width of anterior maxillary teeth in square face form, Tapered face form, and Ovoid face form was 49.48±5 mm, 46.81±4.08 mm, and 49.11±4.97mm, respectively. There were no statistical differences in interpupillary distance and width of anterior maxillary teeth in square face form, Tapered face form, and Ovoid face form. The goal of the current study was to determine whether the interpupillary distance and the width of the anterior maxillary teeth were related. The mean inter-canine distance was 56.12 mm, 56.07 mm, and 61.52 mm, respectively,. The mean interpupillary distances were 56.26, 56.97, and 62.68 mm, respectively. The ANOVA followed by post hoc test and Pearson correlation test was performed. P-value<0.05 was considered statistically significant. Confidence interval was set at 95%.The present data compares interpupillary and intercanine distances between males and females across different arch forms (oval, square tapering, and square). Statistical analysis using t-tests revealed that the differences between males and females were not statistically significant for most arch forms, with p-values greater than 0.05 (e.g., p=0.805, 0.774, 0.441, 0.832, and 0.059).

Conclusion

This study found a positive correlation between interpupillary distance and width of anterior maxillary teeth among the different types of face forms. When all the parameters are considered, only interpupillary distance maintains a constant proportional relationship with teeth that are not worn and hence can be used as a guide for selecting the proper size of a totally edentulous individual.

References

1. Williams JL. A new classification of human tooth forms with special reference to a new system of artificial teeth. Dental Cosmos. 1914;56:627-8.
2. Ellakwa A, McNamara K, Sandhu J, James K, Arora A, Klineberg I, El-Sheikh A, Martin FE. Quantifying the selection of maxillary anterior teeth using intraoral and extraoral anatomical landmarks. J Contemp Dent Pract. 2011;12(6):414-21.
3. Brodbelt RH, Walker GF, Nelson D, Seluk LW. Comparison of face shape with tooth form. The Journal of Prosthetic Dentistry. 1984;52(4):588-92.
4. Boucher CO. Implant Dentures: Prosthodontic—Unfavorable. J. Prosthet. Dent.. 1960;10(6):1143-8.
5. Martone AL. Clinical applications of concepts of functional anatomy and speech science to complete denture prosthodontics: Part VIII. The final phases of denture construction. J. Prosthet. Dent.1963;13(2):204-28.
6. Hussain MW, Qamar K, Naeem S.The role of interpupillary distance in the selection of anterior teeth. *Pak Oral Dent J.* 2012;32(1):165–9.
7. Rai R. Correlation of nasal width to inter-canine distance in various arch forms. J Indian Prosthodont Soc.2010;10(2):123–127.
8. Abdullah MA. Inner canthal distance and geometric progression as a predictor of maxillary central incisor width. J. Prosthet. Dent.2002; 88: 16-20
9. Gomes VL, Goncalves LC, Parado CJD, Junior IL, et al. Correlation between facial measurements and the mesiodistal width of the maxillary anterior teeth. J Esthet Restor Dent 2006;18:196-205.
10. Hussain MW, Qamar K, Naeem S. The role of interpupillary distance in the selection of anterior teeth. Pak Oral Dent J. 2012;32(1):165–9.
11. Sheikh MA, Topoulos AP, Deitcher SR. Isolated internal jugular vein thrombosis: risk factors and natural history. Vascular Medicine. 2002;7(3):177-9.
12. Al Wazzan KA. The relationship between intercanthal dimension and the widths of maxillary anterior teeth. J .Prosthet Dent.2001; 86: 608-12.
13. Ramamoorthi M. Interpupillary distance as a guide for the selection of upper anterior teeth. The Internet Journal of Dental Science. 2009;9(1):1-34.
14. Banik RK, Rahman MM, Majumder B, Rumon K, Biswas U, Hossain M. Relationship between the interpupillary distance and the width of maxillary anterior teeth of different face forms among Bangladeshi adult population. Int J Med Sci. 2023;10(1):15-19.
15. Al Wazzan KA. The relationship between intercanthal dimension and the widths of maxillary anterior teeth.J .Prosthet Dent. 2001;86(6):608-12.