



Co-relation between Philtral Width and Maxillary Central Incisors Width in Central India

Vyakhya Agrawal¹, Naveen S Yadav², Harsh Mahajan³, Kirti Somkuwar⁴, Abhinav Khare⁵, Dr. Ridhi Tiwari⁶

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

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

³Professor, Department of Prosthodontics, People's Dental Academy, Bhopal (MP), India

⁴Reader, Department of Prosthodontics, People's Dental Academy, Bhopal (MP), India

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

⁶Senior 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 May 2025)

KEYWORDS

Philtral Width,
Central Incisors,
and Digital Vernier
Caliper

ABSTRACT:

the patient's self-esteem and quality of life. Thus, the aim of this study was to evaluate the co-relation between philtral and maxillary combined central incisor width in Central Indian population as a guide to the dimensions of maxillary anterior teeth.

Materials and Methods: Measurement of philtral width was done by measuring the width of philtrum with digital vernier caliper (to the fraction of 1/10th of a millimeter). Measurement of width of central incisor was done intraorally with a digital vernier caliper.

Results: Result of this study revealed a statistically significant positive linear correlation between philtrum width and central incisor width ($r = 0.039$, $p = 0.001$).

Conclusion: There is a positive linear correlation between the philtrum width and central incisor width. Using this result, we can provide esthetically pleasant maxillary central incisors with proper tooth width and tooth form according to philtrum width and face form.

Aim and Objective: Successful restoration of a tooth within the aesthetic boundaries results in a distinctly positive effect on

Introduction

The human face plays an important role in highlighting human individuality, identity, and personality. According to Young et al "it is apparent that beauty, harmony, and individuality are major qualities" of aesthetics. The dental appearance is an integral part of facial beauty. This has led to an increased interest in dental aesthetic among dentists and patients.^[1] The restoration of natural and pleasing lip support is one of the prime requisites of an esthetic denture. Denture esthetics is defined as 'the cosmetic effect produced by a dental prosthesis which affects the desirable beauty, attractiveness, character, and dignity of the individual'.^[2]

Determination of width of maxillary anterior teeth is an important criteria for selection and arrangement of teeth in completely and partially edentulous patients to enhance aesthetics and function.^[3] Currently there are many guidelines for anterior tooth selection. John H. Lee co related the combined mesio-distal width of Maxillary Central Incisors with philtrum. He has stated that the width

of these two teeth is equal to the width of the philtrum. Based on William's theory; many studies have attempted to evaluate the correlation between the upside down facial form and the form of the maxillary central incisor.^[4] The literature of Prosthodontics is based mostly on study populations outside India, and there is an apparent lack of information about the selection of Maxillary Central Incisor forms in subjects of Indian ethnicity.^[5] Hence this study was conducted to evaluate the co relation between philtral width and combined maxillary central incisor width in North Indian population. If positive co-relation is found, this study will be helpful to clinicians in the selection of maxillary anterior teeth for fabrication of partial and complete denture prosthesis.

Materials and Methods

This study was conducted in the Department of Prosthodontics and Crown & Bridge, at People's Dental Academy, Bhopal (Madhya Pradesh). The study involved 120 dentulous subjects including male & female of Indian



origin. All dentulous subjects were in-between 18-50 year age, group. Written consent was taken from subjects after explaining the procedure in detail. The inclusion criterions of the study were; dentulous subjects without any missing teeth and with fully erupted second molars, Angles Class I occlusion without any deformity. The exclusion criteria of the study were; carious, fractured, nonvital maxillary central incisor, Scarring in the upper lip, Cleft lip patients.

Instruments and Materials used in the Study

Maxillary perforated dentulous metal stock tray of varying sizes, Rubber bowl (flexible) and curved spatula, Rubber bowl and plaster spatula, Cast trimmer, Alginate, Dental stone and digital vernier caliper.

Methodology

a) Measurement of Philtral Width

Patients were seated in upright position with lips lightly touching each other. It was ensured that the lip was in its most relaxed position. Two most prominent points were marked at base of philtrum. These points were marked by drawing a line along the vertical ridge of philtrum and marking a point where they meet the vermilion border of upper lip. The width between these points were measured by digital vernier calipers to the fraction of 1/10th of a millimetre (figure 1).



Figure 1: Measuring Philtrum Width with Vernier Caliper

b) Measurement of Width of Central Incisor

Measurements of the maxillary central incisor were made intraorally with a Digital Vernier Caliper. The vernier's external measuring edges allowed for a correct fit in the embasures, while its interior edges of the beak remained unaltered. The mesio-distal measurements of central incisors were recorded at the widest dimension (contact areas). (Figure 2)

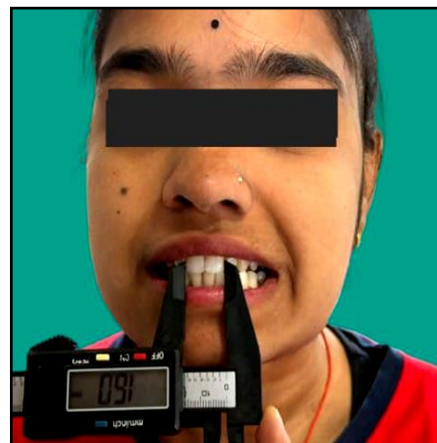


Figure 2. Measuring combined central incisor width with digital Vernier Caliper

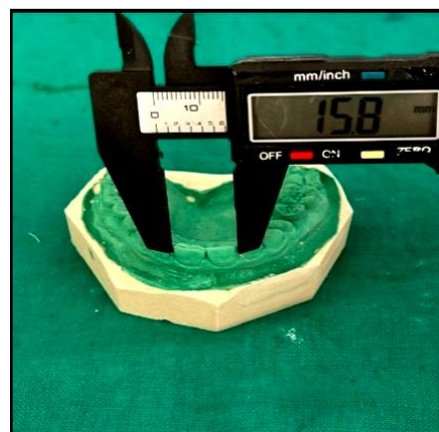


Figure 3. Measuring the width of central incisors with digital Vernier Caliper on model

After that an alginate impression was made and the cast were prepared with Type III dental stone and the mesio distal width was again cross-checked using a digital vernier caliper and the result was compared. Mean of both the reading were calculated. (Figure 3). All tabulated data were send for statistical analysis. Chi-square test was used to compare categorical variables. The Unpaired t test was used to compare continuous variables. Pearson correlation coefficient was calculated. The p value < 0.05 was considered as significant.

Result

The result of this study revealed a statistically significant positive linear correlation between philtrum width and central incisor width ($r = 0.039$, $p = 0.001$). (**Table 1**) The tight clustering of points around the trend line suggests a moderate to strong correlation. (**Scattered Diagram-1**). So we can use the philtrum width to determine the combined Central Incisor width in north Indian population in cases of

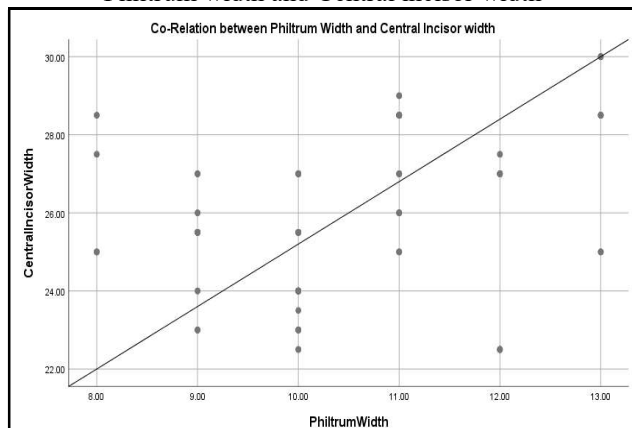


no pre extraction records available. The findings of this study can be used for selection of size of maxillary central incisors.

Table 1- Correlation between Philtrum width and Central incisor width (n-120)

Width (mm)	Mean \pm SD	Correlation coefficient	p-value
Philtrum width	10.48 \pm 1.42	0.309	0.001*
Central Incisor width	25.94 \pm 2.00		

Figure 4. Scattered diagram showing Correlation between Philtrum width and Central incisor width



Graph: Co-relation between philtrum width and central incisor width

Statistical Analysis

Data was entered in Microsoft Excel spreadsheet and descriptive data were analyzed using SPSS software Version 26.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics and a Pearson correlation was used to determine the relationship between philtrum width and central incisor width. For statistical purposes, a p-value of ≤ 0.05 was considered significant.

Discussion

As the subjects were from same population, the results of this study are applicable to the Central Indian Population. During oral rehabilitation, a dentist must emphasize on development of a pleasant smile and orofacial expression for the patient.^[6,7] Maxillary anterior teeth are very important in this regard.^[8] These teeth must be in harmony with the facial measurements for enhanced facial aesthetics.^[9] Selection of most appropriate size of artificial maxillary anterior teeth has always been a challenge during prosthetic treatment. It becomes even more difficult in absence of pre-extraction records.^[10] Various facial

measurements have been suggested in the literature for determining the size of the artificial maxillary anterior teeth but their reliability is still in question.^[11] The accurate selection of artificial teeth is a prime concern for clinicians and lab technicians to ensure the success of the prosthesis. Various authors have suggested that artificial teeth should have same position, shape and color as natural teeth. Teeth selection is not simply a mechanical procedure, but requires dexterity and knowledge of biology. Selection of teeth forms is an important step before teeth arrangement. Prime objective of teeth selection is to create a dentofacial harmony.^[12] Latta, Weaver, and Conkin, (1991) measured the width of the mouth, the Interalar width, the bizygomatic width, and the Interpupillary distance. The width of the mouth, interalar width, bizygomatic width, and interpupillary distance were measured in edentulous patients. The widths varied widely, even when the population was separated into groups by sex and/or race. When mean values were studied, black men differed significantly from black women, white women, and white men in interalar and bizygomatic widths; white women differed from the other groups in all widths. No correlation was found between the widths for the population as a whole, nor when the population was further divided into race, sex, or group. When artificial teeth were chosen for eight randomly selected patients using a method recommended for each of the widths, the same mold was dictated by two methods for seven patients, and by three methods for five patients.^[13] Sellen PN et al. (1993) reviewed the methods used to select artificial anterior teeth for the edentulous individuals. They Selected artificial teeth for a denture is complex when there are no remaining natural teeth and no pre-extraction records. The aim of this study is to review the methods used to select artificial anterior teeth for the edentulous individual. The review takes account of the majority of papers published during the last 100 years and is organized according to the methods used for determining artificial tooth form. Several factors have been proposed as aids for artificial tooth selection, and numerous methods have been devised for the evaluation of reliable esthetic factors in determining artificial tooth form. And they concluded that till date, no universally reliable method of determining tooth form has been found. The Williams classification (1914) is the most universally accepted method of determining anterior tooth form.^[14] Al Wazzan KA et al investigated to determine whether a relationship exists between the intercanthal dimension and 4 mesiodistal width combinations of the maxillary anterior teeth. The maxillary anterior teeth of 443 adult subjects were examined. Intercanthal distance was measured between the median angles of the palpebral fissure. The mean widths of the 2 central incisors, the combined widths of the central incisors, the combined width of the 4 incisors, and the combined width of the 6 anterior teeth were determined intraorally at their widest



dimension. Pearson correlation coefficients were calculated to determine the relationship between intercanthal distance and the 4 measurements of maxillary anterior teeth ($\alpha=0.05$). Although the Pearson correlation coefficients were relatively small, a significant relationship existed between intercanthal dimension and the 4 maxillary teeth dimensions ($P<0.0001$). It was found that biometric ratios of 1:0.267 and 1:1.426 could be used to estimate the central incisor width and the combined widths of the 6 anterior teeth, respectively. Within the limitations of this study, the results suggest that intercanthal distance can be used as a preliminary method for determining the width of the maxillary anterior teeth for edentulous patients.^[15] Mavroskoufis et al. studied the nasal width and incisive papilla as guide of selection of maxillary anterior teeth. A investigation of 64 Angle Class I, skeletal Class I dental students showed that the interalar nasal width is a reliable guide for selecting the mold of anterior teeth, and that the incisive papilla provides a stable anatomic landmark for arranging the labial surfaces of the central incisors at 10 mm anterior to the posterior border of the papilla. The mesiodistal width of the set of anterior teeth (four incisor and the mesial halves of the canines) should be determined by adding 7 mm to the patient's nasal width. The tips of canines on the horizontal plane, should be set on a line which passes through the posterior border of the incisive papilla. The distance between them should equal the patient's nasal width, so that from the frontal view they would each seem to lie on a perpendicular line drawn from each of ala of the nose. In this study 120 dentulous patients including male and female were involved. 86 patients were in between 20-30 year of age group and 34 patients were of more than 30 years. The mean age of patients were 24.01 ± 2.72 years ranging from 20-32 years. In the present study 58 male and 62 female subjects had participated. About half of patients were females (51.7%). This study revealed a statistically significant positive linear correlation between philtrum width and central incisor width ($r = 0.039$, $p = 0.001$).

Conclusion

Within the limitation of the study, the following conclusions were drawn:

There is a positive linear correlation between the philtrum width and central incisor width. Using this result, we can easily provide esthetically pleasant maxillary central incisors with proper tooth width and tooth form according to philtrum width and face form.

Reference

1. Kapse DP, MK DS. Role Of Adjacent Soft Tissues In Determining Dimensions Of Maxillary Anterior Teeth. *Int J Dentistry Oral Sci.* 2021 Nov 24;8(11):5117-22.
2. Winkler S. Essentials of complete denture prosthodontics. Second Edition. A.I.T.B.S. 2009;202.
3. Dhanraj Ganapathy, Janani Nandakumar, Prathap Sekhar. Philtral width and width of maxillary central incisor - A correlational analysis in dentate adult human subjects. *Innovative Journal of Medical and Health Science.* 2015;5(4):133–135.
4. Sandhu Navreet, et al. Role played by soft tissue landmarks such as philtrum in selecting the width of artificial maxillary central incisors. *Indian Journal of Dental Sciences.* 2012;4(1).
5. Korlakunte Pavankumar R, et al. A clinical study to evaluate the correlation between maxillary central incisor tooth form and face form in an Indian population. *Journal of Oral Science.* 2012;54(3):273-278.
6. Pound E. Lost fine arts in the fallacy of ridges. *J Prosthet Dent.* 1954;4:6–16.
7. Krajicek DD. Natural appearance for the individual denture patient. *The Journal of Prosthetic Dentistry.* 1960 Mar 1;10(2):205-14
8. Latta GH Jr, Weaver JR, Conkin JE. The relationship between the width of the mouth, interalar width, bizygomatic width, and interpupillary distance in edentulous patients. *J Prosthet Dent.* 1991 Feb;65(2):250-4.
9. Desjardins RP. Clinical evaluation of the wax trial denture. *J Am Dent Assoc.* 1982 Feb;104(2):184-90.
10. Grave AM. The frequency of various molds in a sample of natural and artificial dentitions. *J Prosthet Dent.* 1987 Feb;57(2):194-7.
11. Hoffman W Jr, Bomberg TJ, Hatch RA. Interalar width as a guide in denture tooth selection. *J Prosthet Dent.* 1986 Feb;55(2):219-21.
12. Agrawal A, Pandey KK, Verma AK, Ali M, Katiyar P, Gaur A. Evaluation of co-relation between philtral width and maxillary central incisors width. *J Adv Med Res.* 2018;24(7):1-6.
13. Latta GH Jr, Weaver JR, Conkin JE. The relationship between the width of the mouth, interalar width, bizygomatic width, and interpupillary distance in edentulous patients. *J Prosthet Dent.* 1991 Feb;65(2):250-4.
14. Sellen PN, Jagger DC, Harrison A. Methods used to select artificial anterior teeth for the edentulous patient: a historical overview. *Int J Prosthodont.* 1999 Jan-Feb;12(1):51-8.
15. Al Wazzan KA. The relationship between intercanthal dimension and the widths of maxillary anterior teeth. *J Prosthet Dent.* 2001 Dec;86(6):608–12.
16. Mavroskoufis F, Ritchie Gm. Nasal width and incisive papilla as guides for the selection and arrangement of maxillary anterior teeth. *J Prosthet Dent.* 1981;45: 592-7.