

Research: Role Played By Soft Tissue Landmarks Such As Philtrum In Selecting The Width Of Artificial Maxillary Central Incisors.

Abstract

Problem: Non-existence of any valid and tested method for determining the size of maxillary anterior teeth in spite of it being critical from the aesthetic point of view. Many attempts have been made to establish methods for estimating the width of artificial maxillary central incisors using anatomical landmarks, but one cannot depend on one particular method for this purpose. This study helps us to provide a guideline along with other methods for determining this relationship.

Purpose: The purpose of the study was to determine whether a relationship exists between the width of philtrum and mesio-distal width of maxillary central incisors in males and females for selection of anterior teeth.

Material And Methods: Study comprised of 58 edentulous subjects with all having healthy permanent teeth in normal arch form, alignment with minimum attrition and normal molar relation. The width of philtrum was measured between the two most prominent points marked at the base of philtrum. Measurement of combined mesio-distal width of maxillary central incisors, individual width of right and left central incisors at their widest dimension were measured in both sexes. Statistical analysis was performed to determine the relationship between the width of philtrum and width of maxillary central incisors.

Results: Width of philtrum was relatively less in females as compared to males. The combined mesio-distal width of maxillary central incisors was always greater than the width of philtrum in both the sex. The mean mesio-distal width of maxillary central incisor was 8.71mm and 8.72mm on right and left respectively in males. While in females the mean mesio-distal width of maxillary central incisor was 8.30mm on right and 8.28mm on left.

Conclusion: The restoration of contour of philtrum is important esthetic requirement. The measurement of its width may provide a valuable guide in determination of the width of maxillary central incisor.

Key Words

Philtrum, Tooth Selection, Width Of Maxillary Central Incisor

Introduction

The aim of Complete Denture Prosthodontic Treatment, and Dentistry by large, is the restoration of the aesthetics, masticatory function and optimal maintenance of patients general health and oral health in specific. Going by the definition, it should be noted that aesthetics should be of prime concern for all prosthodontic restorative procedures especially in young patients. And for aesthetics, the selection of anterior teeth becomes critical for an edentulous patient.

Estimation of dimensions of anterior teeth for an edentulous patient becomes gruesome when there is lack of any pre-extraction record. For such cases various researchers have given several hypotheses but none of these have been verified for accountability in Indian subjects.

Various hypotheses put forward can be summarized as:

The relation between width of philtrum and mesio-distal width of the central incisor as proposed by J. H. Lee was found to be valid in English subjects, but any research to validate its accountability in Indian subjects was lacking. Philtrum being in the midline is one of the easiest to measure from clinical point of importance especially in Indian clinic practicing environment, this relation deserved attention and validation for its use on Indian patients.

Restoration of aesthetics in completely edentulous individual is complicated due to difficulty in selecting the artificial anterior teeth of proper size. The problem becomes more viscid when there is complete lack of any pre-extraction records.

1. "Hunt and Pick" or "Trial and Error" method until the Prosthodontist was satisfied with size.
2. Daniel et al¹ reported that mesio-distal width of all max.6 anteriors =

bizygomatic width / 3.3

3. Sears^{2,3} reported that: mesio-distal width of each max. central incisor = bizygomatic width / 16
4. Bhalla⁴ reported that the corners of mouth were mesial to tips of Max.Canine by 3.14mm and 3.0mm for right and left respectively.
5. John H. Lee^{5,6} reported that combined mesio-distal width of maxillary central incisor to be equal to width of Philtrum.
6. Berry^{7,8} States that width of each maxillary central incisor is 1/16th of the width of face.

Normal facial landmarks study is compulsory before attempting to achieve the goal of natural and pleasing facial appearance and expressions with complete dentures. The facial landmarks at lower third of face have a direct relationship to the presence of natural teeth. The contour of the

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lips, especially, depends upon their intrinsic structure and the support provided to them by the teeth or denture base. Incorrect positioning of anterior teeth will severely alter the normal appearance of patient.

Maxillary central incisors have been long proven to be key in establishing good esthetics, and hence selection of maxillary central incisors becomes critical.

John H. Lee^{5,6} co-related the combined mesial-distal width of maxillary central incisor with philtrum. He has stated that the width of these two teeth is equal to the width of the philtrum. This test was done in English subjects. But it lacked any valid research in Indian subjects. Shourie et al⁹ have reported variation in size of maxillary incisors in subjects from America and Australia.

In present study, it was planned to conduct a study to find out the relationship between mesio-distal width of Maxillary Central Incisor and the width of philtrum in Indian male and female subjects. The mesio-distal width of right and left maxillary central incisor has also been compared.

Aims and Objectives

- To co-relate the size of the philtrum to the combined mesio-distal width of the maxillary central incisors in males and females.
- To establish a co-relationship guide for the selection of anterior teeth for individual patients to obtain and restore optimal aesthetic result for edentulous patient.

Note: All these objectives and aims were to verify the patency of J. H. Lee's hypotheses in Indian population

Materials And Methods

Selection Criteria

- Study was conducted on 58 individuals, aged between 17-21 years.
- Reason for this age group was that the case of attrition is minimum.
- Out of 58, 38 were males and 20 females.
- All subjects had full complement of periodontically healthy teeth. Teeth were in normal molar relation.
- Cases with any abnormality were discarded.

Techniques of measurement:

1. Measurement of the Width of Philtrum

- Patients seated in upright posture and lips lightly touching each other.
- It was ensured that lip was completely in 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.

- Radiographic pen(0.4mm) was used to mark these lines and points.

- The width between these two points were measured by vernier calipers to the fraction of 1/10th of a millimeter. [Figure 1]

2. Measurement of combined Mesio-distal width of Maxillary Central Incisors

Impression and Mounting of casts:

- Teeth were rinsed and cleaned with cotton.
- Impression was made in Alginate impression material of both the arches.
- After washing the impression in running water, it was immediately poured in Stone plaster.
- Casts thus obtained were mounted on a plain line articulator with teeth in maximum intercuspation. [Figure 2]

3. Marking of the lowest point of incisal edges of central incisors in a horizontal plane

- Modelling wax was adapted on the labial surface of lower incisors to bring the level of lower incisors in the same vertical plane as the upper incisors.
- A line was marked on wax representing the lowest points of incisal edges of maxillary central incisors in a horizontal plane with the tip of a B.P. blade by placing a flexible scale which touched the lowest points of maxillary central incisal edges. [Figure 3]

4. Measurement of combined mesio-distal width of Maxillary Central Incisors

- Length of the crown was measured from the highest point on the cervical line to the lowest point on the incisal edge represented by the line on wax in a horizontal plane.
- The cervico-incisal distance was divided into three parts. The junction of the incisal and middle one third was marked on the distal sides of right and left central incisors using fine lead pencil.
- It was done so because mesio-distal width of central incisor is thought to be maximum at distal contact areas at junction of mesial and incisal one thirds.
- Measurement was done using vernier calipers. [Figure 4]

- In order to get maximum width two or more measurements were made one above and one below this level.

- The maximum of three readings were taken and recorded as the combined mesio-distal width of maxillary central incisors.

5. Measurement of mesio-distal width of Right and Left Maxillary Central Incisors

- This was done individually for right and left central incisors by the same method already described.
- The statistical analysis and comparison between mean value of the ratio and differences were done using "t" test of the analysis of variance to test the significance of data collected for the correlation of combined mesio-distal width of maxillary central incisors and width of philtrum in males and females.

Results

The mesio-distal width of right and left maxillary central incisors of every subject were measured and the combination of the dimensions were obtained by adding the individual values.

The width of philtrum was also measured in both the sexes. The descriptive statistics such as comparison between the mean difference of the mesio-distal width of maxillary central incisors, width of philtrum in both sex and the comparison of mesio-distal width of right and left maxillary central incisors according to sex is summarized in **Table I and II** respectively. The t-test shows statistically significant results.

- The combined mesio-distal width of maxillary central Incisor ranged between 16.0 to 18.8mm while philtrum ranged between 13.8-16.6mm.
- The difference between the width of philtrum and maxillary central incisor ranged between 0.9-3.6mm.
- The mean of combined mesiodistal width of maxillary central incisor was 17.44mm in males and 16.56mm in females.
- The mean width of philtrum was 15.76mm in males and 14.84mm in females.
- The combined mesiodistal width of maxillary central incisor in females ranged from 15.1 to 17.9mm whereas the philtrum ranged from 13.6 to 16.3mm. There was a range of 0.9-3.5mm in the difference between the width of maxillary central incisor and philtrum in females.

- In males, the mesiodistal width of right maxillary central incisor ranged from 7.5-9.5mm whereas it ranged from 8.0-9.3mm on left. The difference between right and left ranged between -0.2 to and +0.2mm. The width of right and left maxillary central incisor was same in 55.26% male subjects.
- In females, the mesiodistal width of right maxillary central incisor ranged from 7.5-8.9mm whereas it ranged from 7.4-8.8mm on left. The difference between right and left ranged between -0.2 to and

+0.3mm. The width of right and left maxillary central incisor was same in 25% female subjects.

Discussion

As the subjects were from same population, the results of this study are applicable to the Indian Population.

According to the **Table II** the combined mesiodistal width of maxillary central incisor was little less in females as compared to males. Combined mesiodistal width of maxillary central incisors has been also reported in literature to be lesser in females^{10,11,12}.

The combined mesiodistal width of maxillary central incisors is always greater than the width of philtrum. The mean difference between the widths of maxillary central incisors was 1.85mm in males and 1.67mm in females. The difference in both the sexes as well as in total were statistically significant ($p < 0.001$, Table I). These finding differed from the statement made by John H. Lee^{5,6} who states that the combined mesiodistal width of both maxillary central incisors was equal to the width of philtrum. This difference in findings may be attributed to the possible racial variation¹³ regarding the mesiodistal width of maxillary central incisors and width of philtrum (located in midline)¹⁴.

The result of this study shows that the sex factor has an influence on the size of the teeth as well as width of philtrum. The combined mesiodistal width of maxillary central incisors and width of philtrum was always greater in males in comparison to females. The results of this study are in conformity with the findings reported in the literature.

It is suggested that more than one anatomic landmark is required to predict the width of the maxillary anterior teeth also taking into consideration the facial and dental proportions 15 and smile analysis 16. The final decision regarding tooth selection should be made during the trial insertion stage of the denture and should be confirmed by consulting with the patient.

Summary And Conclusion

- Based on the observation and results, the following conclusions can be drawn:
- Sex is an influencing factor on size of teeth and philtrum.
- When the width of philtrum decreases the combined mesio-distal width of maxillary central incisor also decreases.
- The mean mesio-distal width of maxillary central incisor on right is 8.71mm and 8.72mm on left in males. While in females the mean mesio-distal width of maxillary central incisor was 8.30mm on right and 8.28 on left.



Fig.1: Measurement of Width of philtrum by Vernier Caliper in male subject

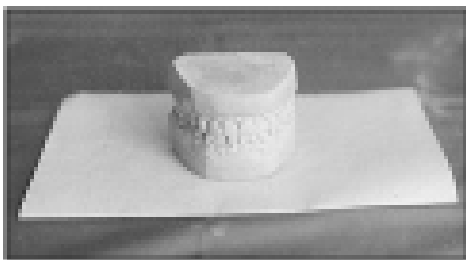


Fig.2: Study cast articulated in centric occlusion with maximum intercuspation

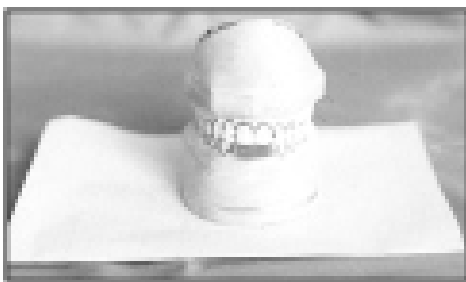


Fig.3: Modelling wax was adapted on the labial surface of lower anterior teeth and horizontal line marked along the lowest edges of maxillary central incisors

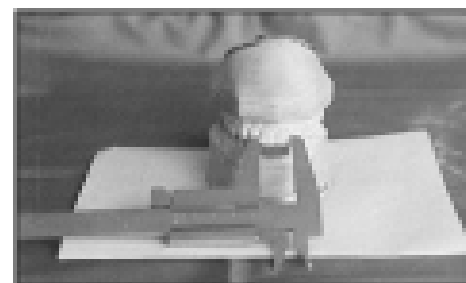


Fig.4: Measurement by vernier caliper between two points at distal contact areas of maxillary central incisors

Table I : Comparison between Width of Maxillary Central Incisors and Width of Philtrum in Males and Females

Sex	No. of Subject	Width of Maxillary Central Incisors and Width of Philtrum in millimeters		t	P
		Mean	SE		
Male	38	1.85	0.12	15.622	<0.01**
Female	20	1.67	0.17	10.093	<0.01**
Total	58	1.79	0.10	18.420	<0.01**
Male v/s Female				0.888	>0.05NS

NS=Insignificant, * = Significant at 0.05 level, ** = Significant at 0.01 level

Table II : Comparison between Width of Right and Left Maxillary Central Incisors according to Sex.

Sex	No. of Cases	Width of Right Maxillary		Width of Left Maxillary		t	P
		Central Incisors in millimeters		Central Incisors in millimeters			
		Mean	SE	Mean	SE		
Male	38	8.71	0.38	8.72	0.38	0.941	>0.05NS
Female	20	8.30	0.53	8.28	0.53	1.560	>0.05NS
Total	58	8.57	0.29	8.57	0.29	0.000	>0.05NS
Male v/s Female		t = 3.478		P < 0.05*		t = 3.950	

NS= Insignificant * = Significant at 0.05 level

- The restoration of contour of philtrum in complete denture is an important esthetic requirement. The measurement of its width may provide a valuable guide in determination of the width of maxillary central incisors.
- Statistically no significant difference was observed between the right and left central incisors among males and females, however there was significant difference between males and females ($p < 0.05$).
- Within the limitation of this study, the philtrum can be used to make a provisional or initial size selection of maxillary central incisors or can be used in combination with other means for tooth selection for an edentulous patient.

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Information For Authors

Ethics

When reporting experiments on human subjects, indicate whether the procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional or regional) and with the Helsinki Declaration of 1975, as revised in 2000 (available at http://www.wma.net/e/policy/17-c_e.html). Do not use patients' names, initials, or hospital numbers, especially in illustrative material. When reporting experiments on animals, indicate whether the institution's or a national research council's guide for, or any national law on the care and use of laboratory animals was followed.

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When possible, quantify findings and present them with appropriate indicators of measurement error or uncertainty (such as confidence intervals). Report losses to observation (such as dropouts from a clinical trial). Put a general description of methods in the Methods section. When data are summarized in the Results section, specify the statistical methods used to analyse them. Avoid non-technical uses of technical terms in statistics, such as 'random' (which implies a randomising device), 'normal', 'significant', 'correlations', and 'sample'. Define statistical terms, abbreviations, and most symbols. Use upper italics ($P < 0.05$).

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Present the results in logical sequence in the text, tables, and illustrations. Do not repeat in the text all the data in the tables or illustrations; emphasise or summarise only important observations.

Discussion

Emphasize the new and important aspects of the study and the conclusions that follow from them. Do not repeat in detail data or other material given in the Introduction or the Results section. Include in the Discussion section the implications of the findings and their limitations, including implications for future research. Relate the observations to other relevant studies.

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Acknowledgments

As an appendix to the text, one or more statements should specify

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2. acknowledgments of technical help; and
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References

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