

Comparative Evaluation of Maxillary and Mandibular Anterior Teeth Width with the Length of Index and Little Finger

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Abstract The size, color, morphology and arrangement of the anterior tooth are the various factors play an imperative role in achieving excellent esthetics in complete denture. Various modalities have been suggested for selecting the size of the anterior teeth like inter-alar distance, inter-canthal distance, bi-zygomatic width, intercanine width. There is no reliable method for selection of anterior teeth etc. To evaluate and compare the width of the maxillary and mandibular anterior teeth with the length of the index and little fingers. total of 50 people were taken for this study. They are grouped into four, Group I, 15–20 years; Group II, 20–30 years; Group III, 30–40 years; Group IV, 40–50 years. Irreversible hydro-colloid impressions of the maxilla and mandible were made and poured with dental stone. The widths of the maxillary and mandibular anterior teeth were measured with an adaptable ruler. The length of the index and little fingers were measured using a vernier caliper. There is significant correlation between the maxillary and mandibular anterior teeth with the index and little finger length. Conclusion: The maxillary anterior teeth width can be calculated with the formula $(1.130 \times \text{index finger length} - 11.972)$, mandibular anterior teeth width can be calculated with the formula $(1.006 \times \text{little finger length} - 2.231)$.

Keywords Anterior teeth width · Index finger · Little finger

Introduction

Esthetics is a primary consideration for patients seeking prosthodontic treatment. The esthetic restoration of the edentulous patient has an important psychological effect [1]. The development of new dental materials and techniques has led to a greater number of treatment options that maximize the likelihood of an attractive outcome. Toward this end, the size and form of the maxillary anterior teeth are important not only to dental esthetics, but also to facial esthetics. The goal is to have the maxillary anterior teeth restore optimal dento-labial relations in harmony with the overall facial appearance [2].

Patients receiving their first dentures often expect to appear similar to when they had their natural teeth. Therefore, the correct selection of the artificial teeth is essential to achieving a pleasant esthetic outcome. If some natural teeth remain, it is easier to choose artificial teeth that blend with the natural dentition than to choose teeth for the edentulous patient with no pre-extraction records available [3–5].

When anterior teeth are selected for completely edentulous subjects, the mesiodistal width of the maxillary central incisors is important because they are the most prominent teeth in the arch when viewed from the frontal aspect [6–9]. Various guidelines have been suggested for determining the size of teeth but different opinions have been reported regarding their significance [3, 10]. They must be in harmony with surrounding oral environment in terms of size, form, and color. To appear attractive, the maxillary anterior teeth must be in proportion to facial morphology [11–13].

Three methods are commonly used today for selecting the width of the 6 maxillary anterior teeth: The first is Berry's biometric ratio method, which is based on the 1:16

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maxillary central incisor width to bi-zygomatic width ratio introduced in 1905 [14]. The Trubyte Tooth Indicator is based on the biometric ratio, and can be used for estimating the width, length, and outline and profile forms of the maxillary anterior. Secondly, interalar width measurement is also used as a method to determine denture tooth. Thirdly, the distance between the relaxed corners of the mouth represents an appropriate width for the 6 maxillary anterior teeth (canine to canine) [15, 16].

In 1914 Williams [17] found a relationship between the size of faces and the size of teeth. Pound [18] determined face width by measuring the distance from zygoma to zygoma. The length is determined from hairline to gnathion. These measurements are divided by 16 indicate the length and width of the maxillary central incisor [19].

Several anatomic measurements have been proposed to aid in determining the correct size of the anterior teeth like inter-commissural width, bilygomatic width, inter-alar width, and inter-pupillary distance [5, 20–23]. However, there is little scientific data in the dental literature to use as a guide for defining the proper size and shape of anterior teeth. The selection of maxillary anterior teeth for complete dentures has posed a problem in clinical practice and a controversy about the best method to employ still exists. According to Leonardo da Vinci an ideal human proportions were governed by the harmonious proportion that he believed in. So that the body structures have a definite correlation with each other. Hence this study was conducted to evaluate and compare the width of the maxillary and mandibular anterior teeth with the length of the index and little fingers.

Materials and Methods

The patients reported to the Dept of Prosthodontics, SRM Dental College, Chennai were participated in this study. A total of 50 peoples were taken for this study. They are grouped into four, Group I, 15–20 years; Group II, 20–30 years; Group III, 30–40 years; Group IV, 40–50 years. The inclusion criteria were [1] no missing maxillary or mandibular anterior teeth [2] no gingival or periodontal conditions problems in the anterior teeth [3] no inter-dental spacing or crowding; [4] no anterior restoration; and [5] no history of orthodontic treatment. The exclusion criteria were (1) dental malocclusion (2) supra-erupted teeth (3) altered passive eruption (4) developmental anomalies (5) anodontia (6) apparent loss of tooth structure due to attrition, fracture, caries, or restorations.

Irreversible hydrocolloid (Zelgon plus–Dentsply India) impressions of the maxillary and mandibular arches were made in stock trays and poured with dental stone (Denstone–Vankaj, India). The width of the anterior teeth was measured from the maximum distance between the mesial and distal contact points of the tooth on a line

perpendicular to the long axis using a adaptable ruler (Figs. 1, 2). To measure the length of the index and little finger a new acrylic device was prepared. Putty impression of index finger was made and poured with dental stone. A mold was prepared. The cast was stabilized in it. Auto-polymerizing acrylic resin was added in the mold space. A slot was created using carborundum disc. The length of the little and index finger were measured from the tip of the finger to the lower border of the line using vernier caliper with a precision of 0.01 mm (Figs. 3, 4, 5). Each parameter was measured three times and the average value was recorded.

Results

For this study 50 maxillary and mandibular casts were measured to evaluate the width of the maxillary and mandibular casts. Table 1 showed the difference between the index finger length with maxillary anterior teeth width in percentage. Table 2 difference between index finger length with mandibular anterior teeth in percentage. The values were analysed using regression analysis. The correlation value (r) $-1 < r < +1$ for maxillary anterior teeth



Fig. 1 Mandibular anterior teeth width

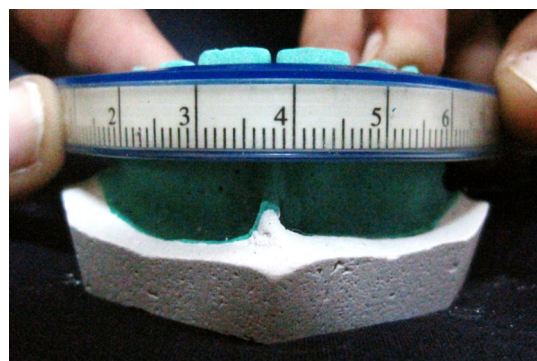


Fig. 2 Maxillary anterior teeth width

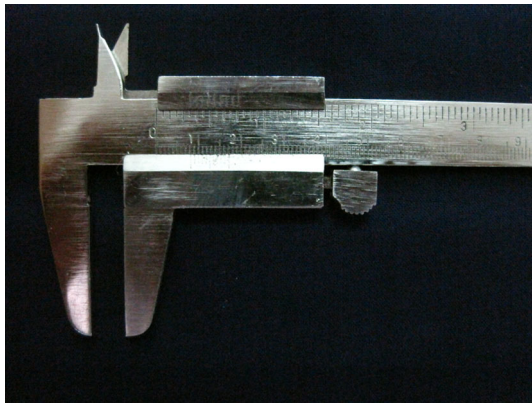


Fig. 3 Vernier caliper



Fig. 4 Index finger length

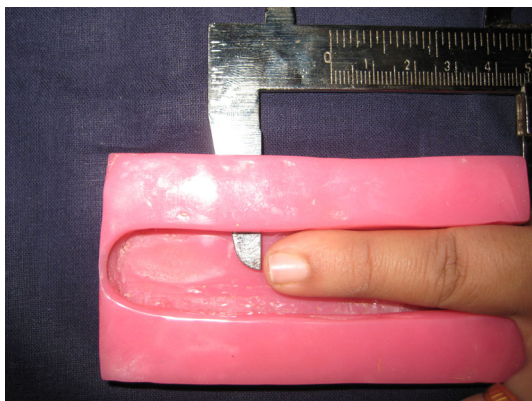


Fig. 5 Little finger width

is 0.964. The actual value of the total maxillary anterior width was highly correlated to the index finger length with a value of 0.964. The correlation value for mandibular anterior teeth is 0.984. The actual value of the total mandibular anterior width was highly correlated to the index finger length with a value of 0.984. Level of significance is 0.01. Hence the maxillary anterior teeth width can be

Table 1 Difference between index finger length and maxillary anterior teeth in percentage

$x > 1$	3	15 %
$1 \leq x \leq 2$	1	5 %
$2 \leq x \leq 3$	13	65 %
$3 \leq x \leq 4$	3	15 %

Table 2 Difference between index finger length and mandibular anterior teeth in percentage

$x > 1$	1	5 %
$1 \leq x \leq 2$	12	60 %
$2 \leq x \leq 3$	6	30 %
$3 \leq x \leq 4$	1	5 %

calculated with the formula $(1.130 \times \text{index finger length} - 11.972)$, mandibular anterior teeth width can be calculated with the formula $(1.006 \times \text{little finger length} - 2.231)$.

Discussion

One of the most confusing and difficult aspects of complete denture prosthodontics is the selection of appropriately sized maxillary anterior denture teeth. Many attempts have been made to quantify the selection of anterior teeth for complete dentures, but little consensus on an effective method has been reached [21].

One of the critical aspects of esthetic dentistry is creating geometric or mathematical proportion to relate the successive width of anterior teeth. Golden proportion, golden percentage, recurring esthetic dental care theories introduced in the field. Lombardi [24–26] was the first to suggest the application of golden proportion in dentistry. Golden proportion and RED are unsuitable methods to relate the successive width of the maxillary anterior teeth in natural dentition [27].

Kern [28] found that 93 % of nasal-width was equal to or within 0.5 mm of the four maxillary incisors. The inter alar width is a reliable guide for selecting the mold of anterior teeth and that the incisive papilla provides a stable anatomical landmark for arranging the labial surfaces of the central incisors at 10 mm anterior the posterior border of the papilla [7]. The width of the nose, when measured in digital photograph can be utilized as a guide for the selection of the maxillary anterior teeth width [29].

Cesario and Latta [21] found that a ratio of 6.6 existed between the inter-pupillary distance and the central incisor width in white men and women, and also in black-women. Latta et al. [22] concluded that the relationships among the

width of the mouth, the interalar width, the bizygomatic width, and the inter-pupillary distance might be used as references if applied in combination, although racial and gender differences were detected when anatomic measurements were evaluated individually.

ICD should be used only as reference value in estimations of central incisor width. Final tooth selection for edentulous subjects should be made in accordance with facial form [23]. The use of the right hamular notch to left hamular notch measurement plus 10 mm provides a useful method for determining the width of the 6 maxillary anterior teeth for complete denture patients with medium and large cast sizes [30].

In these present study 50 peoples maxillary and mandibular anterior teeth were measured in the casts using vernier caliper. The results showed that there is significant correlation between the maxillary and mandibular anterior teeth with the index and little finger length. The maxillary anterior teeth width can be calculated with the formula ($1.130 \times \text{index finger length} - 11.972$), mandibular anterior teeth width can be calculated with the formula ($1.006 \times \text{little finger length} - 2.231$).

Conclusion

Within the limitations of the study I concluded that there is significant correlation between the maxillary and mandibular anterior teeth with the index and little finger length. The maxillary anterior teeth width can be calculated with the formula ($1.130 \times \text{index finger width length} - 11.972$), mandibular anterior teeth width can be calculated with the formula ($1.006 \times \text{little finger length} - 2.231$).

References

- Krajicek DD (1960) Natural appearance for the individual denture patient. *J Prosthet Dent* 10:205–214
- Hasanreisoglu U, Berksun S, Aras K, Arslan I (2005) An analysis of maxillary anterior teeth: facial and dental proportions. *J Prosthet Dent* 94:530–538
- Sellen PN, Jaggar DC, Harrison A (1999) Methods used to select artificial anterior teeth for the edentulous patient: a historical overview. *Int J Prosthodont* 12:51–58
- Wazzn KA (2001) The relationship between intercanthal dimension and the width of maxillary anterior teeth. *J Prosthet Dent* 86:608–612
- Hoffman W, Bomberg TJ, Hatch RA (1986) Interalar width as a guide in denture tooth selection. *J Prosthet Dent* 55:219–221
- Heatwell CM, Rahn AO (1986) Syllabus of complete dentures, 4th edn. Lippincott William & Wilkins, Philadelphia, pp 313–314
- Mavroskoufis F, Ritchie GM (1980) Variation in size and form between left and right maxillary central incisor teeth. *J Prosthet Dent* 43:254–257
- Lavelle CL (1972) Maxillary and mandibular tooth size in different racial groups and in different occlusal categories. *Am J Orthod* 61:29–39
- Sanin C, Savara BS (1971) Permanent mesiodistal crown size. *Am J Orthod* 59:488–500
- Varjao FM, Nogueira SS (2005) Intercommissural width in 4 racial groups as a guide for the selection of maxillary anterior teeth in complete dentures. *Int J Prosthodont* 18:513–515
- Ricketts RM (1982) The biologic significance of the divine proportion and fibonacci series. *Am J Orthod* 81:351–370
- Marquardt SR (2002) Dr. Stephen R. Marquardt on the golden decagon and human facial beauty. Interview by Dr. Gottlieb. *J Clin Orthod* 36:339–347
- Gurel G (2003) The science and art of porcelain laminate veneers. Quintessence, London, pp 83–86
- Berry FH (1905) Is the theory of temperatures the foundation of the study of prosthetic art. *Dent Mag* 1:405
- Baker PS (2009) Tooth selection. In: Rahn AO, Ivanhoe JR, Plummer KD (eds) Textbook of complete dentures, 6th edn. People's Medical Publishing House, Shelton, p 188
- Lieb N, Silverman SI, Garfinkel L (1967) An analysis of soft tissue contours of the lips in relation to the maxillary cuspids. *J Prosthet Dent* 18:292
- Williams JL (1914) A new classification of human tooth form with special reference to a new system of artificial teeth. *Dent Cosmos* 56:627–628
- Pound E (1973) Personalised denture procedures Anaheim. Denar Corporation, Calif, p 22
- Winkler S (1979) Essentials of complete denture prosthodontics. WB Saunders Co., Philadelphia
- Scandrett FR, Kerber PE, Umrigar ZR (1982) A clinical evaluation of techniques to determine the combined width of the maxillary anterior teeth and the maxillary central incisor. *J Prosthet Dent* 48:15–22
- Cesario VA, Latta GH Jr (1984) Relationship between the mesiodistal width of the maxillary central incisor and interpupillary distance. *J Prosthet Dent* 52:641–643
- Latta GH, Weaver JR, Conkin JE (1991) The relationship between the width of the mouth, interalar width, bizygomatic width, and interpupillary distance in edentulous patients. *J Prosthet Dent* 65:250–254
- Abdullah MA (2002) Inner canthal distance and geometric progression as a predictor of maxillary central incisor width. *J Prosthet Dent* 88:16–20
- Lombardi RE (1973) The principles of visual perception and their application to denture esthetics. *J Prosthet Dent* 29:358–382
- Levin EL (1978) Dental esthetics and golden proportion. *J Prosthet Dent* 40:244–252
- Ward DH (2001) Proportional smile design using the recurrent esthetic dental proportion. *Dent Clin North Am* 45:143–154
- Sreenivasan murthy BV, Ramani N (2008) Evaluation of natural smile: golden proportion, RED or Golden percentage. *J Conserv Dent* 11:16–21
- Kern BE (1967) Anthropometric parameters of tooth selection. *J Prosthet Dent* 17:431
- Vanderlei LG, Luiz CG, Marcio MC, Barbara DL (2009) Interalar distance to estimate the combined width of the six maxillary anterior teeth in rehabilitation treatment. *J Esthet Restor Dent* 21:26–36
- Philip SB, Walter J, Carol AL, George AP, Stephen WL (2010) The Relationship of denture cast measurements to width of maxillary anterior teeth. *J Prosthet Dent* 105:44–50