Original Article

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Determination of Anthropometric Correlation of Golden Proportions Existing in Maxillary Anterior Teeth of the Northern Indian Population: An Original Research

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Abstract

Background and Purpose: The gold standard for achieving optimal esthetics while recreating the esthetics has been in accordance with the concept of 'Golden Proportion'. The main purpose for conducting the present study was to estimate an average value of mesiodistal dimensions of the maxillary anterior teeth in the mixed population of northern India and its correlation with the ideal values of golden proportion.

Methodology: In the present study 100 subjects were selected (50 male and 50 female). Maxillary impressions were made using Non-aqueous elastomeric impression material and poured with dental stone. The dimensions Maxillary anterior teeth measured using digital vernier caliper. The widths of the teeth were measured from the mesial contact point to distal contact point of the respective teeth.

Results: Data obtained were tabulated and subjected to one sample t-test. The proportion for the Width of the right and left Maxillary Lateral to central Incisor was found to be 0.70 mm, and it was not in correlation with golden proportion. For the canine to lateral incisor, it was identified that there was a correlation with golden proportion with the results obtained was 0.60 mm.

Conclusion: The results obtained for the ratio of the Maxillary Right and Left Lateral Incisor to Central Incisor and golden proportion were not in correlation. However, the results obtained for the ratio of the Maxillary Right and Left Canine to Lateral Incisor and Golden Proportion were in correlation.

Keywords: Maxillary central incisor; Golden Proportion; Vernier Caliper.

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INTRODUCTION

Selection of artificial teeth for anterior region requires a knowledge and understanding of number of physical and biologic factors that are directly related to each patient.[1] The dentist must perform this phase of prosthodontic care for anterior teeth since he is the only person who can accumulate, correlate and evaluate the Bio-mechanical information. So that the selection of anterior teeth will meet the individual esthetic and functional needs of the patient. One of the most

important tasks in esthetic dentistry is the creation of harmonious proportions between the widths of maxillary anterior teeth when restoring or replacing them. Aesthetics involves more than the six anterior maxillary teeth which involves the concept of the 'golden proportion' and has often been offered as a cornerstone of smile design theory.[2]

Physiognomy is the art of judging an individual's character or personality by the appearance of their face.[3] The artistic parameters to be considered for essential beauty and those which are subtly present in natural beauty form the fundamental principles of esthetics. Understanding these artistic parameters of beauty and co-relating them to the dento-facial complex will enable the dentist to appropriately scale esthetics in any dento-facial composition. When mathematics is applied to the study of ideal tooth form, a numerical relationship is established within a single tooth form (ideal proportion) and also between a series of teeth in the arch (relative proportion). The position of the tooth in the arch, the relationship between the width, the length and the face of the tooth can also be numerically established in relation with certain anatomic landmarks the upper anterior teeth are not a white monolithic band bordered by lips, but distinctentities with specific proportions andembrasures. ***Golden Proportion*** is expressed in numerical form as the ratio 1.618:1 and applied by classical mathematicians such as Euclid and Pythagoras in pursuit of universal divine harmony and balance.[4]

MATERIAL AND METHOD

A prospective study was conducted in the Department of the Prosthodontics, Faculty of Dental sciences, Banaras Hindu University. The study was conducted on the students of the Dental College which were included as participants. On the basis of the pilot study, Sample size proposed for the study was 100 keeping equal variants of male and female (50 male and 50 female), with age group of 20 years to 26 years, after they fulfilled the inclusion and exclusion criteria.

Subjects were included having complete upper and lower anterior teeth, no periodontal disease, no spacing and crowding in anterior maxillary teeth, no history of orthodontic treatments, no intruded, extruded or rotated teeth in the anterior region. Subjects were excluded subjects with any kind of prosthesis in relation to Maxillary anterior teeth.

Stock tray was selected and modified according to the contours of patient's arch. Maxillary impression was made Non-Aqueous Addition silicone elastomeric impression material. Impression material was manipulated according to the manufacturer's instruction, once impression was set it was retrieved from the mouth and waspoured using dental stone (Type III). After setting of the dental stone, it was retrieved from the impression and base of the cast was poured with dental plaster (Type II). The dimensions of maxillary anterior teeth were measured using digital vernier caliper (Fig. 1). The mesiodistal widths of the teeth were measured from the mesial contact point to distal contact point of the teeth (Fig. 2). Two observers were recruited and the device was calibrated to measure the readings for three times by two different observers and the mean values were calculated after the recordings.

RESULTS

Descriptive statistics of the values were obtained and tabulated and subjected to statistical analysis for one sample t–test. The mean values for the Maxillary Central Incisor for right and left side were 8.30 ± 0.20 and 8.30 ± 0.20 mm respectively. For the right and left Lateral Incisor it was found 6.00 ± 0.70 and 6.00 ± 0.70 mm respectively, also mean for the right and left canine it was 3.5 ± 0.50 and 3.5 ± 0.50 respectively (Table 1).



Fig. 1: Digital Vernier Caliper for Measuring Dimension

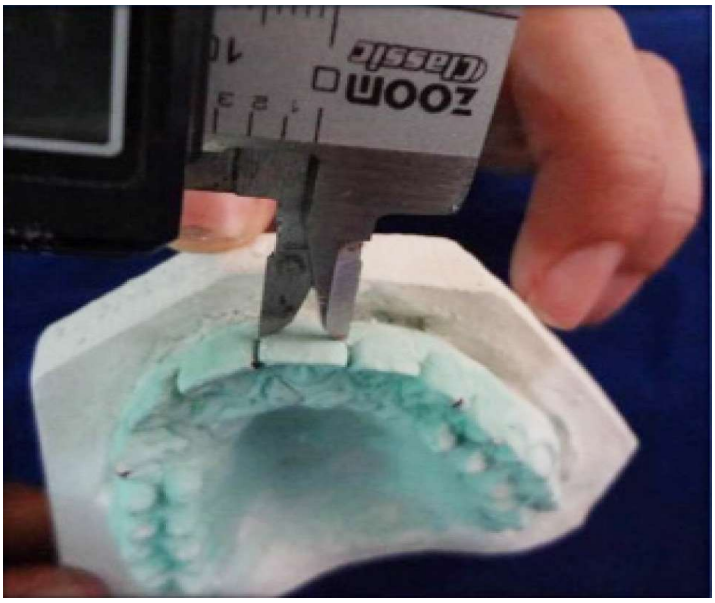


Fig. 2: Measurement of Width of Maxillary Anterior Teeth

Table 1: The mean values for the Maxillary Central Incisor for right and left side

S. No.	Right			Left		
	Central incisor	Lateral Incisor	Canine	Central incisor	Lateral Incisor	Canine
1	11	6.8	4.2	11	6.8	4.2
2	9.5	5.9	3.7	9	5.6	3.5
3	10	6.2	3.8	10	6.2	3.8
4	8	5	3.1	8	5	3.1
5	9.5	5.9	3.7	10	6.2	3.8
6	8	5	3.1	8.5	5.3	3.3
7	10.5	6.5	4	10	6.2	3.8
8	8.5	5.3	3.3	8.5	5.3	3.3
9	9.5	5.9	3.7	9.5	5.9	3.7
10	11	6.8	4.2	11	6.8	4.2
11	12	7.4	4.6	10	6.2	3.8
12	11	6.8	4.2	9	5.6	3.5
13	8	5	3.1	8	5	3.1
14	8	5	3.1	8.5	5.3	3.3
15	9.5	5.9	3.7	9.5	5.9	3.7
16	8.5	5.3	3.3	8.5	5.3	3.3
17	7.7	4.8	3	7.8	4.8	3
18	8.4	5.2	3.2	8.4	5.2	3.2
19	9.7	6	3.7	9.7	6	3.7
20	8.8	5.5	3.4	8.5	5.3	3.3
21	9.4	5.8	3.6	9	5.6	3.5
22	9.6	6	3.7	9.2	5.7	3.5
23	9.5	5.9	3.7	9.5	5.9	3.7
24	8.5	5.3	3.3	8.4	5.2	3.2
25	8.2	5.1	3.2	8	5	3.1
26	9.5	5.9	3.7	9.3	5.8	3.6

Table Cont...

27	9.7	6	3.7	9.5	5.9	3.7
28	8.4	5.2	3.2	8.5	5.3	3.3
29	7.5	4.7	2.9	7.6	4.7	2.9
30	8.9	5.5	3.4	8.6	5.3	3.3
31	9.2	5.7	3.5	9.3	5.8	3.6
32	7.9	4.9	3	8	5	3.1
33	8.5	5.3	3.3	8.4	5.2	3.2
34	8.8	5.5	3.4	8.6	5.3	3.3
35	7.4	4.6	2.8	7.3	4.5	2.8
36	7.8	4.8	3	7.9	4.9	3
37	7.5	4.7	2.9	7.8	4.8	3
38	8.3	5.1	3.2	8.5	5.3	3.3
39	7.4	4.6	2.8	7.5	4.7	2.9
40	7.5	4.7	2.9	7.3	4.5	2.8
41	8.9	5.5	3.4	8.6	5.3	3.3
42	7.4	4.6	2.8	7.3	4.5	2.8
43	7.8	4.8	3	7.9	4.9	3
44	7.5	4.7	2.9	7.8	4.8	3
45	9.1	5.6	3.5	8.8	5.5	3.4
46	8.8	5.5	3.4	8.6	5.3	3.3
47	7.4	4.6	2.8	7.3	4.5	2.8
48	7.8	4.8	3	7.9	4.9	3
49	7.5	4.7	2.9	7.8	4.8	3
50	8.3	5.1	3.2	8.5	5.3	3.3
51	6.6	4.1	2.5	6.7	4.2	2.6
52	8.8	5.5	3.4	8.6	5.3	3.3
53	7.4	4.6	2.8	7.3	4.5	2.8
54	7.8	4.8	3	7.9	4.9	3
55	7.5	4.7	2.9	7.8	4.8	3
56	8.3	5.1	3.2	8.5	5.3	3.3
57	10.1	6.3	3.9	10	6.2	3.8
58	8.6	5.3	3.3	8.7	5.4	3.3
59	8.3	5.1	3.2	8.4	5.2	3.2
60	7.6	4.7	2.9	7.5	4.7	2.9
61	9	5.6	3.5	8.6	5.3	3.3
62	7.4	4.6	2.8	7.3	4.5	2.8
63	7.8	4.8	3	7.9	4.9	3
64	7.5	4.7	2.9	7.8	4.8	3
65	8.3	5.1	3.2	8.5	5.3	3.3
66	6.2	3.8	2.4	6.3	3.9	2.4
67	8.5	5.3	3.3	8.5	5.3	3.3
68	8.5	5.3	3.3	8.5	5.3	3.3
69	9.4	5.8	3.6	9.6	6	3.7
70	7.3	4.5	2.8	7.4	4.6	2.8
71	8.8	5.5	3.4	8.6	5.3	3.3
72	9.6	6	3.7	9.4	5.8	3.6
73	8.6	5.3	3.3	8.5	5.3	3.3

Table Cont...

74	7.5	4.7	2.9	7.8	4.8	3
75	8.3	5.1	3.2	8.5	5.3	3.3
76	7.4	4.6	2.8	7.4	4.6	2.8
77	9	5.6	3.5	8.7	5.4	3.3
78	9.3	5.8	3.6	9.1	5.6	3.5
79	10.2	6.3	3.9	10.2	6.3	3.9
80	8.5	5.3	3.3	8.5	5.3	3.3
81	9.4	5.8	3.6	9.6	6	3.7
82	7.3	4.5	2.8	7.4	4.6	2.8
83	8.8	5.5	3.4	8.6	5.3	3.3
84	7.4	4.6	2.8	7.3	4.5	2.8
85	7.8	4.8	3	7.9	4.9	3
86	7.5	4.7	2.9	7.8	4.8	3
87	8.3	5.1	3.2	8.5	5.3	3.3
88	6.6	4.1	2.5	6.8	4.2	2.6
89	8.8	5.5	3.4	8.6	5.3	3.3
90	7.4	4.6	2.8	7.3	4.5	2.8
91	7.5	4.7	2.9	7.4	4.6	2.8
92	7.5	4.7	2.9	7.8	4.8	3
93	9.1	5.6	3.5	9.1	5.6	3.5
94	8.4	5.2	3.2	8.4	5.2	3.2
95	7.5	4.7	2.9	7.6	4.7	2.9
96	8.5	5.3	3.3	8.7	5.4	3.3
97	7.8	4.8	3	7.7	4.8	3
98	8.5	5.3	3.3	8.5	5.3	3.3
99	7.9	4.9	3	8.5	5.3	3.3
100	11.2	6.9	4.3	11.2	6.9	4.3

The proportion for the maxillary anterior teeth was compared with the golden proportion. The proportion for the Width of the right and left Maxillary Lateral to central Incisor was found to be 0.70 mm. Thus, there was close correlation found between Lateral to Central Incisor and golden proportion. However, for the canine to lateral incisor it was identified that there was a correlation with golden proportion with the results obtained was 0.63 mm (Table 2). Henceforth, the assessment of width-to-width ratio of the Maxillary Anterior teeth showed that there was no correlation found for the Lateral to Central Incisor and golden proportion, but there was correlation that exists between Canine to Lateral and golden proportion.

DISCUSSION

When mathematics is applied to the study of ideal tooth form, a numericalrelationship is established within a single tooth form (ideal proportion) and alsobetween a series of teeth in the arch (relative proportion). **Gold Proportion** is applied to the smile made up of the central, lateral incisor and themesial half of the canine, it shows that the central incisor is 62% wider than the lateralincisor which in turn is 62% wider than the visible portion of the canine which is themesial half, when viewed from the front.[5] The size and morphology of maxillary central incisors are the key determinants in esthetically accepted cases. Since the position of maxillary anterior teeth has the strongest influence on esthetics and only few guidelines describe their proportions, it seemed reasonable to perform the study to define the 'average proportions' in intact dentition, and to compare them with the Golden Proportion. On the contrary Gestalt theory implies that the mind organisesthe outside world so that it can come to termswith it. This involves creating meaning, stability, balance and security. These concepts allow theobserver to achieve a better object-background (figure ground) relationship by encapsulatingthe following four constituents: Proximity Similarity Continuity Closure.[3] In traditional methods extracted teeth were used for measuring tooth sizes, but at present photographs and casts are

used for this purpose instead of extracted teeth. But measuring the ratios from the obtaining casts would give accurate measurements of the tooth, and for which measuring dimensions of the tooth from the cast was done in this study and the results obtained were compared for golden proportion. Mean with standard deviation were obtained for the Maxillary Anterior teeth (Table 1). The ratio for maxillary lateral incisor to central incisor was found to be 70% (0.70 mm) (Table 2). Thus, the proportion of the maxillary lateral incisor to the central incisor found no correlation with the golden proportion.

Another ratio measured for canine to lateral incisor was 63% (0.63 mm) (Table 2). The results obtained in this study were similar to the results obtained by the Parnia *et al.*[1], who reported the tooth-to-tooth measurements for canine to lateral incisor was also 63%.

Henceforth, the proportion of maxillary canine to lateral incisor, results obtained were in correlation with the golden proportion. However, assessment for the ratio of Maxillary Lateral Incisor to Central Incisor were not in correlation with golden proportion, but the ratio for the Maxillary Canine to Lateral Incisor were in correspondence to golden proportion.

Because of the variety in nature, esthetics in dentistry for the individuals should not be standardized in the same way. Although we should follow some fundamental guidelines in esthetic treatment planning, it should be acknowledged that esthetics varies greatly from person to person. It is therefore important to consider the dentofacial specificities of each individual and the wide variety of natural teeth proportions when restoring or replacing the maxillary anterior teeth. In addition, individual cultural characteristics and perceptions of beauty must be considered.[6]

CONCLUSION

From the present study, the following conclusions were drawn:

The results obtained for the ratio of the Maxillary Right and Left Lateral Incisor to Central Incisor and golden proportion were in close correlation.

However, the results obtained for the ratio of the Maxillary Right and Left Canine to Lateral Incisor and Golden Proportion were in absolute correlation.

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