

Evaluation of Recurring Esthetic Dental Proportion in Natural Mandibular Anterior Dentition

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ABSTRACT

Aim: The concept of the Recurring esthetic dental (RED) proportion is useful in diagnosing and developing symmetry, dominance and proportion for esthetically pleasing smiles. This study was undertaken to evaluate validity of RED proportion in mandibular anterior teeth.

Materials and Method: One hundred and three subjects in age group of 50 yrs. and more were selected for the study. Photographs of subjects were taken using Nikon D200 camera with 135mm lens and analyzed using Adobe Photoshop CS4 extended software. The widths of mandibular central incisor, lateral incisor and canine were measured with this software and their successive proportions were calculated.

Results: After calculating proportions in mandibular anterior teeth, P value was found to be statistically insignificant ($P>0.05$).

Conclusion: Within the limitations of the study, RED proportion was not seen in mandibular natural dentition.

Keywords: Dentition, Esthetics, Mandible.

INTRODUCTION

The literature has shown that esthetics seems to be more important than functions of teeth. So the people are more concerned about their missing anterior teeth and their replacement than posterior teeth¹. Principles that make up esthetics are difficult to analyze². For esthetically pleasing smiles, amount of maxillary and mandibular teeth display with lip at rest or during function is important. The amount of maxillary tooth displayed is inversely proportional to increasing age whereas the amount of mandibular teeth is directly proportional to increasing age. Therefore, a young person will display more



maxillary than mandibular teeth, whereas an older individual will show more mandibular rather than maxillary teeth. Individual with shorter upper lips displays more maxillary anterior, and those with longer upper lips show more mandibular anterior teeth³. As mandibular anterior teeth display increases with age, it is equally important as maxillary anterior teeth for smile analysis. So this study was undertaken to analyze whether RED proportion exists in mandibular anterior teeth or not. Methodical analysis has revealed that such principles can be applied to evaluate and alter dental esthetics with predictability if they really exist⁴. Each principle can be considered, recognized, assessed and developed individually in esthetic management⁵. Among the esthetic principles, the proportion can be predicted with a formula that

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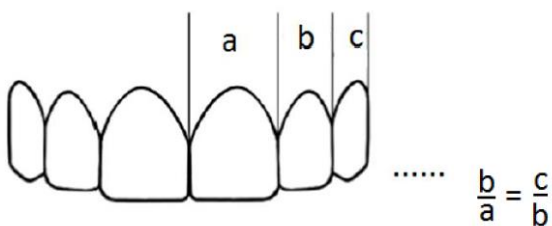


Fig 1: Successive widths of the teeth as viewed from front should remain constant as one move distally. (RED proportion concept).



Fig 2: Width of mandibular anterior teeth as measured at contact area.

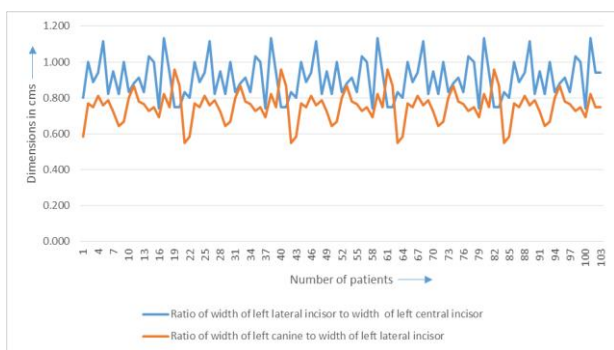


Fig 3: Comparison of ratio of width of left lateral incisor to central incisor and ratio of width of left canine to left lateral incisor.

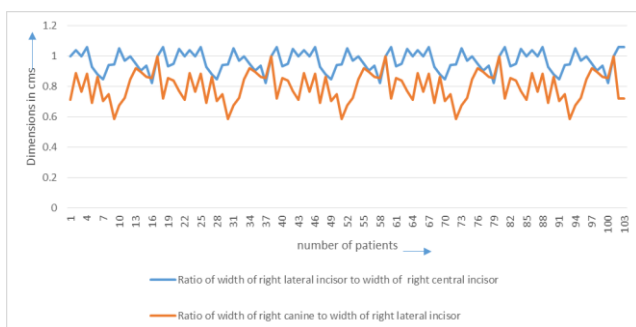


Fig 4: Comparison of ratio of width of right lateral incisor to central incisor and ratio of width of right canine to right lateral incisor.

defines the ratio of the component from one constituent to the next. 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 and recurring esthetic dental proportion are theories introduced in this field⁶. The recurring esthetic dental (RED) proportion is a concept proposed by Ward. The RED proportion states that the proportion of the successive widths of the maxillary teeth as viewed from the front should remain constant while progressing distally (Figure 1)⁴. When viewed from the front, the width of each successive tooth depreciates by the same proportion relative to the tooth mesial to it.

MATERIALS AND METHOD

One hundred and three subjects in age group of 50 years and more were selected for this study. The selected population was approved as having esthetic smile by a four member panel comprising of non-dentists from general population.

Inclusion criteria for the subjects included in study were well aligned maxillary and mandibular anterior teeth. Exclusion criteria were missing teeth except for possibly the third molar, mandibular anterior restorations, trauma, or any maxillofacial surgery, unpleasant dental alignment (crowding, spacing, rotation, or severe dental tilt), remarkable malformations, discoloration, or structural deformities of the teeth, unpleasant fractured teeth, severe dento-facial deformities, unpleasant gingival color or contour & obvious asymmetries. Photographs of the subjects were taken from the frontal view with Nikon D200 camera, 135 mm lens with a tripod, at a distance of 1 meter, and by the same and single investigator throughout the study. The lower lip was retracted in all photographs to clearly display the mandibular anterior teeth as well as its respective gingiva. Photographs were analyzed using Adobe Photoshop CS4 extended software. The width of mandibular central incisors, lateral incisors and canines were measured using the scale tool provided in the software. The teeth were evaluated for maximum width at contact area (Figure 2). Each measurement was made thrice by the same operator and the repetitive value was used for accuracy and calibration of results. Ratio of widths of mandibular lateral incisor to central incisor and ratio of width of canine to lateral incisor of both side were calculated and evaluated for RED proportion. The

measurements were entered in in Microsoft excel sheet and statistically analyzed.

RESULTS

Table 1: Paired t-test for comparison of ratio of left side.

	Ratio of width of left lateral incisor to width of left central incisor	Ratio of width of left canine to width of left lateral incisor
Mean	0.908	0.752
Variance	0.012	0.008
Observations	103	103
Pearson Correlation	0.036	
df	102	

Table 2: Paired t-test for ratio of right side.

	Ratio of width of right lateral incisor to width of right central incisor	Ratio of width of right canine to width of right lateral incisor
Mean	0.96	0.800
Variance	0.004	0.001
Observations	103	103
Pearson Correlation	-0.05392	
df	102	

Width of teeth were measured using tool in Adobe Photoshop CS4 extended software and were entered in Microsoft excel sheet and ratio of lateral incisor to central incisor and canine to lateral incisor were measured for both right and left sides. This data were statistically analyzed using paired t test. P value was found to be statistically insignificant ($P > 0.05$) (Table 1 & 2). So this suggests that RED proportion does not exist in natural mandibular anterior teeth. Secondly after statistical analysis it was noticed that ratio of width of canine to lateral incisors as viewed from front is always less than that of lateral incisor to central incisor.

DISCUSSION

Different proportions are described in the literature for the size of anterior teeth e.g. are golden proportion, golden percentage proportion, repeated ratio/ continuous proportion and RED

proportion etc. One long accepted theorem of relative proportionality of anterior teeth typically visible in smile involves concept of golden proportion. Based on Levin's formula⁷, a smile, when viewed from front, is considered to be esthetically pleasing if each tooth in that smile is approximately 60% of the size of tooth immediately mesial to it. Preston⁸ found that only 17% of patients were having maxillary lateral incisor in golden proportion to maxillary central incisor and none of canine was in golden proportion to lateral incisor. And it has been believed that when the golden proportion is used, lateral incisor seems to appear too narrow and the resulting canine will not be prevalent enough.

Based on golden percentage proportion Snow^{9,10} stated that width of maxillary central incisor should be 25% the intercanine distance in the frontal view. When the elements of golden proportion and continuous proportion are combined, the result derived gives the Recurring esthetic dental proportion. Ward^{11,12,13} proposed RED proportion which states that successive widths of the teeth as viewed from the frontal should remain constant as ones moves distally.

The overall esthetic appearance of a human smile is governed largely by the symmetry and proportionality of the teeth that constitute the smile. The overall harmony and balance of a smile depend largely on proper position, rotation and their alignment of teeth in arch. Illusion due to rotation of teeth play a significant role in dental esthetics. Rotation of mandibular canine makes illusion that width of canine is less than the width of mandibular lateral incisor when viewed from front. So along with the size and proportionality of teeth its position and alignment is equally important in dental esthetics.

Camera used in this study was Nikon D200 with 135mm lens with tripod. The distance maintained during throughout study was 1 meter. To maintain accuracy and calibration of result throughout the study photos were taken 3 times by the same operator.

It is important to determine a mathematical or geometrical relationship between teeth, in order to achieve an esthetic restorative result. It would be helpful if statistically reliable relationships existed

to support the existing relationship theories. The ratio between central and lateral incisors and between lateral incisor and canine is not constant in this study, as suggested by Ward^{11,12,13}. Hence, there is no evidence in this study to support the RED proportion theory as applied to natural mandibular anterior dentition.

CONCLUSION

In the light of the results of this investigation the following conclusions can be derived: RED proportion was not found to exist between the six mandibular anterior teeth. In order to establish objectively quantifiable width ratio between mandibular anterior teeth, ethnic differences should be taken into consideration. This will also help determine exactly what percentages are truly golden.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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