https://doi.org/10.48047/AFJBS.6.Si3.2024.2941-2945

African Journal of Biological Sciences

Journal homepage: http://www.afjbs.com

Research Paper Open Access

Recurring esthetic dental proportion as applied to maxillary anterior dentition in young adults: An original research

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Article Info

Volume 6, IssueSi3, 2024

Received: 20Apr 2024

Accepted: 05 May 2024

DOI:

10.48047/AFJBS.6.Si3.2024.2941-2945

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 maxillary anterior teeth.

Materials and Method: Twenty subjects in age group of 18-25 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 maxillary central incisor, lateral incisor and canine were measured with this software and their successive proportions were calculated.

Results: After calculating proportions in maxillary 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 maxillary natural dentition.

Keywords: Dentition, Esthetics, Maxillary.

1. Introduction

Recent research underscores a trend where individuals give more importance to the cosmetic appeal of their teeth rather than their functional value, especially prioritizing the replacement of front teeth over those at the back.[1] Dental aesthetics involve complex principles that are not easily dissected. Essential to an attractive smile is the visibility of both upper (maxillary) and lower (mandibular) teeth during rest and speech.[2] The visibility of maxillary teeth reduces with age, while that of mandibular teeth tends to increase. Typically, younger people display more maxillary teeth, and older individuals show more mandibular teeth. Moreover, people with shorter upper lips are likely to expose more maxillary anterior teeth, and those with longer upper lips tend to expose more mandibular anterior teeth.[3] Considering the prominence of mandibular anterior teeth in older ages, they hold equal importance in the analysis of smiles.[4]

The objective of this study is to explore whether the recurring esthetic dental (RED) proportion is present in maxillary anterior teeth.[5] Systematic reviews indicate that such principles, if proven to exist, could be effectively applied to enhance and evaluate dental aesthetics accurately.[6] Each aesthetic guideline is subject to individual assessment, identification, evaluation, and refinement within aesthetic management. Notably, certain dental proportions can be anticipated through formulas that specify the ratios among sequential components. Establishing precise mathematical or geometric ratios that dictate the widths of anterior teeth is vital in aesthetic dentistry.[7] Notable theories such as the golden proportion, golden percentage, and RED proportion are foundational in this area.[8]

Proposed by Ward, the RED proportion theory argues that the widths of successive maxillary teeth should decrease consistently when viewed from the front, maintaining a constant ratio as one moves distally.[9]

2. Materials and Methods

This study involved twenty individuals aged between 18 and 25, all of whom were selected after being judged to possess an aesthetic smile by a panel of four laypersons.

Participants were required to have well-aligned maxillary and mandibular anterior teeth. We excluded any individual missing teeth (with the possible exception of third molars), those with anterior mandibular restorations, histories of trauma, or prior maxillofacial surgery. Other exclusion criteria included noticeable dental misalignments like crowding, abnormal spacing, rotation, or severe tilting. Significant anomalies such as malformations, color abnormalities, noticeable fractures, major dento-facial deformities, or pronounced gingival irregularities also led to exclusion.

Frontal photographs were taken using a Nikon D200 camera equipped with a 135 mm lens, mounted on a tripod exactly one meter away. All images were captured by the same researcher to maintain consistency. During photography, the upper lip was retracted to ensure a clear view of the maxillary anterior teeth and their surrounding gum tissue.

The photographs were processed using Adobe Photoshop CS4 Extended, where the widths of the maxillary central incisors, lateral incisors, and canines were measured at the broadest point of contact. These measurements were replicated three times by the same individual to confirm accuracy. The ratios of the widths between the maxillary lateral incisors to the central incisors and the canines to the lateral incisors were computed on both sides to determine the presence of the RED proportion. Data was subsequently analyzed in Microsoft Excel.

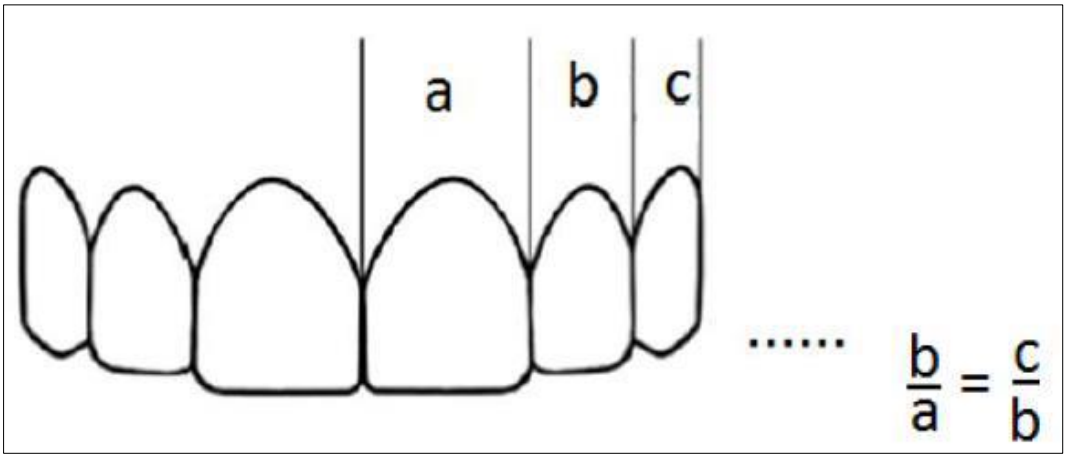

FIGURE1: SUCCESSIVE WIDTHS OF THE TEETH AS VIEWED FROM FRONT SHOULD REMAIN CONSTANT AS ONE MOVE DISTALLY. (RED PROPORTION CONCEPT)

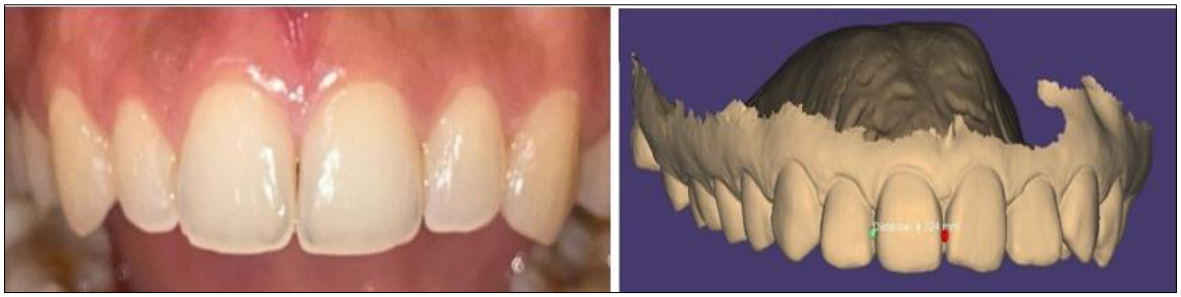

FIGURE 2: WIDTH OF MAXILLARY ANTERIOR TEETH AS MEASURED AT CONTACT AREA

3. RESULTS

Using Adobe Photoshop CS4 Extended, the widths of the anterior teeth were measured and recorded in an Excel spreadsheet. The analysis calculated the ratios between the lateral incisors and central incisors, and between the canines and lateral incisors for both left and right sides. A paired t-test was used to analyze the data, resulting in a P value greater than 0.05, indicating that the RED proportion does not naturally occur in maxillary anterior teeth. Additionally, the analysis revealed that the width ratios of canines to lateral incisors were consistently smaller than those of lateral incisors to central incisors.

TABLE 1: PAIRED T-TEST FOR COMPARISON OF RATIO OF LEFT SIDE, 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**
Number	20	20
Mean	0.830	0.844
SD	0.053	0.032
Correlation value	0.393	
P Value	0.327**	

Level of Significance $p \leq 0.05$, * Significant, ** Non-Significant

Statistically, no significant correlation was present between Ratio of Width of left lateral incisor to width of left central incisor and Ratio of width of left canine to width of left lateral incisor.

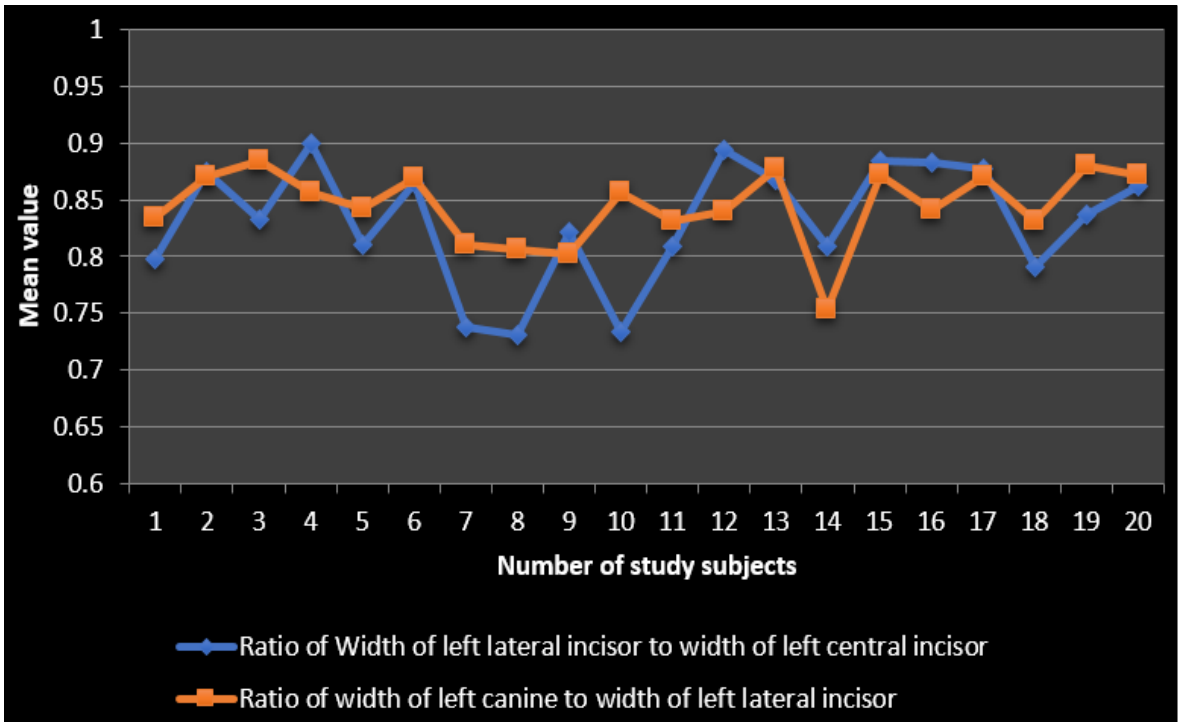

FIGURE 3:COMPARISON OF RATIO OF WIDTH OF LEFT LATERAL INCISOR TO CENTRAL INCISOR AND

RATIO OF WIDTH OF LEFT CANINE TO LEFT LATERAL INCISOR

TABLE 2: PAIRED T-TEST FOR RATIO OF RIGHT SIDE, 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**
Number	20	20
Mean	0.810	0.836
SD	0.014	0.118
Correlation value	-0.071	
P Value	0.767**	

Level of Significance P ≤ 0.05, * Significant, ** Non-Significant

Statistically, no significant correlation was present between Ratio of Width of right lateral incisor to width of right central incisor and Ratio of width of right canine to width of right lateral incisor.

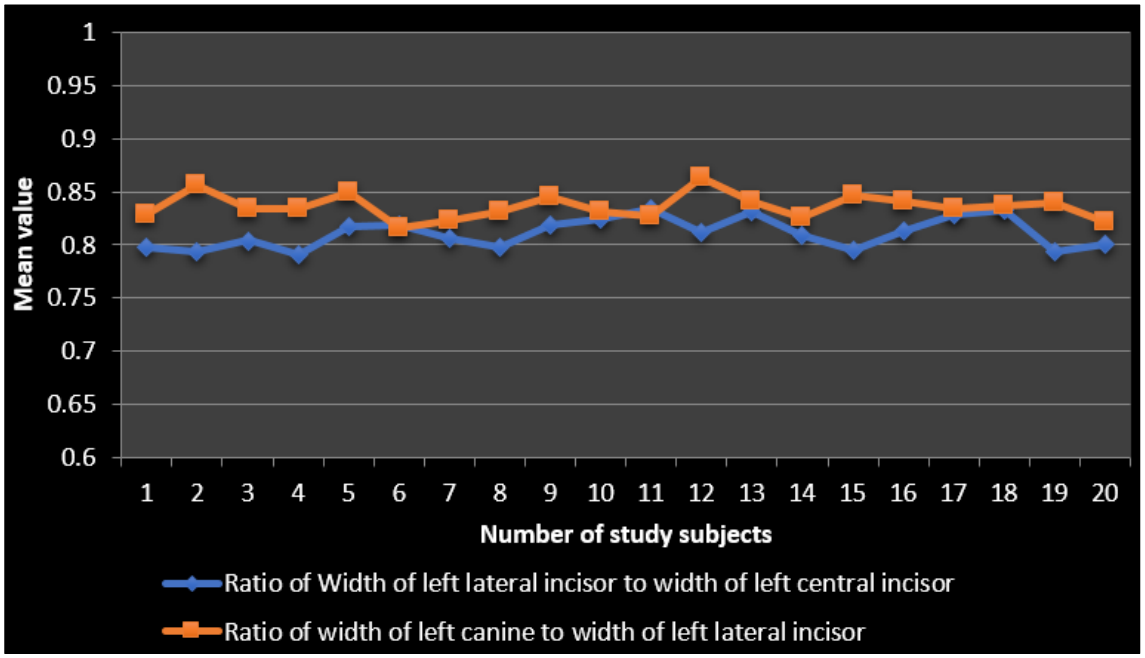

FIGURE 4: COMPARISON OF RATIO OF WIDTH OF RIGHT LATERAL INCISOR TO CENTRAL INCISOR AND RATIO OF WIDTH OF RIGHT CANINE TO RIGHT LATERAL INCISOR

4. Discussion

The dimensions of anterior teeth are frequently discussed in dental literature, encompassing theories like the golden proportion, golden percentage, RED proportion, and others.[10] The golden proportion, a well-recognized principle, dictates that an aesthetically pleasing smile features each tooth being approximately 60% the size of the adjacent mesial tooth. However, studies such as Preston's have shown that only a small percentage of people naturally exhibit these ideal proportions.[11] This study further explores the golden percentage and RED proportion theories, illustrating the complexities in achieving standardized aesthetic outcomes.[12]

Snow's golden percentage suggests that the width of a maxillary central incisor should constitute 25% of the total width across the canine teeth. Meanwhile, Ward's RED proportion maintains that the widths of successive teeth should decrease uniformly from the front view.[13]

The symmetry and proportion of teeth play pivotal roles in the overall aesthetics of a smile, heavily influenced by the accurate positioning, rotation, and alignment of each tooth. The study highlighted that while existing theories provide a framework, the natural variance in tooth size and alignment often challenges the practical application of these proportions.

5. Conclusion

The study revisits several proportional theories concerning the aesthetics of anterior teeth, including the golden proportion and RED proportion, emphasizing the difficulty of universally applying these ideals. The findings indicate that while these proportions aim to enhance aesthetic appeal, natural deviations often exist, suggesting a need for adaptable and individualized approaches in aesthetic dentistry. Thus, while foundational proportions offer valuable guidelines, achieving a universally pleasing aesthetic outcome often requires a tailored approach that considers each individual's unique dental characteristics.

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