

Original Article**Evaluation of widths of maxillary anterior teeth and their relation to the golden proportion in the southwestern part of Saudi Arabia**Aruna Kanaparthy¹, Rosaiah Kanaparthy², Nezar Boreak¹, Redhwan Aslami¹¹Department of Operative Dentistry, College of Dentistry, Jizan University, Jizan, Saudi Arabia² Department of Periodontics, College of Dentistry, Jizan University, Jizan, Saudi Arabia

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ABSTRACT

Background: With available esthetic dental materials in dentistry, satisfactory restoration of anterior teeth is possible. However in addition to the material aspect, the size and form to be given to the maxillary teeth assumes great significance.

Aims: The aim of this study was to evaluate the existence of golden proportion in the widths of maxillary anterior teeth.

Methods: This study was conducted with 30 male and 30 female students studying in the College Of Dental Sciences and Hospital, Jazan, Saudi Arabia. The students were screened for the fulfillment of selection criteria, Alginate impressions were taken and dental casts of maxillary arches made. The widths of anterior central incisors, lateral incisors and canines were measured using a digital caliper. The existence of golden proportion was investigated in the width ratios of the maxillary anterior teeth.

Results: Comparison of perceived width ratios of lateral to central and canine to lateral with the golden proportion of 0.618 was carried out. In males the results showed that while the mean width ratio for the lateral to canine corresponded to the golden proportion, the lateral to central ratio did not correspond to the golden proportion. In females, the central to lateral ratio was in accordance with the golden proportion but not the canine to lateral ratio.

Conclusion: Golden proportion was found to exist in the mean width ratios of canine-lateral teeth in males and in the mean width ratio of maxillary central and lateral teeth in females.

Keywords: Golden proportion, anterior teeth, esthetic dentistry, canine-lateral width- ratio

INTRODUCTION

"Begin with the end in mind. This approach is even more applicable when it comes to restoration of maxillary anterior teeth. With the available esthetic dental materials today, better patient and dentist satisfaction is achievable. However, in addition to the materials, the size and form to be given to the maxillary teeth assumes equal importance. We are likely to do greater justice as restorative dentists if we have a set of esthetic guidelines for such restorations. As music is the study of the harmony of sound in space, so proportion is the study of harmony of structures in space [1]. One of the most important challenges in esthetic dentistry is the creation of harmonious proportions between the widths of maxillary anterior teeth in restoring them [2], while the concept of esthetics is mainly subjective, time tested and acceptable tooth proportions can lend more objectivity to the dentists work.

Research in the area of esthetic perception has identified different factors that contribute to a beautiful face. Among these factors the concept of "Golden proportion" or "Golden ratio can prove to be invaluable [3]. Dental and facial esthetics are said to be optimized if the proportion between widths of maxillary anterior teeth is repeated when viewed from the front. The widths of the central incisors, Lateral incisors and canines are in the golden proportion of 0.618 to each other as seen from the front. This golden proportion has been proposed in many articles and textbooks as an esthetic guideline for restoring maxillary anterior teeth [4]. The apparent widths of the maxillary anterior teeth on smile, and their actual mesio-distal width, differ because of the curvature of the dental arch. Therefore, only the mesial portion of the canine crown can be seen in a frontal view. For a more acceptable appearance, the apparent width of the lateral incisor should be (62%) of the width of the central incisor, the apparent width of the canine should be (62%) of that of the lateral incisor, and

the apparent width of the first premolar should be (62%) of that of the canine. This ratio of recurring (62%) proportions appears in a number of other relationships such as in human anatomy, in nature as in flowers birds, animals, in paintings and in architectural marvels [5]. The objective of the present study was to investigate the occurrence of the golden proportion between the widths of the maxillary anterior teeth in students with esthetic smiles.

MATERIALS AND METHODS

Equipment used-Diagnostic instruments, impression trays, gloves, bowls, spatulas, alginate impression material, plaster, pencil,scale,digital caliper, calculator (Fig 1 & Fig 2). The study was conducted in the College Of Dental Sciences and Hospital, Japan, Saudi Arabia.

Fig. 1



Fig. 2



Selection criteria: All individuals were aged between 18 and 24 years. Those students with an esthetic smile and pleasant dental alignment were chosen for the study. Those students with unpleasant dental alignment (crowding, spacing, rotations, tilting), malformations, intrusions, extrusions, fractures or asymmetry were excluded from the study. Students with a history of restorations of anterior teeth orthodontic treatment missing teeth or maxillofacial surgery were excluded from the study. Based on these criteria, 30 male and 30 female students were selected. Impressions of the maxillary arches were made with alginate impression material and study casts prepared using type IV plaster. Measurements of widths of anterior teeth were made using a digital caliper. Ratios of widths of lateral to central incisors and canines to lateral incisors were calculated. Statistical analysis was carried out. Statistical analysis-Comparison of perceived width ratios of lateral to central incisors and canine to lateral incisors with the golden proportion was done using one sample t test in males and females.

RESULTS

Males (n=30). In males, the lateral to central incisor width ratios ranged from 0.50 to 0.98. The mean perceived width ratio was calculated to be 0.68. Comparison of the mean perceived width ratio (0.689) of lateral to central incisors with golden proportion showed that the lateral to central incisor ratio did not correspond to the golden proportion. The canine lateral ratios ranged from 0.34 to 1.0. The mean perceived width ratio was calculated to be 0.60. Comparison of the mean perceived width ratio of canine to lateral incisor with golden proportion showed that the results corresponded to the golden proportion (0.60 to 0.63 was taken as acceptable) [Table-1].

Table 1: Comparison of the perceived width ratios of lateral to central incisors and canine to lateral incisor with the golden proportion in males using one sample t-test

Variables	Study	Mean	SD	Mean Difference	95% CI for mean diff.		t-value	P-value
Lateral/central ratio	Present	0.689	0.101	0.071	0.034	0.109	3.8560	0.0010*
	Golden	0.618						
Canine/lateral ratio	Present	0.60	0.134	-0.022	-0.072	0.028	-0.8970	0.3770
	Golden	0.618						

*p<0.05

In females (n=30) the mean lateral to central incisor ratios ranged from 0.46 to 0.75. The mean

perceived width ratio was calculated to be 0.62. Comparison of the mean perceived width ratio (0.62) of lateral to central incisors with the golden

proportion showed that the lateral to central incisor ratio corresponded to the golden proportion. The canine to lateral incisor ratios ranged from 0.30 to 0.67. The mean perceived width ratio was calculated to be 0.55. Comparison of the mean

perceived width ratio (0.55) of canine to lateral with golden proportion showed that the result did not correspond to the golden proportion. Females (n=30) [Table 2]

Table 2: Comparison of the perceived width ratios of lateral to central incisors and canine to lateral incisor with the golden proportion in females using one sample t-test

Variables	Study	Mean	SD	Mean Difference	95% CI for mean diff.		t-value	P-value
Lateral/central ratio	Present	0.626	0.070	0.008	-0.018	0.035	0.6490	0.5210
	Golden	0.618						
Canine/lateral ratio	Present	0.550	0.097	-0.068	-0.105	-0.032	-3.8400	0.0010*
	Golden	0.618						

DISCUSSION

The Golden Proportion has been known as mathematics of harmony since ages. This is believed to be a blueprint for features in nature, art, architecture and humans that conform to harmony and beauty. The Golden Proportion has captured the interest and curiosity of experts for centuries because of its apparent connection with esthetics. This proportion has been observed in both organic and inorganic entities, natural and architectural marvels ranging from Egyptian Pyramids, famous Greek temple Parthenon, Taj Mahal of India classical works of Leonardo Da Vinci "Mona Lisa" and "Last Supper", Corbusier human body sketch of proportion "Le Modulor", musical compositions of Mozart, Beethoven and in the human form itself. Nature does not disappoint us and is abundant with examples of the Golden Proportion. From the double helical form of our DNA to flowers and insects, from the dolphin, butterfly, moth to the peacock's feather, the golden proportion is present all around us. [6, 7] As all these cannot be mere coincidences, the association between golden proportion and esthetics cannot be overlooked.

Aristotle is considered one of the pioneers in pointing out the value of proportion in esthetics as early as fourth century BC. In a comprehensive article on esthetics written in (1973), Lombardi mentioned the golden proportion and anticipated more detailed observations regarding its application to esthetics. [8] Levin was the first to assert the existence of the golden proportion in (1978). [1] He explained the association of proportion with an esthetically pleasing dentition and smile. A portion between 2 adjacent parts which is repeated across enhances the unity within the diverse part of the composition [9] this ratio is approximately 1.61803:1; that is, the smaller section is about 62% the size of the larger. The uniqueness of this ratio is that the ratio of the smaller part to the larger part is the same as the ratio of the larger part to the whole.

[10] Since then there have been many studies checking out the existence of golden proportion in

esthetic smiles with varying results. The idea of esthetics varies from person to person and from one culture to another, different ethnic groups show different ratios which are esthetically acceptable. Subjective and objective perception of dental esthetics differs. Trying to mathematically quantify dental esthetics maybe a helpful guideline particularly with reference to the specific ethnic group under consideration, but is not mandatory. In this study we have observed that the mean ratio in males in the central to lateral incisor region was 0.68 and did not match the golden proportion. However the mean ratio in lateral incisor to canine region was 0.60 and corresponded to the golden proportion. The mean perceived width in females corresponded to the golden proportion in relation to central to lateral width with a value of 0.62. However it did not correspond to the golden proportion in the lateral incisor to canine area at the value of 0.55. The occurrence of golden proportion in this study cannot be overlooked and cannot be considered as a coincidence. Anterior teeth in golden proportion are definitely esthetic, but esthetics is not limited to the occurrence of golden proportion. It is not necessary to achieve the width of the anterior teeth exactly as that of the Golden Proportion when designing an anterior reconstruction. In fact, these exact proportions rarely occur in the natural dentition. The Golden proportion is just one of the many factors involved in smile design. The value of Golden proportion is as a diagnostic tool in evaluation smile and as a guide to veneer preparation and fabrication [11].

LIMITATIONS OF THE STUDY

There is a possibility of errors in this study such as parallax errors and minor discrepancies in the study casts which can affect the outcome of the study. Also, the sample size is not sufficient to come to a

definite conclusion. Additional research with the use of larger sample size and accurate paper grids to record the measurements at the chair side rather than on the casts as advocated by Edward I Levin will do greater justice to this to the study.

CONCLUSION

In this study golden proportion existed between widths of maxillary central and lateral incisors in the females. Golden proportion existed between widths of maxillary lateral incisors and canines in the males. Golden proportion can be considered as a fundamental guideline in esthetic treatment planning in dentistry.

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