

Golden ratio in dental and facial esthetic: A review of literature

Nikoo Ghadimi ¹, Zakaria Shirbeigi ², Fatemeh Kianfar ³, Sayed Sobhan Khademi ⁴ and Hoda Ghodrati ^{5,*}

¹ Dental School, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

² Dental School, Tabriz University of Medical Sciences, Tabriz, Iran.

³ Dental School, Ardebil University of Medical Sciences, Ardebil, Iran.

⁴ Department of Periodontics, School of Dentistry, Islamic Azad University (Khorasgan Branch), Isfahan, Iran.

⁵ Postgraduate Student, Department of Prosthodontics, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

World Journal of Biology Pharmacy and Health Sciences, 2023, 14(01), 252–255

Publication history: Received on 09 March 2023; revised on 20 April 2023; accepted on 23 April 2023

Article DOI: <https://doi.org/10.30574/wjbphs.2023.14.1.0180>

Abstract

Esthetic dentistry is a field of dentistry that focuses on enhancing the individuals' esthetic, oral function, and health. One of the tools that have been used is the golden ratio which is a mathematical concept with substantial application in facial and dental esthetics. Some studies showed that this proportion affects people's esthetic. Therefore, using the golden ratio can be beneficial for improving individuals' facial and dental esthetic when it combines with other procedures such as implants and gingival recession treatment.

Keywords: Golden ratio; Golden proportion; Dental esthetic; Facial esthetic

1. Introduction

Esthetic dentistry is a field of dentistry that focuses on enhancing the look of teeth and gums. In addition to enhancing tooth look, esthetic dentistry also aims to improve function and oral health (1). The public's need for esthetic treatment has increased as a result of the fact that dental appearance is a crucial component of facial beauty and individuals' psycho-social well-being may be significantly impacted by perceptions of dental esthetics (2). Thus, it's crucial for dentists to have a variety of tools, including mathematical tools and software, that can improve the individuals' oral health, and esthetics of dental restorations and give patients long-lasting esthetics by restoring their health (3-9). One of the tools that can be lucrative in esthetic dentistry is utilizing the golden ratio.

The golden ratio or golden proportion is a mathematical concept with substantial application to both artistic and natural forms. This ratio is apparent in nature from the spiral of a seashell to the arrangement of leaves on a stem (10). The golden ratio is based on symmetry and proportion which work in harmony to create beauty and esthetics (3). Utilizing the golden ratio, as a mathematical proportion, produces repeatable, measurable concepts that can be used to assess and enhance dental esthetics in predictable approaches (11).

As a mathematical tool to evaluate proportions in the frontal view of the arrangement of the maxillary teeth, the golden proportion has been advocated (11). The previous studies used the golden ratio between the maxillary central incisor, lateral incisor, and canine widths to achieve an esthetically pleasing smile (12, 13). Each tooth's width must be in balance with the width of the adjacent teeth and the entire face in order to have a natural appearance and the best dental esthetics (14). Moreover, the golden ratio is used in facial esthetics to assess the connection between facial features with the goal of achieving facial harmony and balance. The width of the mouth, the distance between the eyes, and the size and shape of the nostrils can all be calculated using the golden ratio (15). To accomplish this harmony, the golden ratio

* Corresponding author: Hoda Ghodrati

is used as a guide, making sure the teeth maintain esthetically acceptable proportions and harmony with surrounding tissues (12).

Due to the importance of esthetics in individuals' oral and psycho-social health and the previous uses of the golden ratio as a mathematical concept with application in esthetics, the major aim of this review of literature is to determine the applications of the golden ratio in dental and facial esthetic

2. Discussion

2.1. What is the golden proportion

The divine proportion, golden mean, and golden section are all names for the mathematical concept known as the golden ratio (16). It is a proportion between two numbers that is typically represented by the Greek letter phi and equates to approximately 1.618 (14). The Fibonacci sequence, a set of numbers in which each number is added to the previous one, is closely related to the golden ratio (17) and can be observed in many different instances, including in mathematics, art, architecture, and nature (10).

2.2. Golden proportion between maxillary anterior teeth

The golden proportion between maxillary anterior teeth has been widely studied and implemented in dentistry in order to produce esthetically pleasing outcomes during dental treatments (12, 13). The golden ratio in natural dentition was examined by Dalaie et al. in a recent review of literature, with a focus on the maxillary anterior teeth. This study emphasizes the importance of the proportional relationship between the widths of the maxillary anterior teeth. Using the Golden Proportion (62%) for tall teeth was found to be the most esthetic, with the Recurrent Esthetic Dental (RED) proportion (70%) being the best proportion for people of average height. The most esthetically pleasing width to height ratio has been found to be 0.75 to 0.78 (18). On the other hand, Londono et al. systematic review and meta-analysis showed that in natural smiles, there was no indication of the presence of the golden ratio and there was no gender difference in the lateral incisor to central incisor tooth width ratio (11).

2.3. Golden proportion in facial analysis

The golden ratio also has been employed in facial analysis to establish the ideal facial proportions between facial features such as width of the mouth, the distance between the eyes, and the size and shape of the nostrils (15). Londono et al. in 2022 evaluated the golden ratio in natural facial esthetics. While, this study demonstrated no conclusive relationship between facial esthetics and the golden ratio across all ethnicities, the alignment, symmetry, and proportion of the face, which are fundamental elements of facial beauty, are still frequently assessed using the golden ratio in facial analysis (19). Moreover, according to a Stevens et al. study in 2021, the golden ratio is a useful tool for facial analysis and dorsal preservation rhinoplasty, which is a surgical procedure that tries to maintain the nose's natural form while enhancing its esthetic (20).

2.4. Ways to achieve maximum esthetic

For achieving the maximum esthetic there are various factors and approaches that need to be considered. One of the most important factors in smile esthetics is the individuals' gingival condition such as gingival recession because by controlling the gingival condition the portion of each tooth that is shown can be varied and can affect the golden ratio between teeth. A detailed evaluation of the etiological variables and the degree of tissue involvement is required to get the best possible esthetic results in gingival recession treatment (21). Classification and control of gingival recession, including white (to evaluate the crown portion)(22), pink (to evaluate soft-tissue conditions surrounding the teeth)(23), and facial esthetic scores, are essential for managing smiles (24). Other crucial factors are the esthetic effects of implant placement in the anterior region. It is crucial to take into account a number of variables that may influence the outcome in order to achieve the best esthetic results with dental implants. Indications for dental implants, variables impacting implant outcomes, dental implant disease, and suggestions for implant maintenance should be considered (25).

3. Conclusion

There are controversial results about using the golden ratio in dentistry for dental and facial esthetic. However, using the golden ratio can be lucrative for improving individuals' facial and dental esthetic when it combines with other procedures such as implants and gingival recession treatment.

Compliance with ethical standards

Disclosure of conflict of interest

There is no conflict of interest.

References

- [1] Banerji S, Mehta SB, Ho CC. Practical procedures in aesthetic dentistry: John Wiley & Sons, 2017.
- [2] Afroz S, Rathi S, Rajput G, Rahman SA. Dental esthetics and its impact on psycho-social well-being and dental self confidence: a campus based survey of north Indian university students. *J Indian Prosthodont Soc.* 2013, 13(4):455-60.
- [3] Geissberger M. Esthetic dentistry in clinical practice: John Wiley & Sons, 2013.
- [4] Ebadian, B., Fathi, A., & Tabatabaei, S. (2023). Stress Distribution in 5-Unit Fixed Partial Dentures with a Pier Abutment and Rigid and Nonrigid Connectors with Two Different Occlusal Schemes: A Three-Dimensional Finite Element Analysis. In L. Testarelli (Ed.), *International Journal of Dentistry* (Vol. 2023, pp. 1–15). Hindawi Limited. <https://doi.org/10.1155/2023/3347197>
- [5] Fathi A, Hashemi S, Tabatabaei S, Mosharraf R, Atash R. Adhesion to Zirconia: An umbrella review. *Int J Adhes Adhes.* 2023, 122:103322.
- [6] Amoric M. Le nombre d'or. Applications à l'analyse architecturale et structurale cranio-faciale [The golden number. Applications to architectural and structural cranio-facial analysis]. *Actualites odonto-stomatologiques.* 1989, 42(166): 205–219.
- [7] Decker JD. The divine proportion. *Am J Orthod Dentofacial Orthop.* 2004, 126: 19A-20A.
- [8] Fathi A, Atash R, Fardi E, Ahmadabadi M, Hashemi S. Comparison of the outcomes and complications of three-unit porcelain-fused-to-metal tooth-implant-supported prostheses with implant-supported prostheses: A systematic review and meta-analysis. *Dent Res J.* 2023, 20(1):3-.
- [9] Abdinian M, Baninajarian H. The accuracy of linear and angular measurements in the different regions of the jaw in cone-beam computed tomography views. *Dent Hypotheses.* 2017, 8(4):100-3.
- [10] Lucchi P, Fortini G, Preo G, Gracco A, De Stefani A, Bruno G. Golden Mean and Proportion in Dental Esthetics after Orthodontic Treatments: An In Vivo Study. *Dent J (Basel).* 2022, 10(12).
- [11] Londono J, Ghasemi S, Lawand G, Dashti M. Evaluation of the golden proportion in the natural dentition: A systematic review and meta-analysis. *J Prosthet Dent.* 2021.
- [12] Levin EI. Dental esthetics and the golden proportion. *J Prosthet Dent.* 1978, 40(3):244-52.
- [13] Snow SR. Esthetic smile analysis of maxillary anterior tooth width: the golden percentage. *J Esthet Restor Dent.* 1999, 11(4):177-84.
- [14] Lombardi RE. The principles of visual perception and their clinical application to denture esthetics. *J Prosthet Dent.* 1973, 29(4):358-82.
- [15] Rossetti A, De Menezes M, Rosati R, Ferrario VF, Sforza C. The role of the golden proportion in the evaluation of facial esthetics. *Angle Orthod.* 2013, 83(5):801-8.
- [16] Yalta K, Ozturk S, Yetkin E. Golden Ratio and the heart: A review of divine aesthetics. *Int J Cardiol.* 2016, 214:107-12.
- [17] Persaud D, O'Leary JP. Fibonacci series, golden proportions, and the human biology. 2015.
- [18] Dalaie K, Behnaz M, Mirmohamadsadeghi H, Dashti M, Beheshti S. Maxillary Anterior Teeth Width Proportion a Literature Review. 2017, 165:197-206.
- [19] Londono J, Ghasmi S, Lawand G, Mirzaei F, Akbari F, Dashti M. Assessment of the golden proportion in natural facial esthetics: A systematic review. *J Prosthet Dent.* 2022.
- [20] Stevens MR, Ghasemi S, Mashhadi Akbar Boojar F, Dashti M. Dorsal Preservation Rhinoplasty: A Literature Review. *Am j cosmet surg.* 2023, 40(1):10-21.

- [21] Alghamdi H, Babay N, Sukumaran A. Surgical management of gingival recession: A clinical update. *Saudi Dent J.* 2009, 21(2):83-94.
- [22] Belser UC, Grütter L, Vailati F, Bornstein MM, Weber HP, Buser D. Outcome evaluation of early placed maxillary anterior single-tooth implants using objective esthetic criteria: a cross-sectional, retrospective study in 45 patients with a 2- to 4-year follow-up using pink and white esthetic scores. *J Periodontol.* 2009, 80(1):140-51.
- [23] Fürhauser R, Florescu D, Benesch T, Haas R, Mailath G, Watzek G. Evaluation of soft tissue around single-tooth implant crowns: the pink esthetic score. *Clin Oral Implants Res.* 2005, 16(6):639-44.
- [24] Dashti M, Zadeh MA. Gingival Recession Classification and Treatment. *Innovative Perspectives in Oral and Maxillofacial Surgery.* 2021:155-68.
- [25] Mauer RG, Shadrav A, Dashti M. Predictability of dental implants. *Innovative Perspectives in Oral and Maxillofacial Surgery.* 2021:35-45.