

## Overview of the Golden Ratio: Exact Description

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### Abstract

Facial and dental analysis should be integrated with all dental treatments, where aesthetics and function should be the main objectives, since the face is the main basis of aesthetic balance, and dentistry must be in sync with it. The objective of this work is a literature review to identify the factors that should be considered in an aesthetic analysis of the patient when submitted for dental treatment. The perception of a balanced face is possible, there being a diversified concept of facial beauty, and this varies according to the patient, the aesthetic treatment must always be an allied function, so that you can improve the facial harmony with the smile, return the positive aesthetic means meeting expectations and giving a positive self-image. It is concluded that the perception of a balanced face is possible, there is a diversified concept of facial beauty, and this varies according to the patient.

**Keywords:** *Esthetics; Esthetics Dental; Smiling*

### Introduction

The golden ratio is conceptualized as a mathematical formula to define the harmony in the proportions of any figure, sculpture, or monument and applied in architecture and works of art. The parts, elements, forms, structures, or assemblies arranged in this proportion seem to show a notion of maximum beauty and effective or proficient function [1]. This proportional relationship constitutes a natural law of growth, for the animal and plant kingdoms, and is found in their anatomies.

In a harmonic face, lines are recognized which, when joined, represent graphically a regular geometric shape [1]. In artistic terms, the general shape of the outline of the face can be described as wide, narrow, short, long, or rounded [2]. Various contour reference points are

examined and related to height and width, determining the facial shape [1]. The facial analysis begins with a frontal view of the patient for evaluation of bilateral symmetry, horizontal and vertical proportions, and nasal width, the relationship of the lips, chin, eyes, midline, and facial profile should be observed [2]. Some of the main points to analyze during the aesthetic analysis of the patient are the oral corridor which can be normal, extensive, or absent. It is necessary to perform the analysis of the upper smile line and its curvature and also incisal leveling, where the proportion of the teeth in an anterior superior position is evaluated [1]. Finally, these aspects must be diagnosed and know how to treat most appropriately, since the professional offers health and the patient is interested in obtaining aesthetics [3].

Anything, a line, a magnitude, a wall, divided by 1.618, results in two unequal parts whose division point (golden point) establishes a proportional and harmonic relationship between them [1,4]. The study of this subject is of interest to several areas, such as Orthodontics, Oral and Maxillofacial Surgery, Dentistry, and Plastic Surgery. To reach the ideal Golden Ratio, we must observe several aspects that will be presented in the following work [4].

Usually, when a person looks for a dentist, he asks for aesthetics, both because of the beauty and because of the external approval he needs; which has to do with their human condition [5]. The role of the dentist is to propose to the patient the safest and most effective means for solving the problems presented to him. [6].

### Objective of the Study

The objective of this study is to inform the factors that should be considered when a patient seeks a dental surgeon, seeking to improve facial harmony. through dental procedures.

### Literature Review

#### Golden ratio

The golden ratio is conceptualized as a mathematical formula to define the harmony in the proportions of any figure, sculpture, or monument and applied in architecture and works of art. The parts, elements, forms, structures, or assemblies arranged in this proportion seem to show a notion of maximum beauty and effective or proficient function [1].

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The application of this proportion is based on the apparent mesiodistal width of the anterior teeth when viewed in a frontal view. The divine proportion occurs when the width of the central incisor is in golden proportion with the width of the lateral incisor and this is in proportion with the width of the canine. To find the ideal ratio, the width of the central incisor must be multiplied by a value defined as the golden ratio, which is 0.61803, or approximately 62%, that is, the divine proportion is that the central incisor is 62% larger than the lateral, and this 62% larger than the mesial view of the canine, thus, the proportion between the teeth is noted from the central incisors, towards the posterior dental elements [4].

According to the concept of the Golden Ratio, the authors mention that it has been used since ancient times by the Greeks, who recognized its dominant role in the proportions of the human body. The Fibonacci exponential mathematical series (1, 1, 2, 3, 5, 8, 13, 21...) demonstrates that each term is the sum of the two previous terms, and the ratio between two consecutive terms tends to approach the Golden Section (1,618). This proportion has been used in several dental specialties, including cosmetic dentistry [7-10].

The shape and contour, the length and width of the teeth, the positioning of the smile line and midline, the axial inclination, and the positioning of the incisal edge of each tooth are some of the aesthetic principles considered and used in smile design. Therefore, the Golden

Proportion deserves special attention in the study of facial beauty, as it enables more precise criteria for the aesthetic-morphological analysis of teeth [10].

### Ideal proportion

According to the harmonic faces, the golden ratio could be found in some measures, in the horizontal and vertical planes. In the horizontal plane: distance between the corners of the lips; distance between the outer corners of the eyes; width of the face at the height of the external acoustic meatus distance between the outer corners of the eyes; distance between the distance of the labial corner between the wings of the nose. In the vertical plane, they observed that the distance between the pupil and the chin was 1.618 times the measurement between the pupil and the root of the hair and that the distance from the pupil to the upper lip was also 1.618 times the distance from the upper lip to the chin [5].

The golden ratio could also be observed when the distance between the pupil and the chin was divided into two segments: the distance from the pupil to the wing of the nose and the distance from the wing of the nose to the chin. The application of these golden ratio concepts would be recommended for treatment planning and evaluations [11].

For symmetry to occur, it is necessary to present the correspondence of shape, color, texture, and positioning between the dental elements of the upper hemiarches. Dominance refers to the fact that the central incisors should be the dominant and most observed teeth [12].



**Figure 1:** Adequate incisal leveling, determined by the Digital Smile Design (DSD) software, followed by an entire rehabilitative esthetic planning, providing an ideal smile proportion.

Based on this knowledge of the predominance of the central incisors, it is recognized that the lateral incisors should appear proportionally smaller (62%) than the central ones. Likewise, the proportion of appearance of the canine about the lateral incisors must be 62%

smaller and coincident with the proportion of appearance of the premolar, and so on. About the central incisor, the canine proportionally appears approximately 33% smaller [7].

The criteria for assessing facial beauty depend on each race. Thus, the facial proportions that please the Mongolian people do not satisfy the aesthetic perceptions of the Caucasian race, since the feeling of beauty is influenced, unconsciously, by the customs and critical appreciations inherent to each people. The central incisor is the predominant tooth that attracts the most attention. The size of the lateral incisors and the canines will follow that of the central incisor, since an ideal proportion, varying from one school to another, exists between these various types of teeth, seen from the front [10,13].

### Diagnosis

The clinical application of the golden ratio in cosmetic dentistry can be defined as the virtual width ratio of the central incisors, in a frontal view, with the other neighboring teeth, and that each tooth must be approximately 60% of the size of its predecessor; these proportions are based on the apparent sizes of the teeth when viewed frontally and not on the actual sizes of the individual teeth [3,13].

By multiplying half of the smile width by 0.618, the apparent value of half of the anterior tooth segment from central to canine is obtained. The value of the anterior tooth segment multiplied by 0.618 establishes the width of the buccal corridor. From this relationship, the key tooth is determined in the frontal view, that is, it is observed whether or not the premolars fit into the anterior tooth segment depending on the arch curvature. In the dental composition, from the midline, each tooth can present the width of the central incisor in golden proportion with the width of the lateral, the width of the lateral in golden proportion with the canine, and the canine with the first premolar, in a progression regressive, that is, 1.618:1 or 62% less [3].

### Treatment

The solutions for aesthetic changes can be through whitening, microabrasion, adhesive procedures, orthodontic treatment, periodontal treatment, and cosmetic remodeling. In the quest for a good impression, all resources are valid. However, the patient's opinion will have to be considered. Cosmetic remodeling consists of grinding or leveling (on the occlusal or incisal side) the teeth. Restorative materials can be added or the teeth ground down as needed. This requires knowledge of dental anatomy, golden ratio, dental and dentofacial harmony, and common sense [9,13].

The development of new restorative techniques and materials to meet the aesthetic requirement has expanded the treatment options for re-anatomization or recontouring of the natural appearance of the teeth, with changes in size, position, and color, with the use of direct adhesive restorative systems, such as resin photopolymerizable composite instead of making more invasive rehabilitation, such as full crowns, making procedures increasingly simpler and more conservative [9].

Among the advantages of this technique are: the practically immediate result that requires few clinical sessions; preservation of the remaining tooth structure; anatomical contouring; aesthetics and resistance; easy restorative repair; low cost compared to indirect procedures. In addition, direct adhesive restorations allow the conservation of dental tissue and are considered reversible procedures, allowing, if necessary, to opt for more invasive procedures. However, it is up to the professional to precisely indicate each case. Adequate scientific knowledge combined with a good notion of aesthetic harmony gives the professional great possibilities to restore the tooth's contour, color, and texture [9].

### Conclusion

Facial morphologies are significantly different across gender groups. Measures and proportions for facial esthetics in the study population show that facial width and height proportions deviated from the reference group. In this sense, an entire person has no facial reference pattern. More studies are needed to evaluate the general population.

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