



RESEARCH ARTICLE

MAIN PREDICTORS IN THE GOLDEN PROPORTION IN ODONTOLOGY AESTHETIC: BRIEF REVIEW

¹Livia Almagro, ¹Rafael Oliveira Bim, ^{1,2}Simone Andreia Gubolin, ^{1,2}Leandro Moreira Tempest, ^{1,2}TaylaneSoffenerBerlanga de Araújo, ^{1,2}Carlos Alberto Costa Neves Buchala, ^{1,2}Ana Paula Bernardes da Rosa Maluf Abbu and ^{1,2,*}Idiberto José Zotarelli Filho

¹University Center North Paulista (Unorp) - São José do Rio Preto – SP, Brazil

²Post Graduate and Continuing Education (Unipos), Street Ipiranga, 3460, São José do Rio Preto SP, Brazil 15020-040

ARTICLE INFO

Article History:

Received 10th September, 2016
Received in revised form
22nd October, 2016
Accepted 17th November, 2016
Published online 30th December, 2016

Key words:

Golden Proportion,
Odontology,
Optimization Treatment,
Aesthetic.

ABSTRACT

Introduction: In the history of humanity, there has always been a search for measures and enjoyable ways, balanced and beautiful. Therefore, professionals had to adapt to the modern world, thus highlighted the value from the perspective of facial aesthetic treatment plan, said the concept of the modern world values beautiful teeth and a nice smile.

Objective: The objective of this study was to present through literature review, the study of the golden ratio or divine proportion applied in dental aesthetics, their versatility and assistance to dentistry.

Methods: The model Followed for the review was PRISMA. We used the databases Scielo, Lilacs, Google Scholar, PubMed articles and works of scientific and doctoral theses master.

Discussion: A harmonious and pleasant smile is synonymous with balance and proportion. Symbolize beauty in its most primitive level, and whenever possible have defined proportions from favorable aesthetic aspects of each individual.

Conclusion: Based on the literature, it was concluded that the golden ratio is one of the real important elements for aesthetic dentistry today, getting up with her favorable and harmonious aesthetic results.

Copyright©2016, Livia Almagro et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Citation: Livia Almagro, Rafael Oliveira Bim, Simone Andreia Gubolin, Leandro Moreira Tempest, TaylaneSoffenerBerlanga de Araújo, Carlos Alberto Costa Neves Buchala, Ana Paula Bernardes da Rosa Maluf Abbu and Idiberto José Zotarelli Filho, 2016. "Main predictors in the golden proportion in odontology aesthetic: Brief review", *International Journal of Current Research*, 8, (12), 44396-44399.

INTRODUCTION

In humanity's history, there has always been a search for measures and enjoyable ways, balanced and beautiful. This concern came to the present day, more and more aesthetics, beauty and harmony stand out mainly in facie, in search of the perfect smile (Bragatto et al., 2016; Sandeep, 2015). In the world, it has grown increasingly search for dental professionals, 19% of dentists located in Brazil. According to the Federal Council of Dentistry, the specialties most searched today, were 67% in the rehabilitation of the smile and aesthetic (Kalia et al., 2015). Therefore, professionals had to adapt to the modern world, thus highlighted the value from the perspective of facial aesthetic treatment plan, said the concept of the modern world values beautiful teeth and a nice smile (Kalia et al., 2015; Thaiana Damasceno Cunha, 2013).

*Corresponding author: Idiberto José Zotarelli Filho,

¹University Center North Paulista (Unorp) - São José do Rio Preto – SP, Brazil

²Post graduateandcontinuingeducation (Unipos), Street Ipiranga, 3460, São José do Rio Preto SP, Brazil 15020-040.

Thus, professionals should take these considerations to the proportion of their dimensions in the treatment of these areas. The divine proportion or ratio Aurea is one of the most efficient existing resources aesthetic proportionality and was widely used throughout art history (Andrade et al., 2004). Moreover, the golden ratio has been described by the philosopher Pythagoras trying to relate the beauty found in nature with mathematical proportions, this ratio is in the architecture of ancient Greece as well as in classic designs as demonstrated by Lombardi (1973); Huntley (1985) (Andrade et al., 2004; Busato et al., 2002). Although this concept is easy to understand, efforts to demonstrate their application complex and difficult explanations. Its simplicity perplexing (Câmara, 2004; Carrilho, 2005). Therefore, this charming proportion has not been explored in all its possibilities. However, the proportion usually consists of something bigger and something smaller. This is the simplest and most universal form of the famous golden number or number of gold (Câmara, 2004). Added to this, we can discuss and understand what meaning the beautiful, with a combination of inner and outer beauty, the perfection of form with the morals of

individual quality, showing references with which individuals include or are included, where the physical aspects and psychological correlates to compose a being, following the customs and cultural traditions. (Busato *et al.*, 2002) The objective of this study was to present through literature review, the study of the golden ratio or divine proportion applied in dental aesthetics, their versatility and assistance to dentistry.

METHODS

The model followed for the review was PRISMA. We used the databases Scielo, Lilacs, Google Scholar, PubMed articles and works of scientific and doctoral theses master. The main descriptors (Mesh Terms) used were "Golden Proportion", "Odontology", "Optimization Treatment", "Aesthetic".

Continuous Predictors

The continuous predictors were odontology treatment.

Response Predictor

The response was predictor golden proportion.

Literature Review

In ancient Greece, the philosopher and mathematician Pythagoras noted that certain proportions linked to standards of beauty and harmony could be mathematically described, based on the asymmetric division of a line (Bragatto *et al.*, 2016). Thus Euclidean termed this theory that in which the splitting a line into two unequal portions asymmetrically, keeps a proportion that the segment is greater for smaller, as the sum of both higher for this. This proportionality is expressed by the number 1, 618, and was known as the golden number, such as the golden ratio, proportion or divine section (Andrade *et al.*, 2004).

The proportional relationship between structures is not only privilege the human body. A certain proportion has been used since ancient Greece, being called one of Euclidean elements (Busato *et al.*, 2002). This ratio was widely used and employed by the architecture of the time, one example being the Parthenon on the Acropolis of Athens, beyond the pyramids of Egypt and the Gothic chairs. This was given the name of PD "golden ratio, its emergence was from the Pythagorean theorem, and since then has been used in various areas of science, as in mathematics, architecture, the visual artists and others (Busato *et al.*, 2002). As the mathematician Leonardo Pisano, known as Fibonacci, considered one of the most talented mathematicians. His fame became known for discovering the sequence of Fibonacci and their role by the introduction of Arabic numerals in Europe (Sandeep *et al.*, 2015). In 1502 32-year-old Fibonacci noted that the golden ratio was related to a numerical series, studying the reproduction of rabbits found that the number is always equal to some predecessors God and that the division of a number by its predecessor, results the golden number, 1,618 (Oliveira *et al.*, 2005; Oliveira, 2005). Although it has always existed in the world of physics and mathematics the golden number is not known exactly when this proportion was discovered and applied by humans, it is known that the ancients used the number in the construction of the great pyramids, entertaining, was more studied and used by philosophers and art in ancient Greece (Oliveira *et al.*, 2005).

Facial ideal ratio has been investigated over the centuries at the same time aesthetic standards have been defined. Thus, there are some scientific analysis of the beauty and features of the human face has its approach based on mathematics (Takeshita *et al.*, 2007). One should, however, always remember that the aesthetics of planning facie and both a science and an art and that the evaluation of aesthetics is subjective because the balance and harmony are very important components to be considered an attractive and harmonious facie (Refenacht, 1998). Anyway it is undeniable the importance of a harmonious and correct ratio, which enters the divine proportion, not only as a mathematical key to getting the aesthetic beauty, but as an auxiliary tool in search and favoring the planning aesthetic treatments ever most effective (Refenacht, 1998). The application of the number of gold to dentistry was mentioned by Lombardi and developed by Levin and currently various parameters that conform to this number of gold can be considered elements involved in structural or biological beauty facial dento composition can be systematically applied in dental rehabilitations (Kalia *et al.*, 2015; Thaiana Damasceno Cunha *et al.*, 2013). Considering the number of biometric studies mainly aimed at the discovery of the numerical correlations between dental and facial elements, the low rate of satisfactory results of course, This suggests that in this matter the specific quantitative and qualitative relationships for each individual can induce aesthetic evaluation (Andrade *et al.*, 2004; Busato *et al.*, 2006). The divine proportion happens when the width of the central incisor is in divine proportion to the width of the lateral incisor and the same in proportion to the width of canine (Sandeep *et al.*, 2015). To find the optimum ratio of this proportion, the width of the central incisor must be multiplied by a value set as a golden ratio which is 0, 61803 or approximately 62%, namely the golden ratio, and that the central incisor is 62% greater than the side, and this 62% higher than the mesial view of the canine, so therefore, the divine proportion between the teeth is noted from the central incisors toward the proportion of subsequent dental elements (Mondelli, 2003).

In nature the divine proportion is widely used and recognized in many details, though it appears with little variation: slightly lower or slightly higher, for this beautiful gold number. inharmonious cases that are beyond the balance and beauty, are completely away from the divine proportion (Gil, 2002). There is a bar with three points, based on the measurement of a certain tooth with the first two points, the third tip automatically proportional when moving compass and its marking in relation to the other two first ends. Several templates called Levin grids in the golden ratio were developed with different widths of central incisors and their proportion of the lateral incisors and canines, in order to help the dental professional in their work, using the famous theory of proportion (Schäfer, 2005). For example, a series of ratios begins with the central incisors in relation to the upper core, the width of upper incisors and premolars region. A second relationship is seen for the incisor segment width less than the width of the maxillary canine (Sandeep *et al.*, 2015; Kalia *et al.*, 2015). A third tends to be present from the lower canines to the buccal groove of the molar. While the golden ratio is an interesting objective to be achieved, it is not always possible because many patients do not have this ratio. so the final result should provide a harmonious relationship in the visibility of the anterior teeth. In front view, the visibility of the teeth should be decreasing from the central incisors (Kalia *et al.*, 2015).

In addition, in a study, we selected 120 students from the dental field, 58 female and 62 male 18 to 22 years old, with complete dental arch without wearing dentures, no problem as injuries, caries among other and not the use of orthodontic appliances. (Reges *et al.*, 2004) a form of identification was drawn up, which was noted the measures of the central incisor, based for making cards with standard brands based on the golden ratio. The purpose of the use of grids was to facilitate the application of the golden number of rules in the previous aesthetic segments (Oliveira *et al.*, 2005; Oliveira, 2005). The card that corresponded was put directly under the anterior teeth in front view and through the mesial-distal dimensional comparison of the lateral incisor and canine with their aways on the card, wrote down the cases that were either not in accordance with that divine proportion. Among the 120 evaluated, 91 had proportionate measures, corresponding to 75.8% of the total (Fariña *et al.*, 2004; Reges *et al.*, 2004). Among women who were analyzed, 96.55% obtained their front teeth in divine proportion, however, it was found that for males the application of the concept of proportionality has relative relevance, as only 56.45 of the men who were assessed had teeth in the golden ratio (Thaiana Damasceno Cunha, 2013).

Promoted a study in order to assess the existence of the divine proportion between the maxillary anterior teeth and a difference between male and female patients with pleasant smiles. To measure the divine proportion between the upper front teeth were scored points in the proximal of each tooth, used millimeter paper, cardboard and ballpoint pen (Andrade *et al.*, 2004). After parallel lines were drawn to the points with a ruler. Mathematically were calculated values of the golden ratio by dividing the smaller by the larger, was expected to find the value of 0, 618. For Anelise Math golden ratio between the central incisors, lateral and these and the canine in this study was taken into account a different deviation to 0, 010 (Busato *et al.*, 2004). Analyzed so that the only difference observed in the prevalence of the golden ratio between the central incisors and lateral incisors, between male and female occurred in the presence of the golden ratio on the right side, which was significantly more prevalent in women than in men (Takeshita *et al.*, 2007). Regarding the golden ratio between lateral and canine, had a higher prevalence of proportion on the left side in women. The presence of the golden ratio in both the right side when the left side was significantly greater between central and lateral incisors incisors than in lateral incisors and canines on both sides (Takeshita *et al.*, 2007). There are some studies that show that this golden ratio is not always found in the composition of the teeth of the general population and therefore should not be systematically applied in all cases, but rather serve as a diagnostic guide and should be particularly adapted to each case (Carrilho, 2005). In order to improve the smile, giving him a harmonious smile, because the presence of a side conoide (22) and canine girovertido (23) committed the smile as a whole, thus not achieving the realization of the theory of the golden ratio (Carrilho, 2005).

DISCUSSION

A harmonious and pleasant smile is synonymous with balance and proportion. Symbolize beauty in its most primitive level, and whenever possible have defined proportions from favorable aesthetic aspects of each individual (Bragatto *et al.*, 2016; Sandeep *et al.*, 2015; Kalia *et al.*, 2015).

The application of the golden number in cosmetic dentistry, the biometric studies, considers numerical correlations between dental elements and facies (Sandeep *et al.*, 2015). Thus, the golden ratio, also called the divine proportion, has been analyzed and studied over the centuries, from there back in ancient Greece, one of Euclidean elements (Machado *et al.*, 2004). This proportion came from the Pythagorean theorem, and is being used in various areas of science, mathematics mainly more also in architecture, and the arts. Noting that the number is always equal the sum of its predecessors and that the division of a number by its predecessor results in the golden number, 1, 618 (Machado *et al.*, 2004). In several studies to detect the prevalence of this divine proportion, central incisors, lateral incisors and canines, between males and females of pleasant smiles, it was observed that some of the examined had no golden proportionate measures (Bragatto *et al.*, 2016; Sandeep *et al.*, 2015; Kalia *et al.*, 2015; Thaiana Damasceno Cunha, 2013). When these measures existed, were much more prevalent in female patients.

Also, for men, the application of the golden concept has relative relevance because few had teeth in the golden ratio (Bragatto *et al.*, 2016; Kalia *et al.*, 2015). Noting also that the presence of the golden ratio was significantly higher among the central and lateral incisors. These studies, it became clear the importance and the actual use of a treatment addressing the golden numbers. As is the case of the use of Levin grids, and also the specific rules of proportion (Kalia *et al.*, 2015). Planning of facial aesthetics is as a science and an art and a good evaluation of facial aesthetics and subjective, because harmony and facial balance are one of the most important components in harmony, but it does not necessarily indispensable for a face to be considered beautiful and attractive (Thaiana Damasceno Cunha, 2013). Even can be no denying the importance of the golden ratio, may be not always, it is observed in the composition of the dental arch of patients in general (Andrade *et al.*, 2004). Therefore, it should not apply in all cases, but rather serve as an accurate diagnosis guide and a tool to help in the search for increasingly effective treatment plan, it should and can be applied to each particular case (Oliveira *et al.*, 2005; Oliveira, 2005).

Conclusion

Based on the literature, it was concluded that the golden ratio is one of the real elements of importance to estética dentistry today, getting up with her favorable and harmonious aesthetic results. However, have to be aware that the divine proportion is just one of many aids that cosmetic dentistry offers, and several excellent results are also obtained in its absence, for the specific quantitative and qualitative relationships to each individual in particular must also it is observed.

Acknowledgements

The work was supported by Unorp - São José do Rio Preto - SP, Brazil.

Declaration of Potential Conflict of Interest

The authors declare no conflict of interest.

REFERENCES

- Andrade, N.J., Rodrigues, A.C., Andrade, A.M.J. 2004. A "divina proporção"- na dentição mista e permanente. *Revista Paulista de Odontologia*, 26:36,8.

- Bragatto, F.P., Chicarelli, M., Kasuya, A.V., Takeshita, W.M., Iwaki-Filho, L., Iwaki L.C. 2016. Golden Proportion Analysis of Dental-Skeletal Patterns of Class II and III Patients Pre and Post Orthodontic-orthognathic Treatment. *J Contemp Dent Pract.* 1;17(9):728-733.
- Busato, A.L.S., Hernandez, P.A.G., Macedo, R.P. 2002. Dentística - restaurações estéticas. IN BUSATO A.L.S. Dentística: restaurações estéticas. São Paulo; Artes medicas, 81-86.
- Câmara C.A.L.P. 2004. Estética em ortodontia: parte I. Diagrama de referencias estéticas dentais (DRED). *Revista Dental Press estética.* cap1: 40-57.
- Carrilho, E.V.P., Paula, A. 2005. Reabilitação estética complexa baseada na proporção áurea. *Revista port. Estomatológico.* 2005, 16: 43-53.
- Fariña, I.R., Reges, R.V., Adabo, G.L., Cruz, C.A.L. 2004. Prevalência da proporção áurea na dentição natural. *Revista da Associação Brasileira de Odontologia.* cap, 11: 239-42.
- Gil, C.T.L.A., Filho, E.M. 2002. Estudo da proporção áurea na arquitetura craniofacial de indivíduos adultos com oclusão normal, a partir de telerradiografias axiais, frontais e laterais. *Ortodontia;* 35:69-85.
- Kalia, A., Mirdehghan, N., Khandekar, S., Patil, W. 2015. Multi-disciplinary approach for enhancing orthodontic esthetics – case report. *Clinical, Cosmetic and Investigational Dentistry.* 7:83-89.
- Machado, C.T., Neto, S.T.P., Sobrinho, L.C., Braz, R. 2004. Recuperação estética: conseguida através do uso da resina composta direta. *Jornal Brasileiro de Clinica odontológica integrada,* 8: 207-11.
- Mondelli, J. 2003. Estética e cosmética em clinica integrada restauradora. São Paulo: Quintessence Editora.
- Oliveira M.G., Bertollo R.M., Pozza D.H., Gaião L., Soares L.P. 2005. A percepção do belo e a proporção divina. *Revista Odontológica Acadêmica Tiradentes Odonto.* cap 7 pág 403-13.
- Oliveira V.L.R. 2005. Estudo da proporção áurea entre incisivos centrais. *Revista Virtuac de Odontologia.* cap 2: 2-6.
- Ono, E., Filho, E.D., Moraes, L.C., Castilho, J.C.M., Moraes M.E.L. 2005. Estudo da proporção áurea em indivíduos braqui e mesofaciais por meio de radiografias cefalométricas Laterais. *Revista do Instituto de Ciências da Saúde.* cap 24; pag 281-87.
- Refenacht, C.R. 1998. Fundamentos de estética. São Paulo: Quintessence Editora.
- Reges R.V., Cruz C.A.S., Chávez O.F.M., Adabo G.L. 2004. Correr SOBRINHO L. Proporção Aurea: um guia do tratamento estético. *Jornal Brasileiro de Dentística e Estética;* cap1: p 292-95; cap1: p 222-27.
- Sandeep, N., Satwalekar, P., Srinivas, S., Reddy, C.S., Reddy, G.R., Reddy, B.A. 2015. An Analysis of Maxillary Anterior Teeth Dimensions for the Existence of Golden Proportion: Clinical Study. *Journal of International Oral Health : JIOH.* 7(9):18-21.
- Schäfer, A. et al. 2005. Estética em dentes anteriores: fechamento de diastema com a utilização de régua para proporção áurea. *Revista Ibero-Americana de Odontologia Estética e Dentística.* cap 4 pag 239-44.
- Soares G.P., Silva F.A.P., Lima D.A.N.L., Paulillo L.A.M.S. Lovadino J.R. 2005. Prevalência da proporção áurea em indivíduos adulto-jovens. *Revista Odonto Ciências.* 21:346-50.
- Takeshita W.M., Medici FILHO E., Castilho J.C.M., Moraes L.C., Moraes M.E.L., Teramoto L. 2007. Verificação da proporção áurea em radiográficas cefalométricas laterais, de pacientes portadores de classe II de Algle, antes e depois do tratamento ortodôntico. *Revista Odonto,* 15:16-24.
- Thaiana Damasceno Cunha, Ivone de Oliveira Salgado, Leonardo César Costa, Tuélita Marques Galdino, Cecília Salgado. Golden Proportion In Upper Anterior Teeth. *Revista Interdisciplinar de Estudos Experimentais,* 2013, 5: 33-38.
