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ANALYSIS OF THE RELATIONSHIP BETWEEN THE GOLDEN RATIO AND THE FACIAL PARAMETER THROUGH CBCT IN SEVENTH CYCLE STUDENTS OF THE FACULTY OF DENTISTRY OF THE UNIVERSITY OF CUENCA, PERIOD SEPTEMBER 2023 - FEBRUARY 2024

ANÁLISE DA RELAÇÃO ENTRE A PROPORÇÃO ÁUREA E O PARÂMETRO FACIAL POR MEIO DE TCFC EM ALUNOS DO SÉTIMO CICLO DA FACULDADE DE ODONTOLOGIA DA UNIVERSIDADE DE CUENCA, PERÍODO DE SETEMBRO DE 2023 A FEVEREIRO DE 2024

ANÁLISIS DE LA RELACIÓN ENTRE LA PROPORCIÓN ÁUREA Y EL PARÁMETRO FACIAL A TRAVÉS DEL CBCT EN ESTUDIANTES DE SÉPTIMO CICLO DE LA FACULTAD DE ODONTOLOGÍA DE LA UNIVERSIDAD DE CUENCA, PERIODO SEPTIEMBRE 2023 - FEBRERO 2024

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ABSTRACT
INTRODUCTION: The clinical skill necessary to modify dentofacial structure through orthodontic procedures, maxillofacial surgery or plastic surgery involves deeply understanding facial harmony. This encompasses the evaluation of facial aesthetics, proportions and symmetry to achieve optimal results. OBJECTIVE: To analyze the relationship between the elements of the golden ratio with the facial parameter using CBCT and lateral cephalic of the seventh cycle students of the Faculty of Dentistry - University of Cuenca. METHODOLOGY: The group of participants in the study was made up of students of the seventh cycle Orthodontics course at the University of Cuenca, which includes 34 people between the ages of 20 and 30 years, belonging to both sexes, with and without orthodontic treatment with class I malocclusion complete dentition. The facial type of each patient was analyzed in relation to the presence or absence of the divine proportion (1.618) between head height and width bizygomatic. Additionally, a data collection matrix was developed to evaluate craniofacial anthropometric measurements. RESULTS: It will be observed that 0% are brachyfacial, 0% are mesofacial and 100% are dolichofacial. Furthermore, the vertical relationship and harmonic profile component of the golden ratio was present in a higher percentage (66.66%) in dolichofacial individuals when compared to the other facial types. CONCLUSION: The facial morphological type that had the most predominance in our study was the dolichofacial with absence of brachyfacials and mesofacials, in the students there was more golden ratio in the vertical relationship and harmonic profile regardless of the sex of the students.

KEYWORDS: Golden ratio. Divine proportion facial parameter. Orofacial. Dolichofacial. Mesofacial. Brachyfacial harmony.

RESUMO
INTRODUÇÃO: A habilidade clínica necessária para modificar a estrutura dentofacial através de procedimentos ortodônticos, cirurgia maxilofacial ou cirurgia plástica envolve um profundo conhecimento da harmonia facial. Isso engloba a avaliação da estética facial, proporções e simetria para alcançar ótimos resultados. MIRAR: Analisar a relação entre os elementos da proporção áurea com o parâmetro facial por meio de TCFC e perfil cefálico dos alunos do sétimo ciclo “A” da Faculdade de Odontologia da Universidade de Cuenca, período de setembro de 2023 a fevereiro de 2024. METODOLOGIA: O grupo de participantes do estudo foi formado por alunos do sétimo ciclo do curso de Ortodontia da Universidade de Cuenca, que inclui 34 pessoas com idades entre 20 e 30 anos, de ambos os sexos, com e sem tratamento ortodôntico. Eu maloclusão dentição completa. O tipo facial de cada paciente foi analisado em relação à presença ou ausência da proporção divina

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(1,618) entre altura e largura da cabeça. bizigomático. Adicionalmente, foi desenvolvida uma matriz de coleta de dados para avaliação das medidas antropométricas craniofaciais. RESULTADOS: Será observado que 0% são braquifaciais, 0% são mesofaciais e 100% são dolicofaciais. Além disso, o componente relação vertical e perfil harmônico da proporção áurea esteve presente em maior percentual (66,66%) nos indivíduos dolicofaciais quando comparados aos demais tipos faciais. CONCLUSÃO: O tipo morfológico facial que teve maior predominância em nosso estudo foi o dolicofacial com ausência de braquifaciais e mesofaciais, nos escolares houve mais proporção áurea na relação vertical e perfil harmônico independente do sexo dos escolares.

PALAVRAS-CHAVE: Proporção áurea. Proporção divina. Parâmetro facial. Harmonia orofacial. Dolicofacial. Mesofacial. Braquifacial.

RESUMEN
INTRODUCCIÓN: La destreza clínica necesaria para modificar la estructura dentofacial mediante procedimientos ortodónticos, cirugía maxilofacial o cirugía plástica implica tener un entendimiento profundo de la armonía facial. OBJETIVO: Analizar la relación entre los elementos de la proporción áurea con el parámetro facial mediante CBCT y cefálica lateral de los estudiantes de séptimo ciclo de la Facultad de Odontología - Universidad de Cuenca. METODOLOGÍA: El grupo de participantes del estudio estuvo compuesto por estudiantes de la asignatura de Ortodoncia de séptimo ciclo de la Universidad de Cuenca que abarca a 34 personas entre las edades de 20 a 30 años, pertenecen a ambos sexos, con y sin tratamiento de ortodoncia, con maloclusión clase I dentición completa. Se analizó el tipo facial de cada paciente en relación con la presencia o ausencia de la proporción divina (1,618) entre la altura de la cabeza y la anchura bicigomática. Además se elaboró una matriz de recopilación de datos destinada a evaluar medidas antropométricas craneofaciales. RESULTADOS: Se observó que el 0% es de tipo braquifacial, el 0% es mesofacial y el 100% es dolicofacial. Además, el componente relación vertical y perfil armónico de la proporción áurea estuvo presente en mayor porcentaje (66,66%) en los individuos dolicofaciales cuando fueron comparados con otros tipos faciales. CONCLUSIÓN: El tipo facial morfológico que tuvo más predominio en nuestro estudio fue el dolicofacial con ausencia de braquifaciales y mesofaciales, en los estudiantes hubo más proporción áurea en la relación vertical y perfil armónico sin importar el sexo de los estudiantes.

PALABRAS CLAVE: Proporción áurea. Proporción divina parámetro facial. Armonía orofacial Dolicofacial. Mesofacial. Braquifacial.

INTRODUCTION

BACKGROUND

Currently, the main reason for consultation in orthodontics is the lack of orofacial harmony, that is, the affectation of facial features and misalignment of teeth or a combination of both. Therefore, it is important to evaluate and collect relevant information about the patient i n o r d e r to analyze the facial structure by calculating the facial proportions and not only to review the esthetic qualities. To understand the relationship between the golden ratio and the facial parameter, it is first important to define these key concepts for this study. (1)

The shape and constitution of the extraoral soft parts depend mainly on genetic factors, malocclusion, environment, and ethnicity and vary concerning sex and age, other factors should be taken into account such as: feeding with teats or bottles, respiratory problems that affect growth and development, sleeping habits, all these or one of these can generate facial asymmetries of both the

head and dental arches, so in these people there is a greater likelihood that there is an absence of golden ratio. (2)

The famous sculptor of antiquity, Phidias, incorporated the golden ratio as an aesthetic canon in his works, as documented in history. Throughout the centuries, ample evidence of the use of this numerical ratio is found in architecture, sculpture, and music. Notable examples of works that respect the ratio include the Olympian Zeus, the Parthenon, Notre Dame Cathedral, the Convent of San Giniano, Da Vinci's Mona Lisa, Canaletto's Grand Canal, and numerous paintings by Salvador Dali, among others. (1)

In the field of dentistry, several authors have investigated the golden ratio, also known as the divine or golden section. This proportion is considered a symbol of beauty, balance and harmony, which is based on mathematical, physical and geometrical principles. The golden ratio is represented by an irrational number obtained by dividing a segment into two parts in such a way that the ratio between the shortest and the longest segment is the same with respect to the entire straight line and is expressed numerically as 1:1.618. To evaluate the golden ratio, three components are taken into account: the external dimension, the vertical and transversal ratio. (3)(5)

Vertical relationships of the face that comply with the golden ratio.

- If the distance from LN (lateral side of the nose) to ME (soft tissue mentioning) is 1, then the distance from LN to TRI (trichion, beginning of forehead wrinkles when the forehead is lifted) is 1, then the distance from LN to TRI is 1. lifted the eyebrow) is from 1,618.
- If the distance from CH (ceiling corner of mouth) to ME (soft tissue chin) is 1, then the distance between LC (lateral canthus of eyes) and CH is 1.618.
- The distance from Me (soft chin) to (the wing of the nose) is 1, and the distance from (Me) to the plane the pupillary plane is 1,618. The distance from Me (chin) to CL (labial commissure) is 1, it is in golden ratio, concerning the distance from CL (labial commissure) to PB (pupillary plane) is 1.618. (1)(2)(3)(10)

The external dimension of the head of an adult is adjusted to the divine proportion.

- Ideally, if the distance from LCHK (lateral edge of the cheeks) is 1, then the distance from TH (top of the head) to ME (chin soft tissues) should be 1.618.

Relationships cross-cutting from one face that should comply with the proportion golden ratio.

- If the distance between LN (lateral side of the nose) is 1, then the distance between CH (soft tissue chin) is 1,618. - The distance between LC (lateral side of the nose) is (1.618) 2 and the distance between the temporal soft tissue brow level is (1.618) 3 or 4.236. (1) (2) (5)



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The facial parameter is determined by anthropometric points and anatomical references because the facial structure changes development and reaches its final shape definitively at the end of facial development. The Facial Morphological Index (FMI) is used. This index is calculated by subtracting the vertical distance between the Ofrion-Of point (junction of the median plane and the plane tangent to the upper edge of the eyebrow) and the Mentonian-Me point (the lowest point of the chin contour), and then multiplying the result by the zygomatic width (Zg-Zg), expressed as a percentage, thus classifying people into three facial parameters or categories: dolichofacial, mesofacial and brachyfacial. The height of the brachyfacial face is limited but is characterized by a wide width; on the other hand, the dolichofacial face exhibits a smaller width and a higher than average height. The mesofacial face, on the other hand, shows uniform proportions in both its horizontal and vertical dimensions. (1)(3)(10)

JUSTIFICATION

This study aims to provide a general analysis of the relationship between the components of the golden ratio with the facial parameters of students of the seventh-cycle dental school of the University of Cuenca, to establish reliable and simple diagnostic criteria to accurately assess the proportion of facial features and thus determine facial harmony. (1)(7)(9)(10)

METHODOLOGY

STUDY DESIGN

The present study was quantitative, observational, and cross-sectional, which made it possible to identify the golden ratio and facial parameters in the faces of the students who participated in the research. The study population was 34 people, who were excluded employing a review of the molar classes of the total population, the only ones who were taken into account to enter the study were the students with bilateral molar class I, which were a total of 24, and the rest were divided between molar class II and molar class III. Of the 24 students, a second exclusion was made, which consisted of a survey of the students to see if they had or had had orthodontic treatment, of which a total of 6 students were accepted for the study, divided into 5 males and 1 female.

SELECTION CRITERIA

The study included 7th cycle "A" students of the Faculty of Dentistry, belonging to both genders, and enrolled during the period September - January 2023 - 2024. Students from 20 to 30 years of age with an apparent good general and psychological condition, presenting complete permanent dentition, without orthodontic treatment in the process, with class I malocclusion, all those involved accepted their voluntary participation in the present investigation.

Students in the 7th cycle A of the dental school who had class II and III malocclusions, students with missing teeth (except third molars), and students with previous orthognathic surgery and/or orthodontic treatment were excluded.

MEASUREMENTS OF VARIABLES USED

1 Morphological facial index:
To determine the facial parameter is measured: IFM = (Of-Me) x 100 (Zg-Zg).

2. Components of the golden ratio:

Three components were taken into account:
- External dimension: Measurement: Zg-Zg (zygomatic width) Measurement: TH-ME (head to mention apex distance).

- Vertical ratio: Measurement: LC-CH (distance from lateral canthus of eye to Cheilion) Measurement: CH-ME (distance from Cheilionn to Mentonian).

- Harmonic profile: Measurement: LC-CH (distance from lateral canthus of eye to ceiling) M e a s u r e m e n t: CH-ME (distance from ceiling to mention).

3. Class I malocclusion: - Crowding - Rotated canines - Protruded upper incisors or diastemas - Anterior crossbites - Posterior crossbites. (1) (2) (3)

STATISTICAL PROCEDURE

A database was structured in Excel. The database was subjected to descriptive analysis (absolute and percentage frequencies); chi-square was used to contrast the statistical tests. For all statistical tests, the significance level was 5 % ($p< 0.05$), with significant results at 95 % reliability. (1) (2) (3) (10)

RESULTS

Table 1 showed that 0% were brachyfacial, 0% were mesofacial and 100% were dolichofacial. In addition, the vertical relationship and harmonic profile component of the golden ratio was present in a higher percentage (66.66%) in dolichofacial individuals when compared to the other facial types.

Table 1. Analysis between the golden ratio and the facial parameter

Components of the golden ratio	Golden ratio	Facial parameter			Total %
		Brachyfacial	Mesofacial	Dolichofacial	
External dimension	Yes (%)	0%	0%	16,66%	16,66%
	No (%)	0%	0%	83,33%	83,33%

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Vertical relationship	**Yes (%)**	**0%**	**0%**	**66,66%**	**66,66%**
	No (%)	**0%**	**0%**	**33,33%**	**33,33%**
Harmonic profile	**Yes (%)**	**0%**	**0%**	**66,66%**	**66,66%**
	No (%)	**0%**	**0%**	**33,33%**	**33,33%**
	Total %	**0%**	**0%**	**100%**	**100%**
Source: Authors					

Table 2. Expected values			
Expected value	**YES**	**NO**	**Total**
External dimension	**16.66**	**83.33**	**99.99**
Vertical relationship	**66.66**	**33.33**	**99.99**
Harmonic profile	**66.66**	**33.33**	**99.99**
Total	**149.98**	**149.99**	**299.97**
	0.49	**0.50**	**1**
Source: Authors			

Table 3. Observed values			
Observed value	YES	**NO**	**Total**
External dimension	**49.99**	**49.99**	**99.99**
Vertical relationship	**49.99**	**49.99**	**99.99**
Harmonic profile	**49.99**	**49.99**	**99.99**
Total	**149.98**	**149.99**	**299.97**
Source: Authors			

Table 4. Relationship between observed and expected values			
Formula cal.	YES	**NO**	**Total**
External dimension	**22.22**	**22.22**	**44.44**
Vertical ratio	**5.55**	**5.55**	**11.11**

Harmonic profile	**5.55**	**5.55**	**11.11**
Total	**33.33**	**33.33**	**66.67**
Source: Authors			

Table 5. Results

	Yes (%)	No (%)	Chi-square
Face parameter/external dimension	**16,66%**	**83,33%**	**44.44**
Face parameter/vertical relationship	**66,66%**	**33,33%**	**11.11**
Face parameter/harmonic profile	**66,66%**	**33,33%**	**11.11**

Source: Authors

DISCUSSION

The aesthetics of the head and neck are related to the golden ratio which is a measure of an ideal face for people, so taking into account these values is important to obtain diagnostic criteria and thus be able to perform a treatment of facial incongruencies for both the operating room area and for orthodontics.

In the article by Dias Melissa et al, it says that the most represented facial types were euryprosopes and mesoprosopes in equal percentage (38.57%). The leptoprosopos only represented 22.86 % of the sample, while the data obtained from the golden ratio, it can be seen that 65.71 % of the sample studied complied with the golden ratio in the measurements analyzed, which was significant. (1)(2)

According to the study conducted by Companioni et al, in 70 individuals, 66.67% of women and 64% of men exhibited compliance with the golden ratio. When examining the facial parameters, it was observed that brachyfacial and mesofacial faces had the highest percentage, with 38.57% and 22.86% respectively, while dolichofacial faces accounted for 22.86%. (2)

In our research, when examining the limited persons who managed to meet the inclusion criteria, a contradiction with the results presented in the reference articles is observed, since most of the students have dolichofacial faces. After analyzing the results, it can be concluded that there is a relationship between the golden ratio in its external dimension aspect and the facial parameter. (1)(9)

When calculating the golden ratio, it was observed that the results of the external dimension did not comply with this relationship in a statistically significant manner. This contrasts with of Companioni et al, where 74.07% corresponded to myofascial faces, 62.96% to brachyfacials, and 55.25% to dolichofacials. In that study, mesofacials were those that complied with the golden ratio, while the results of our work indicated that dolichofacials complied in greater proportion to the parameters of vertical relation and harmonic profile. (4)(8)(7)

CONCLUSION

To conclude, the morphological facial type that was most predominant in the study carried out in the dental school of the University of Cuenca on the seventh cycle students was the dolichofacial, with an absence of brachyfacial and mesofacial (this may be due to the small number of individuals included in the study) and on the values of the golden ratio ranging from 1 to 1.68 in the students analyzed there was more golden ratio in the vertical relation and harmonic profile regardless of their sex.

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