University of Babylon

College of Dentistry

Five Stage



Evaluation of natural smile: Golden proportion, RED or Golden percentage

اشراف : الدكتور أمير حميد العميدي

الدكتور عمار عيسى مهدي

اعداد طلاب المرحلة الخامسة

أسعد علاء جاسم علي عباس محمد أحمد علي محسن أحمدمرتضيز هير حسين عبد الأمير كاظم

السنه الدراسية : ۲۰۲/۲۰۲۱

Abstract

Creating and Assist the geometric or mathematical proportion related to six maxillary anterior teeth comported it with actually width of theses teeth it is importing aspect in Esthetic dentistry. Golden proportion, recurring esthetic dental (RED) proportion and golden percentage are new theories in this field.

Introduction

Study of the face started thousands of years ago. Clinicians, artists, and sculptors are more interested in the face form and its features $[1]^{1gr}$. A beautiful smile is perhaps the most striking feature in the face. It is an expression which conveys various emotions like pleasure, happiness or amusement. The smile is a means of communicating emotions throughout the world and is an uniquely human gesture $[1]^{5gr}$. One of the critical aspects of esthetic dentistry is creating geometric or mathematical proportion to relate the successive width of anterior teeth. Golden proportion, golden percentage and recurring esthetic dental are theories introduced in this field.[1,2,4]^{234gr}Lombardi was the first to suggest the application of the golden proportion in dentistry. He said that the golden proportion was too strong for use in determining tooth size.[1]^{2gr}, He also described the use of a repeated ratio in the maxillary anterior teeth. This implies that an optimized dentofacial composition of the lateral to central incisor width and the canine to lateral incisor width are repeated in proportion.[1]^{2gr} He said that the width of the central incisor should be in golden proportion to the width of the lateral incisor and that the lateral incisor should be in golden proportion to the width of the canine, when viewed from the front. $[2]^{3gr}$ In addition, he devised a grid with the spaces in golden proportion and advocated the use of this grid to evaluate and develop harmonious proportions of teeth.[3]^{6gr} However, in a more recent study, it was reported that the golden proportion did not exist between the widths of the maxillary anterior teeth in individuals in who have an esthetic smile.[3]^{6gr}

Ward suggested the recurring esthetic dental (RED) proportion. He based his suggestion on the result of his study in which he described RED proportion as the proportion of the successive width of the teeth remaining constant, when progressing distally from the midline.[4]^{4gr} Snow considered a bilateral analysis of apparent individual tooth width as a percentage of the total apparent width of the six anterior teeth. He proposed the golden percentage, wherein the proportional width of each tooth should be: canine 10%, lateral 15%, central 25%, central 25%, lateral 15%, and canine 10% of the total distance across the anterior segment, in order to achieve an esthetically pleasing smile.[5]^{7gr}

Aim to investigate validity ratio fit for actually esthetic dental smile and to investigate the existence and suitability of Golden proportion, Recurring Esthetic Dental, and Golden percentage between the true widths of maxillary anterior teeth in individuals with natural dentition.

MATERIALS AND METHODS

Subject : forty dental students, 8 male students and 32 female students in the 20-25 age group with esthetic smile , were selected for the study

Inclusion criteria Subjects: Asian Iraqi origin; natural dentition in maxillary anterior region

Exclusion criteria: Subjects who have undergone orthodontic treatment; maxillary anterior tooth size alterations

method by which calculated the measurement

Subjects were positioned in the natural head position mesiodistal width of every sex upper anterior teeth measured and distant from right canine to left canine calculated all by Venire Caliper and The subject was asked to smile ,the smile captured by iphone pro 12 for document the smile .

Measurements

The Golden proportion for each subject was measured thus: the width of the central incisor was multiplied by 62% and compared with the width of adjacent lateral incisor. Similar values indicate that the width of the central incisor is in golden proportion to the width of the lateral incisor By comparing the width of the lateral incisor multiplied by 62% with that of the canine, it can be determined whether the width of the lateral incisor is in golden proportion to the width of the lateral incisor

RED proportion was calculated by dividing the width of each lateral incisor by the width of the adjacent central incisor and the resulting number was multiplied by 100. Similarly, the width of each canine was divided by the width of adjacent lateral incisor and the resulting number was multiplied by 100. If the values obtained are constant, it means that the central incisor, lateral incisor, and canine are in RED proportion.

The golden percentage was calculated by dividing the width of each central incisor, lateral incisor and canine by the total width of all six

٤

maxillary anterior teeth and multiplying the resulting value by 100, in order to obtain the golden percentage for each tooth. If the values from canine to canine were 10, 15, 25, 25, 15, and 10%, it indicates that the six maxillary anterior teeth are in golden percentage

RESULTS

Table 1 gives the width of teeth starting from right canine to left canine and the distance from right canine to left canine

no.	sex	LCW	RCW	LLW	RLW	LCAW	RCAW	CA-CA, D
1	F	9	9	5	4	9	9	40
2	Μ	9	9	7	7	8	8	39
3	Μ	9	9	7	7	7	8	42
4	F	7.5	7.5	6	6	6	6.5	37
5	Μ	9	9	6.5	6.5	8	8	36
6	F	6	6	4	4	4	4	34
7	F	5	5	4	4	5	5	34
8	Μ	7	7	5	5	6	6	39
9	F	6	6	3	3	4	4	36
10	F	8	8	6	6	7	7	40
11	F	7	7	5	5	6	6	38
12	F	7	7	4	4	6	6	39
13	F	10	10	6.5	6.5	8	8	42
14	F	8	8	6	6	7	7	40
15	F	10	10	7	7	9	9	46
16	F	8	8	6	6	7	7	40
17	F	10	10	7	7	9	9	46
18	F	11	11	5	6	8	7.5	44
19	F	9	9	5	5	7	7	38

20	F	9	10	6	7	9	8	45
21	F	8	8	5.5	5.5	7	7	40
22	F	11	11	6	7	9	9	48
23	F	9	9	7	8	8.5	8.5	40
24	Μ	6	6	4	4	5	5	35
25	Μ	9	9	6	6	7	7	30
26	Μ	9	9	6	6	8	8	32
27	F	6	6	4	4	4	4	34
28	F	5	5	4	4	5	5	34
29	Μ	7	7	5	5	6	6	39
30	F	6	6	3	3	4	4	36
31	F	8	8	6	6	7	7	40
32	F	7	7	5	5	6	6	38
33	F	7	7	4	4	6	6	39
34	F	10	10	6.5	6.5	8	8	42
35	F	8	8	6	6	7	7	40
36	F	10	10	7	7	9	9	46
37	F	8	8	6	6	7	7	40
38	F	10	10	7	7	9	9	46
39	F	11	11	5	6	8	7.5	44
40	F	7	7	4	4	6	6	39

Statistical analysis

All statistical analysis are calculated by using SPSS version 26 software.

Continuous data were expressed as means \pm SD ,Std error of mean, minimum, and maximum .Categorical variables are presented as absolute numbers and percentages. Chart view was illustrated by line plots.

A cut off value was arrived at, to determine whether the subjects lie in the golden proportion range or not The cut-off value was calculated as follows

First, the difference between two groups was calculated, following which an average mean was calculated. Once the average mean was derived, values lying within the range of average mean + 1.09 Standard deviation was considered to be in golden proportion.

Sixty five percent of the subjects had right central incisor in golden proportion to right lateral incisor.

Almost fifty eight percent of the subjects had left central incisor in golden proportion to left lateral incisor.

Table 2give Golden proportion of right and left central incisor to right and leftlateral incisor

The mean values and standard deviation for RED proportions for males and females are listed in Table 3. RED proportion between central incisor and lateral incisor lie in the 67.2-127.7% range. RED proportion between canine and lateral incisor lie in the 67.97-125.83% range.

The values obtained for golden percentage, beginning with the right side canine and moving to the left canine in this study were17.43, 14.04, 20.701, 20.646, 14.04, 17.45 the relationship between the golden percentagefor each anterior tooth for men and women respectively.intable 4

				Std		
parameters	Ν	mean±SD	error	Minimum	Maximum	
golden proportion for right central incisor of right lateral incisor	male	8	5.03±0.77	0.273	3.72	5.58
	female	34	$5.08{\pm}1.09$	0.192	3.1	6.82
	Total	40	5.076 ± 1.02	0.162	3.1	6.82
golden proportion for left central incisor of	male	8	5.03±0.77	0.273	3.72	5.58
	female	34	5.06 ± 1.07	0.19	3.1	6.82
left lateral incisor	Total	40	5.06 ± 1.01	0.16	3.1	6.82

Table 2 :

Table 3:

			Std		
parameters	Ν	mean±SD	error	Minimum	Maximum

	male	8	71.32±4.6	1.632	66.66	77.77
Red proportion lateral	female	34	66.168±10.29	1.82	45.45	80
incisor/Central incisor left side	Total	40	67.2±9.616	1.52	45.45	80
	male	8	119.04±9.62	3.403	100	133.33
	C 1	24	100.04.10.51	2.07	100	100
Red proportion	temale	34	129.86±18.51	3.27	100	180
left side	Total	40	127.7±17.55	2.77	100	180
	male	8	71.32±4.6	1.632	66.66	77.77
	female	34	67.12±10.311	1.822	44.44	88.88
Red proportion lateral Incisor/central incisor						
right side	Total	40	67.966±9.55	1.51	44.44	88.88
	male	8	120.83±6.35	2.24	114.28	133.33
Red proportion	female	34	127.08±21.72	3.84	100	225
Canine/Lateral Incisor Right Side	Total	40	125.83±19.722	3.11	100	225





Table 4:

parameters	Ν	Mean±SD	Std error	Minimum	Maximum	
golden percentage	male	8	22.58 ± 4.86	1.72	17.14	30

right central incisor	female	34	20 23+2 75	0.48	14 7	25
inglit contrai mensor	Total	40	20.701+3.347	0.529	14.7	30
	male	8	22.58±4.86	1.72	17.14	30
golden percentage left	female	34	20.16±2.73	0.483	14.7	25
central incisor	Total	40	20.646±3.34	0.528	14.7	30
	male	8	16.06±3.23	1.14	11.42	20
golden percentage	female	34	13.53±2.52	0.44	8.33	20
right lateral incisor	Total	40	14.04±2.827	0.447	8.33	20
	male	8	16.06±3.23	1.14	11.42	20
golden percentage left	female	34	13.25±2.29	0.4	8.33	17.5
lateral incisor	Total	40	13.82±2.71	0.428	8.33	20
	male	8	19.39±4.04	1.43	14.28	25
	female	34	16.94±2.75	0.487	11.11	22.5
golden percentage right canine	Total	40	17.43±3.159	0.499	11.11	25
	male	8	19.09±4.16	1.47	14.28	25
	female	34	17.03±2.82	0.49	11.11	22.5
golden percentage left canine	Total	40	17.45±3.186	0.503	11.11	25



Figure 2: Indicates golden proportion relation between rightcentral incisor and right lateral incisor

DISCUSSION

It important to assist the actually width of maxillary anterior teeth and find the actually mathematic relation related to them ,This study was conducted on 40 dental students, 8being male subjects and 32 female subjects. With respect to the theory of golden proportion, the results in this study were seen in relation to left lateral incisor width and left canine width as clinically calculated. This was observed in a total of 8 male out of 40 subjects no one of them was fulfill golden proportion of which and 32 female ,13 of them (40.625) that fulfill porporation for lateral incisor but for right and left canine there wasn't any relation The overall results showed that the golden proportion did not seem to exist, as MinooMahshid et al and Fayyad MA et al [7]^{10GR} In their study of subjects with esthetic smile, they evaluated the existence of golden proportion by measuring the mesio-distal width of six anterior teeth, on scanned pictures of individuals. They arrived at the conclusion that golden proportion did not exist in natural dentition.[6,7]^{9,10gr} as these study was calculating m-d width of six anterior teeth clinically conclusion golden proportion did not exist in natural dentition

With respect to RED proportion, the results of this investigation showed that the ratio of the width of maxillary lateral incisors to the width of central incisors is between 67.2and 67.966 The ratio of width of canine to width of lateral incisor is between 127.7and 125.83. In the present study, the ratio between central and lateral incisors and between lateral incisor and canine is not constant. The ratio increases as one moves distally. The value 67.2and 67.966, which was the ratio of the width of maxillary lateral incisors to width of central incisors, is in agreement with the 70% RED proportion suggested by Ward,[4]^{4gr}and the mean proportion suggested by Fayyad et al, [7]^{10gr} which was between 66 and 78%.

The ratio between central and lateral incisors and between lateral incisor and canine is not constant, as suggested by Ward[4]^{4gr}Hence, there is no evidence in this study to support the RED proportion theory as applied to natural dentition.

As for using Golden percentage theory to correlate the six anterior teeth, the result of the present investigation suggests that the mean values for golden percentage for central incisor is 20.646_20.701% The mean value for lateral incisors is 14.04-13.82 %. With respect to golden percentage of canines which was 17.43-17.45 %, the result of this study showed a mean value 14.04-13.82 % The values for lateral incisor was in almost agree with those suggested by Snow, [5] who recommended a value of 15 as the golden percentage for lateral incisor with little less. The figures obtained for central incisor are lower than those suggested by Snow,[5]^{11gr} who estimated 25% for central incisors. Canines have a higher value (7 addition)than those suggested by Snow, $[5]^{4\text{gr}}$ who recommended a golden percentage value of 10 for canines. In general, it appears that the width of central incisors is smaller and the width of canines is larger than those suggested by the golden percentage theory. A value of 20.701% for centrals, , and 17.45 % for canines can't be adopted but lateral incisor canadopted to golden percentage, as these percentages are also not applicable to the natural dentition. variations in the values obtained in this study result from clinical measure of six anterior, as compared to previous study which All the measurements were taken with the help of the software Adobe Photoshop 7 as inBV Sreenivasan Murthy, NiketaRamani ^{15gr}

CONCLUSION

In the light of the results of this investigation the following conclusions can be derived:

- The theory of Golden percentage was not found between clinical calculated maxillary anterior teeth only lateral incisor of natural dentition was related to it
- 2) The golden proportion was not found to exist between perceived clinical calculated maxillary anterior teeth on natural dentition.
- RED proportion was not found to exist between clinical calculated the six maxillary anterior teeth
- The different found in this study come from the way value of teeth measure, teeth calculated clinically and the value was statically analysis
- 5) finally no of these theory applicable for actually width of maxillary anterior teeth in compared with other studies using computer software Adobe Photoshop 7

REFERENCES:

1-Wahl N. Orthodontics in 3 millennia. Chapter 7: Facial analysis before the advent of the cephalometer. Am J OrthodDentofacialOrthop. 2006 Feb;129(2):293-8

2_Lombardi RE. The principles of visual perception and their clinical application to denture esthetics. J Prosthet Dent 1973;29:358-82

3-Levin EL. Dental esthetics and the golden proportion. J Prosthet Dent 1978;40:244-52.

4-Ward DH. Proportional smile design using the recurring esthetic dental (RED) proportion. Dent Clin North Am 2001;45:143-54

5-Tjan AH, Miller GD, Josephine GP. Some esthetic factors in a smile. J. Prosthet. Dent.. 1984;51:24-28.

6-Correspondence :Assistant Professor, Department of Prosthodontics, Altamash Institute of Dental Medicine Karachi. E-mail: naseer_ahmed752@yahoo.com, Postal Address: A-194, Block-C, Gulshan-e-Jamal, Karachi. Contact No: 0321-2213907

Preston JD. The golden proportion revisited. J Esthet Den 1993;5:247-51. 7-

8-Snow SR. Esthetic smile analysis of anterior tooth width: The golden percentage. J Esthet Dent 1999;11:177-84

9 Mashid M, Khoshvaghti A, Varshosaz M, Vallaei N. Evaluation of "Golden Proportion" in individuals with an esthetic smile. J EsthetRestor Dent 2004;16:185-92.

10. Fayyad MA, Jaman KD, Aqrabawi J. Geometric and mathematical proportions and their relations to maxillary anterior teeth. J Contemp Dent Pract 2006;7:1-10.

11- Snow SR. Esthetic smile analysis of anterior tooth width: The golden percentage. J Esthet Dent 1999;11:177-84.

12-Muhammad, Sher, R. E. H. M. A. N. Shahid, and MUHAMMAD ISMAIL Siddiqui. "Tooth morphology and aesthetics while smiling in accordance to golden proportion." Pakistan journal of medical and health sciences 10.1 (2016): 281

13-Dent, Eur J. Prosthodont Rest. "A study to evaluate the prevalence of golden proportion and RED proportion in aesthetically pleasing smiles." Eur. J. Prosthodont. Rest. Dent 21.1 (2013): 29-33

14-Maharjan, Anjana, and Sarita Joshi. "Clinical evaluation of maxillary anterior teeth in relation to golden proportion, RED proportion and golden percentage." Journal of Nepal Health Research Council 16.1 (2018): 11-15

15 Maharjan, Anjana, and Sarita Joshi. "Clinical evaluation of maxillary anterior teeth in relation to golden proportion, RED proportion and golden percentage." Journal of Nepal Health Research Council 16.1 (2018): 11-15

-...