

Evaluation of Tooth Dimension Proportion in Post Orthodontic Treatment Smile

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ABSTRACT

Background: The purpose of the study was to evaluate teeth visibility in different types of smile after orthodontic correction. **Methods:** Post treatment photograph of 30 patients with different types of smile was collected. Widths of the maxillary anterior teeth were measured using a software xscope version 4.0 (USA). Proportional width of different teeth were collected and then compared with golden proportion. **Result:** The variation was maximum in wide smile for both lateral incisor as well as canine followed by narrow smile.

Keywords: Post treatment smile, tooth dimension.

INTRODUCTION

Smile esthetics is the prime concern in modern society.¹ Harmonious proportions in maxillary anterior teeth is an important component of an esthetic smile.² According to Levin 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".^{3,4} According to Proffit, the width ratio of central and lateral are the best way to determine what the post treatment size of lateral should be and same for canines when they are narrowed to replace missing laterals.⁵

Lomardi⁶ and Snow⁷ stated that symmetry, dominance, and proportion are required to create unity and esthetics in a smile for this golden percentage was found to be very useful

as it does not depend on lateral incisors alone for analysis, asymmetry is easily identifiable and can be easily analysed chair side. Some other authors have also mentioned the use of this proportion in anterior esthetics.^{6,7} However some studies have shown that the golden proportion is rarely seen in maxillary anteriors.^{8,9,10,11}

Yang et al suggested different factors such as growth pattern, incisor exposure, inter-premolar width and tooth material which affect buccal corridor.¹² According to Proffit, the buccal corridor width in ideal smile is 13-17% of the intercommisural distance, less than 13% in wide smiles and greater than 17% in narrow smiles.⁵

Few studies have established a relation between esthetic proportions and arch width and others have established relation between tooth

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material and inter-premolar width and buccal corridor width.^{7,12,13,14}

MATERIALS AND METHOD

Inclusion criteria:

1. age between 15-25 years,
2. all permanent teeth till second molars present,
3. no history of trauma,
4. no dental anomalies of tooth size or morphology,
5. Well-aligned maxillary anterior teeth with no spacing, crowding, rotations or restorations.

Standardized frontal posed smile photographs were taken for all patients.

The measurements on the standard cropped photographs were done using Xscope Version 4.0 (USA). The facial photographs were evaluated by five orthodontists. The buccal corridors and the inter-commissure distance were measured on the photographs and the sample was divided into three groups as follows:

1. Buccal corridor width 13-17% - average smile (Figure 4)– Group I
2. Buccal corridor width <13% - wide smile (Figure 5)– Group II
3. Buccal corridor width >17% - narrow smile (Figure 6) – Group III

The proportions of the lateral to the central incisor and lateral incisor to canine were calculated for all the patients. The results were tabulated and subjected to statistical analysis (SPSS 20.0, SPSS Inc, Chicago, Illinois). The degree of linear relationship between the variables in each group was determined by using the one way ANOVA. The level of significance was set at $p < 0.05$.

RESULTS

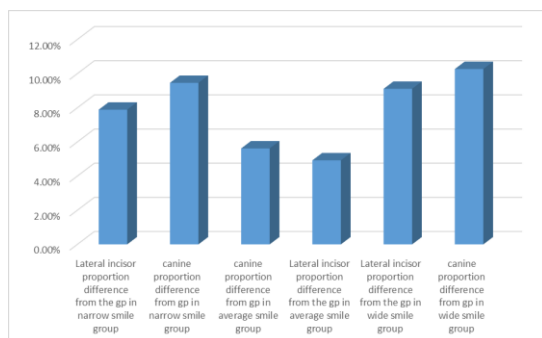
The sample consisted of 30 participants, 10 each for narrow, average and wide smile. The data (table 1) revealed a maximum difference in the mean from the golden proportion to be in the canine proportion in wide smile 10.27% followed by canine proportion in narrow smile group 9.46%. The least variation was observed in lateral incisor proportion in narrow smile group 4.92% followed by canine proportion in average smile 5.62%. A post hoc Bonferroni test (table 2) done to evaluate the significance of the difference from golden proportion revealed that a statistically significant difference was found in all the groups ($p < 0.05$) except lateral incisor ($p = 0.017$) and canine proportion ($p = 0.06$) in average smile groups. Therefore, while the golden proportion was not followed in any of the smile types, the golden proportion was most closely followed in the average smile group.

Table 1: ANOVA test to evaluate the significance of intergroup and intragroup difference.

	N	Mean	Std. Deviation	Std. Error Mean	Sig
Lateral incisor proportion difference from the GP in average smile group	10	4.92%	3.66%	1.16%	0.000
canine proportion difference from GP in average smile group	10	5.62%	2.25%	0.71%	
Lateral incisor proportion difference from the GP in wide smile group	10	9.11%	6.17%	1.95%	
canine proportion difference from GP in wide smile group	10	10.27%	5.25%	1.66%	
Lateral incisor proportion difference from the GP in narrow smile group	10	7.89%	4.70%	1.48%	
canine proportion difference from GP in narrow smile group	10	9.46%	2.91%	0.92%	

Table 2: Bonferroni post hoc test to evaluate the groups showing a significant difference from the golden proportion.

(I) S No	(J) S No	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Golden proportion	Lateral incisor proportion in narrow smile group	-7.89*	1.81	.001	-13.62	-2.15
	Lateral incisor proportion in wide smile group	-9.11*	1.81	.000	-14.84	-3.37
	Lateral incisor proportion in average smile group	-4.9200	1.81	.179	-10.65	.81
	Canine proportion in narrow smile group	-9.46*	1.81	.000	-15.19	-3.72
	Canine proportion in wide smile group	-10.27*	1.81	.000	-16.00	-4.53
	Canine proportion in average smile group	-5.620	1.81	.060	-11.35	.115



Graph 1: variation from golden proportion.

DISCUSSION

Hulsey compared the attractiveness of orthodontically treated and untreated smiles. He examined the “buccal corridors” as a ratio: distance between the maxillary canines/distance between the corners of the smile. He then observed that the buccal corridor ratio was of no significance to an attractive smile.¹⁵ According to Tikku et al increased buccal corridor display was considered less attractive by laypersons and orthodontists alike.¹⁴

Although several studies have evaluated the prevalence of golden proportion and the relation between smile esthetics and buccal corridors, no study has seen the correlation between the golden proportion and different smile widths. The data from this study suggested that the greatest variation of the mean values from the golden proportion was

found in the wide smile group followed by the narrow smile group. The proportion of the maxillary anterior teeth was closest to the golden proportion in the average smile group.

The canine proportion values deviated more from the golden proportion as compared to the lateral incisor proportion values. The deviation of canine proportion also followed the same sequence, i.e. wide smile group followed by the narrow smile group and average smile group.

Calculating the proportions involved measuring the apparent width of the teeth. The proportion of anterior teeth is calculated by measuring the apparent width of teeth as viewed on the photograph. The teeth form an arch form. The visibility of the anterior teeth is affected by the arc formed by the anterior teeth. One can expect the apparent width of the lateral and canine to be greater in a wide arch and less in a narrow arch form. The width of central incisors remains constant as it is the dominant tooth in the smile arc and fully visible.

The results of the study do support this view to some extent. The greatest deviation was observed in the wide smile, where a wide arch form can be expected. This was followed by a narrow smile, where the discrepancy could be attributed to comparative narrow width of the central incisors or the narrow apparent width of the lateral incisor as compared to canine. The

closest values were observed in the patients with average smile.

CONCLUSION

According to present study wide smile group showed the greatest variation and canine dimension showed a greater variation as compared to lateral incisor irrespective of the smile width.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

REFERENCES

1. Machado AW. 10 commandments of smile esthetics, Dental press J.Orthod. vol.19 no 4.Maringa July/Aug.2014
2. Sreenivasan Murthy B V, Ramani N. Evaluation of natural smile: Golden proportion, RED or Golden percentage. J Conserv Dent 2008;11:16-21
3. Levin EL. Dental esthetics and the golden proportion. J Prosthet Dent. 1978;40:244-52.
4. Morley J. Smile design specific considerations. J Calif Dent Assoc 1997;25(9):633-637.
5. Proffit W R: Contemporary Orthodontics, 5thed. St Louis' Mosby" 2013
6. Preston JD. The golden proportion revisited. J Esthet Dent 1993;5(6):247-251
7. Snow SR. Esthetic smile analysis of maxillary anterior tooth width: the golden percentage, J Esthet Dent. 1999;11(4):177-84.
8. Gillen RJ, Schwartz RS, Hilton TJ, Evans DB. An analysis of selected normative tooth proportion. Int J Prosthodont 1994;7(5):410-417.
9. Aziz M, Hossain MZ. Validity of mathematical proportions in maxillary anterior teeth among Bangladeshi population. APOS Trends Orthod 2017;7:41-8
10. Hegde MN, Malhotra S. Evaluation of golden proportion between maxillary anterior teeth of south indian population. Dent Open J. 2016; 2(5): 137- 141
11. Lombardi RE. The principles of visual perception and their clinical application to denture esthetics. J Prosthet Dent 1973; 29:358-82
12. Il-Hyung Yang, Dong-Seok Nahm, and Seung-Hak Baek (2008) Which Hard and Soft Tissue Factors Relate with the Amount of Buccal Corridor Space during Smiling?. Angle Orthod:2008;5-11.
13. Soheilifar S, Soheilifar S, Javanshir B, Noorani A, Akbarzadeh M, Malekshoar M, Comparison of buccal corridor and dental arch width changes in extraction and non-extraction orthodontic treatment. Sch. Acad. J. Biosci., 2017; 5(1):21-28
14. Tikku T, Khanna R, Maurya R P, Ahmad N. Role of buccal corridor in smile esthetics and its correlation with underlying skeletal and dental structures. Indian J Dent Res 2012;23:187-94
15. Hulsey CM. An esthetic evaluation of lip-teeth relationships present in the smile. Am J Orthod 1970;57:132-44.