

# Aesthetic perception of gingival smiles

## *Percepção estética do sorriso gengivoso*

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### Resumo

**Introdução:** Cirurgiões-dentistas têm mostrado interesse em conhecer novos meios para a construção de sorrisos mais atraentes, porém com pouca preocupação em entender os motivos pelos quais o paciente está insatisfeito. **Objetivo:** Avaliar a percepção estética de pessoas leigas em odontologia em comparação com dentistas clínicos gerais e periodontistas quanto ao sorriso gengivoso, e comparar esta percepção estética do gênero masculino e feminino. **Metodologia:** Foi realizada fotografia de um sorriso padrão e modificada digitalmente para criar as condições periodontais de sorriso gengivoso de 0,5mm até 2,5mm. As fotografias foram avaliadas por 150 indivíduos (25-65 anos), 81 do gênero feminino e 69 do masculino, divididos em três grupos: 50 leigos, 50 clínicos gerais e 50 periodontistas. A avaliação foi realizada por escala analógica visual. Os testes de avaliação estatística utilizados foram Quiquadrado de Person, t de Student, ANOVA e Newman-keuls. **Resultado:** As percepções estéticas entre os profissionais são semelhantes, e percebem mudanças na estética do sorriso mais sutis que leigos. Os clínicos gerais e os periodontistas foram sensíveis de forma semelhante às mudanças geradas no sorriso gengivoso quando estas chegaram a 1,5 mm, enquanto que os leigos só perceberam quando estas modificações chegaram a 2,5 mm. Em todos os grupos não houve diferença significativa da percepção estética de avaliadores do gênero masculino e feminino. **Conclusão:** A percepção estética do sorriso gengivoso entre dentistas clínicos gerais e periodontistas foi semelhante, e os profissionais de odontologia foram mais exigentes do que os leigos. Não houve diferença na percepção estética feminina e masculina.

**Descritores:** Gingiva; percepção; estética; fotografia; sorriso.

### Abstract

**Introduction:** Dentists have shown interest in learning new techniques to create more attractive smiles, but with little concern for understanding the reasons why the patient is dissatisfied. **Objective:** To evaluate the aesthetic perception of laypersons in dentistry in comparison with general practitioner dentists and periodontists regarding the gingival smile, and to compare this aesthetic perception between the male and female genders. **Methodology:** A photograph of a standard smile was taken and was digitally modified to create the periodontal conditions of a gingival smile from 0.5 mm to 2.5 mm. The photographs were judged by 150 individuals (25-65 years of age), 81 female and 69 male, divided into three groups: 50 laypersons, 50 general practitioners and 50 periodontists. The evaluation was performed using a visual analog scale. The statistical evaluation tests used were the Pearson Chi squared test, Student's t-test, ANOVA and Newman-keuls. **Result:** The aesthetic perceptions among the professionals are similar, and they observe more subtle changes in the aesthetics of the smile than the laypersons observe. The general practitioners and periodontists were similarly sensitive to changes generated in the gingival smile when these reached 1.5 mm, while laypersons only perceived them when these changes reached 2.5 mm. There was no significant difference in the aesthetic perception of male and female evaluators in any of the groups. **Conclusion:** The aesthetic perception of the gingival smile between general practitioner dentists and periodontists was similar, and dental professionals were more demanding than the layperson. There was no difference between female and male aesthetic perceptions.

**Descriptors:** Gingiva; perception; esthetics; photography; smiling.

## INTRODUCTION

The society to which an individual belongs greatly influences the concept of beauty and aesthetics adopted, it being considered abstract and related to individual expectations<sup>1</sup>.

The concept of the ideal smile is related to the position, color and shape of the anterior teeth, and to good harmony between lips and gums. Dentists have shown increasing interest in learning



new techniques and materials to create more attractive smiles, but with little concern for understanding the reasons why the patient is dissatisfied<sup>2</sup>.

Conditions such as median line deviation, color of the teeth, and dental and gingival margin symmetry have been the subject of several studies of aesthetic perception<sup>3-6</sup>. Gingival smile is an important aesthetic change that, in some cases, periodontics can correct surgically following aesthetic standards<sup>7</sup>.

The gingival smile is of great concern to dentists as they consider it aesthetically unacceptable, and its correction generally requires combined orthodontic, periodontic and surgical procedures. However, for patients, the gingival smile is not always perceived as "not aesthetic"<sup>8</sup>.

The impact of the gingival smile on the aesthetic perception of the smile requires further studies, so that we can offer aesthetic treatments which are more and more satisfactory to our patients. Therefore, this study aimed to evaluate the aesthetic perception of laypersons in dentistry, in comparison with general practitioner dentists and periodontists, regarding the exposure of gingival tissue when smiling, and to compare male and female aesthetic perceptions.

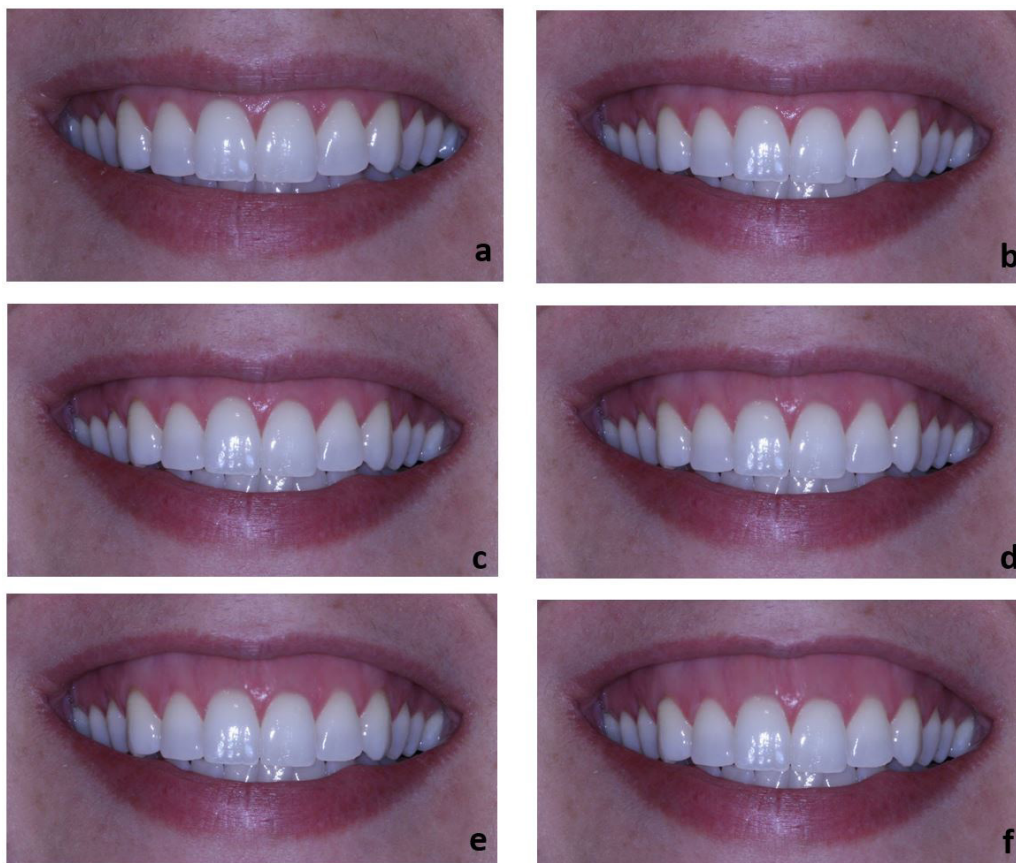
## METODOLOGY

This cross-sectional study was carried out in the city of Vitória, ES, after receiving approval of the research project number 178/10 from the Committee of ethics in dental research of the Health

Sciences Center of Federal University of Espírito Santo, and all participants signed the informed consent. The sample comprised 150 volunteers, randomly chosen. A hundred dentists were selected from lists submitted by the Regional Council of Dentistry of Espírito Santo (CRO-ES); 50 laypersons were randomly drawn from the list of patients seen at the Brazilian Dentistry Association (Espírito Santo section). All participants evaluated the aesthetics of smiles by looking at photographs and filling out an evaluation sheet for each photograph. They were divided into 3 groups of 50 individuals each: Group 1, laypersons (34 female and 16 male); Group 2, general practitioner dentists (30 female and 20 male); Group 3, periodontists (27 female and 23 male). The dentists were approached in their workplace, with the consent of the CRO-ES and the State Department of Health.

The photograph taken was of a female frontal smile. It was digitally modified on the gingival margin of the upper anterior teeth, by a professional photographer using the Adobe Photoshop software (Adobe Systems Inc., San Jose, California), to create a gingival smile, using a similar method to that adopted in other work<sup>3,4,6,9-15</sup>. The photograph was modified every 0.5 mm up to a level of 2.5 mm, totaling six photos, as shown in Figure 1.

Each volunteer received the photo album of smiles, and evaluation sheets containing a visual analogue scale (VAS) of 100 mm of which the leftmost position indicated "not attractive smile" and the rightmost position indicated "very attractive smile", as used in other studies<sup>3,4,9</sup>. They had a maximum of 20 minutes to complete



**Figure 1.** Modifications creating a gingival smile. (a) Initial Smile; (b) smile with gingival display increased by 0.5 mm; (c) smile with increased gingival display by 1.0 mm; (d) smile with increased gingival display by 1.5 mm; (e) smile with gingival display increase by 2.0 mm; and (f) smile with display increased by 2.5 mm.

the evaluation sheets in the presence of at least one researcher. Volunteers were asked not to compare the photographs of the album.

The original, unmodified photograph was used as the control. A single researcher assessed the evaluations. Digital caliper (Mitutoyo, code 500-784, Suzano, Brazil) was used for the quantitative analysis. It was positioned on the line most to the left of the scale, and opened to the markings made by the volunteer. All values, obtained in millimeters, were recorded as scores.

The data were presented in tables. The means and standard deviations (SD) were calculated, when the data were normally distributed to the 5% level of significance using the Shapiro-Wilk test, to analyze the variables. In the case of rejection of the hypothesis of normality, the medians and quartiles (Qi) were calculated. The statistical tests of analysis of variance (ANOVA),

the Newman-Keuls or Student's t-test were used to compare the means of the quantitative variables, in relation to the study groups, when data showed normal distribution. The Kruskal-Wallis or Mann-Whitney test was applied in the case of rejection of the hypothesis of normality. The Pearson Chi-squared test was applied for categorical data analysis.

The software used in the analysis was the Epi-Info program 3.5.3 for Windows. The significance level used in the tests was 5%.

## RESULT

Table 1 shows the sample characterization by gender, age and schooling (in the case of dental professionals), using absolute and percentage distribution.

**Table 1.** Distribution according to gender, age and schooling of clinical dentists, periodontists and laypersons sampled

Variables	Groups						Total	P
	Clinical Dentists (n = 50)		Periodontists (n = 50)		Layperson (n = 50)			
	f <sub>i</sub>	%	f <sub>i</sub>	%	f <sub>i</sub>	%		
<b>Gender</b>								
Female	30	33.0	27	29.7	34	37.4	91	0.356*
Male	20	33.9	23	39.0	16	27.1	59	
<b>Age</b>								
19  --- 25	3	6.0	-	-	11	22.0	14	0.883**
25  --- 30	10	20.0	3	6.0	6	12.0	19	
30  --- 35	9	18.0	18	36.0	7	14.0	34	
35  --- 40	10	20.0	5	10.0	4	8.0	19	
40  --- 45	3	6.0	9	18.0	5	10.0	17	
45  --- 50	1	2.0	8	16.0	2	4.0	11	
50  --- 55	7	14.0	3	6.0	7	14.0	17	
55  --- 60	4	8.0	3	6.0	3	6.0	10	
60  --- 65	2	4.0	-	-	2	4.0	4	
≥ 65	1	2.0	1	2.0	3	6.0	5	
Mean ± SD	38.8 ± 11.6		40.0 ± 9.2		39.1 ± 15.4			
Amplitude	23-65		26-70		19-79			
<b>Schooling</b>								
01  --- 10	21	42.0	17	34.0	-	-	29	0.348***
11  --- 20	13	26.0	14	28.0	-	-	36	
21  --- 30	10	20.0	15	30.0	-	-	21	
31  --- 40	6	12.0	3	6.0	-	-	13	
≥ 40	-	-	1	2.0	-	-	1	
Mean ± SD	15.2 ± 10.9		40.0 ± 9.2					
Amplitude	1-37		4-49					

General practitioner dentists and periodontists were sensitive to changes in producing the gingival smile when these exposures reached 1.5 mm. The laypersons perceived the changes only when the increase in gingival exposure reached 2.5 mm. These data can be observed in Table 2, which shows the means, standard deviations and the results of the Newman-Keuls and ANOVA tests.

There were no statistical differences, among the evaluations made by different gender participants, to modifications that increased gum display to the gingival smile, as shown in Table 3.

## DISCUSSION

Studies have been carried out using laypersons in dentistry, general practitioner dentists and specialists in orthodontics, as evaluators of smile aesthetics, to identify possible agreement in what is considered aesthetic or not aesthetic in a smile<sup>3,4,6,9-15</sup>.

**Table 2.** Distribution according to the average percentage of aesthetic perception of the different changes in the gingival smile observed by clinical dentists, periodontists and laypersons

Scale (mm)	Groups					
	Clinical Dentists		Periodontists		Laypersons	
	Mean	SD	Mean	SD	Mean	SD
0.0	75.6 <sup>a</sup>	19.1	73.6 <sup>a</sup>	17.3	68.8 <sup>a</sup>	19.7
0.5	72.5 <sup>a</sup>	20.2	70.4 <sup>a</sup>	16.6	70.0 <sup>a</sup>	19.8
1.0	68.4 <sup>ab</sup>	20.9	67.6 <sup>ab</sup>	19.4	67.6 <sup>a</sup>	20.5
1.5	61.7 <sup>bc</sup>	21.9	61.1 <sup>bc</sup>	17.0	63.9 <sup>a</sup>	19.5
2.0	56.8 <sup>c</sup>	25.3	57.0 <sup>c</sup>	19.1	59.6 <sup>a</sup>	22.1
2.5	47.6 <sup>d</sup>	23.4	47.5 <sup>d</sup>	22.8	48.1 <sup>b</sup>	25.0
p*	<0.001		<0.001		<0.001	

\*ANOVA; SD = standard deviation. Different letters indicate significant difference, at the level of 5%, according to the Newman-Keuls test.

However, there is need for a study using periodontists. In their practices, they see patients with varying degrees of periodontal damage, showing reduction of the height of the interdental papillae, gingival recessions and gaps, and also patients who complain about gingival smiles. Therefore, they have difficulties, at the moment, in proposing periodontal treatment when suggesting that these aesthetic changes should or should not be corrected.

The importance of studying the perception of clinical dentists and laypersons in dentistry lies in understanding the real necessity of performing certain procedures. In situations where the patient presents the gingival smile, but does not consider it as "not aesthetic" and there is no functional impairment, it may not be necessary to carry out periodontal treatment, even if the dentist thinks differently.

However, in some cases, the corrections are important because, according to Pausch, Katsoulis<sup>13</sup>, the amount of gingival display may affect the perception of age and degree of kindness of that person<sup>12</sup>.

According to Kao et al.<sup>16</sup> and Verardi et al.<sup>7</sup>, when these aesthetic smile standards are not present, surgical modifications to the dentogingival complex may be necessary, especially when the patient presents the gingival smile. Among gingival smile causes there is the altered passive eruption, which occurs when the gingival margin covers part of the anatomical crown, resulting in dental shortening<sup>7,16</sup>. Dentogingival dimensions should be evaluated carefully to get a correct diagnosis, and for good planning, in those cases that allow surgical exposure of the dental crown leading to clinical, biological and aesthetic improvement<sup>7,17</sup>. Another option for correcting the gingival smile is the use of botulinum toxin, an effective and reversible method. Depending on the individual component of the gingival smile, the botulinum toxin injection can be used as an independent treatment, as a complement to other, invasive techniques, or as a temporary measure while waiting for a permanent solution<sup>18</sup>.

Currently, many studies have shown that the characteristics of an aesthetic smile, according to dental professionals and laypersons, are different. Some of these studies have worked with computer modified photographs and are shown to be an effective method for evaluating the different perceptions<sup>3,4,6,9-12,14</sup>.

**Table 3.** Distribution according to the average percentage of aesthetic perception of the changes in the gingival smile by clinical dentists, periodontists and laypersons divided by gender

Scale (mm)	Groups											
	Clinical dentists				Periodontists				Laypersons			
	Masculine		Feminine		Masculine		Feminine		Masculine		Feminine	
	Means.	SD	Means.	SD	Means.	SD	Means.	SD	Means.	SD	Means.	SD
0.0	78.2	16.4	73.8	20.7	73.9	17.5	73.3	17.4	69.5	17.5	68.4	20.9
0.5	75.9	19.3	70.2	20.9	68.9	17.2	71.7	16.3	70.4	16.5	69.7	21.4
1.0	71.5	18.9	66.4	22.2	67.4	17.4	67.7	21.2	64.2	19.3	69.2	21.1
1.5	63.8	22.6	60.3	21.7	58.3	14.9	62.5	18.6	58.9	20.2	66.2	18.9
2.0	58.8	26.1	55.4	25.1	54.7	16.4	50.0	21.3	56.8	17.2	60.9	24.2
2.5	51.6	23.5	45.0	23.3	45.7	20.2	49.1	25.1	42.6	20.2	50.6	26.8

SD = Standard deviation.

Analyzing the aesthetic perception of patients and professionals in relation to increased gingival display (gingival smile), it was observed that, according to general practitioner dentists and periodontists, 1.5 mm of gingival display compromises the aesthetics of the smile. For laypersons however, the aesthetic is compromised from 2.5 mm. These findings show that professionals have a more critical perception than laypersons, which is explained by the fact that professionals study and know the aesthetic concepts in the literature.

These results agree with similar data obtained from a study by Ker et al.<sup>19</sup>, which reported that laypersons considered a gingival display of 2.1 mm as ideal, and up to 3.6 mm as tolerable. They also agree with data from the studies of Cracel-Nogueira, Pinho<sup>4</sup>, Guo et al.<sup>10</sup>, Kaya, Uyar<sup>11</sup>, Oshagh et al.<sup>12</sup>, Pithon et al.<sup>14</sup> and Talic et al.<sup>3</sup>, which reported that dentists are more critical than laypersons.

Geron, Atalia<sup>8</sup> concluded that laypersons considered that a gingival display of more than 1.0 mm compromised aesthetics. Pithon et al.<sup>15</sup> observed that laypersons as well as dentists considered smiles to be aesthetic with up to 2 mm of gingival display, which differs from the results of this study.

In the present study, there was no difference between specialists and general practitioners in the aesthetic perception of the gingival smile. According to studies conducted using orthodontists, experts are less tolerant than the general public of certain conditions, and sometimes overestimate the need for treating these patients<sup>11,19,20</sup>.

In the present study, no statistically significant difference was observed between genders, in the three groups of evaluators, in the perception of gingival aesthetics. This agrees with results of the studies by Ioi et al.<sup>9</sup>, Kaya, Uyar<sup>11</sup>, Oshagh et al.<sup>12</sup>, Talic et al.<sup>13</sup>. It disagrees with Geron, Atalia<sup>8</sup> and Mokhtar et al.<sup>6</sup>, who claim that laywomen are less critical of smiles with greater gingival display than men, and with Cracel-Nogueira, Pinho<sup>4</sup>, who say that laywomen and dentists are more critical with respect to the degree of gingival display.

We still don't have an answer to what is ideal aesthetically, but we can say that all individuals (laypersons, general practitioner dentists and periodontists) care about periodontal aesthetics and observe its evolution. Thus, it should be evaluated and treated so that, at the end of the dental treatment, we are satisfied not only regarding size, shape and color of the teeth, but also regarding gingival position.

## CONCLUSION

The aesthetic perception of the gingival smile was similar among dental surgeons, general practitioners and periodontists, and dental professionals were aesthetically more demanding than laypersons in dentistry. There was no difference between female and male aesthetic perceptions.

Further studies are needed, so that the perception of professionals and patients on the aesthetics of gingival smile can be better understood, in order to achieve greater aesthetic satisfaction.

## REFERENCES

- Rodrigues CD, Magnani R, Machado MS, Oliveira OB. The perception of smile attractiveness. *Angle Orthod.* 2009 Jul;79(4):634-9. PMID:19537851. <http://dx.doi.org/10.2319/030508-131.1>.
- Ayyildiz E, Tan E, Keklik H, Demirtag Z, Celebi AA, Pithon MM. Esthetic impact of gingival plastic surgery from the dentistry students' perspective. *Eur J Dent.* 2016 Jul-Sep;10(3):397-402. PMID:27403061. <http://dx.doi.org/10.4103/1305-7456.184164>.
- Talic N, Alomar S, Almaidhan A. Perception of Saudi dentists and lay people to altered smile esthetics. *Saudi Dent J.* 2013 Jan;25(1):13-21. PMID:23960550. <http://dx.doi.org/10.1016/j.sdentj.2012.09.001>.
- Cracel-Nogueira F, Pinho T. Assessment of the perception of smile esthetics by laypersons, dental students and dental practitioners. *Int Orthod.* 2013 Dec;11(4):432-44. PMID:24427802.
- Kokich VO, Kokich VG, Kiyak HA. Perceptions of dental professionals and laypersons to altered dental esthetics: asymmetric and symmetric situations. *Am J Orthod Dentofacial Orthop.* 2006 Aug;130(2):141-51. PMID:16905057. <http://dx.doi.org/10.1016/j.ajodo.2006.04.017>.
- Mokhtar HA, Abuljadayel LW, Al-Ali RM, Yousef M. The perception of smile attractiveness among Saudi population. *Clin Cosmet Investig Dent.* 2015 Jan;7:17-23. PMID: 25653558. <http://dx.doi.org/10.2147/CCIDE.S74764>.
- Verardi S, Ghassemian M, Bazzucchi A, Pavone AF. Gummy smile and short tooth syndrome – part 2: periodontal surgical approaches in interdisciplinary treatment. *Compend Contin Educ Dent.* 2016 Apr;37(4):247-251. PMID: 27136119.
- Geron S, Atalia W. Influence of sex on the perception of oral and smile esthetics with different gingival display and incisal plane inclination. *Angle Orthod.* 2005 Sep;75(5):778-84. [http://dx.doi.org/10.1043/0003-3219\(2005\)75\[778:IOSOTP\]2.0.CO;2](http://dx.doi.org/10.1043/0003-3219(2005)75[778:IOSOTP]2.0.CO;2). PMID:16283815.
- Ioi H, Nakata S, Counts AL. Influence of gingival display on smile aesthetics in Japanese. *Eur J Orthod.* 2010 Dec;32(6):633-7. PMID:20403956. <http://dx.doi.org/10.1093/ejo/cjq013>.
- Guo J, Gong H, Tian W, Tang W, Bai D. Alteration of gingival exposure and its aesthetic effect. *J Craniofac Surg.* 2011 May;22(3):909-13. PMID:21558927. <http://dx.doi.org/10.1097/SCS.0b013e31820f7f7a>.
- Kaya B, Uyar R. Influence on smile attractiveness of the smile arc in conjunction with gingival display. *Am J Orthod Dentofacial Orthop.* 2013 Oct;144(4):541-7. PMID:24075662. <http://dx.doi.org/10.1016/j.ajodo.2013.05.006>.
- Oshagh M, Moghadam T, Dashlibrun YN. Perceptions of laypersons and dentists regarding the effect of tooth and gingival display on smile attractiveness in long- and short-face individuals. *Eur J Esthet Dent.* 2013;8(4):570-81. PMID:24624379.

13. Pausch NC, Katsoulis D. Gender-specific evaluation of variation of maxillary exposure when smiling. *J Craniomaxillofac Surg.* 2017 Jun;45(6):913-20. PMID:28431806. <http://dx.doi.org/10.1016/j.jcms.2017.03.002>.
14. Pithon MM, Santos AM, Viana de Andrade AC, Santos EM, Couto FS, da Silva Coqueiro R. Perception of the esthetic impact of gingival smile on laypersons, dental professionals, and dental students. *Oral Surg Oral Med Oral Pathol Oral Radiol.* 2013 Apr;115(4):448-54. PMID:23022025. <http://dx.doi.org/10.1016/j.oooo.2012.04.027>.
15. Pithon MM, Santos AM, Campos MS, Couto FS, dos Santos AF, Coqueiro RS, et al. Perception of laypersons and dental professionals and students as regards the aesthetic impact of gingival plastic surgery. *Eur J Orthod.* 2014 Apr;36(2):173-8. PMID:24663008. <http://dx.doi.org/10.1093/ejo/cjt020>.
16. Kao RT, Dault S, Frangadakis K, Salehieh JJ. Esthetic crown lengthening: appropriate diagnosis for achieving gingival balance. *J Calif Dent Assoc.* 2008 Mar;36(3):187-91. PMID:18444429.
17. Rossi R, Benedetti R, Santos-Morales RI. Treatment of altered passive eruption: periodontal plastic surgery of the dentogingival junction. *Eur J Esthet Dent.* 2008;3(3):212-23. PMID:19655539.
18. Nasr MW, Jabbour SF, Sidaoui JA, Haber RN, Kechichian EG. Botulinum toxin for the treatment of excessive gingival display: a systematic review. *Aesthet Surg J.* 2016 Jan;36(1):82-8. PMID:26254429. <http://dx.doi.org/10.1093/asj/sjv082>.
19. Ker AJ, Chan R, Fields HW, Beck M, Rosenstiel S. Esthetics and smile characteristics from the layperson's perspective: a computer-based survey study. *J Am Dent Assoc.* 2008 Oct;139(10):1318-27. PMID:18832267. <http://dx.doi.org/10.14219/jada.archive.2008.0043>.
20. Pinho S, Ciriaco C, Faber J, Lenza MA. Impact of dental asymmetries on the perception of smile esthetics. *Am J Orthod Dentofacial Orthop.* 2007 Dec;132(6):748-53. PMID:18068592. <http://dx.doi.org/10.1016/j.ajodo.2006.01.039>.

## CONFLICTS OF INTERESTS

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The authors declare no conflicts of interest.

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