

# Evaluation of Buccal Corridor Sizes in Esthetic Smile Perception among General Dentists and Laypersons

Ann Nimmy Rajeev, S. Vinoth, S. Nagalakshmi, B. K. Rajkumar, D. Dhayanithi, Pawan Kumar

Department of Orthodontics and Dentofacial Orthopaedics, Vivekanandha Dental College for Women, Affiliated to Tamil Nadu Dr. MGR Medical University, Namakkal, Tamil Nadu, India

**ABSTRACT** **Aim and Objective:** The aim of the study was to evaluate and correlate the influence of the size of buccal corridor on the perception of esthetic smile among general dentists and lay persons. **Materials and Methods:** A photograph of a female with ideally aligned teeth was selected and digitally manipulated using Adobe Photoshop 7.0 software (San Jose, California, United States.) to create the following smile: Photographs of an ideal smile and a smile with different levels of buccal corridors 2%, 10%, 15%, 22% and 28% was created and the smile attractiveness was assessed by 40 general dentists and 40 lay persons. A visual analog scale score sheet, with 50mm scale was used for rating the smile attractiveness. Unpaired t-test was used to compare the mean scores between general dentists and laypersons and also between male and female raters. **Results:** There was no significant sex difference in judging the influence of size of buccal corridor among the male and female raters of both general dentists and laypersons. Overall, both general dentists and laypersons preferred smiles with narrow or medium buccal corridor to those with medium broad and broad. **Conclusion:** General dentists and laypersons evaluated smile similarly. Hence our results show a similar esthetic perception among general dentists and laypersons. This could be due to the influence of media, television, internet etc.

**KEYWORDS:** Buccal corridor, general dentist, layperson, smile aesthetics

## INTRODUCTION

Earlier in orthodontics, the treatment plan was solely based on the cephalometric readings and skeletal parameters. In recent years, a paradigm shift from hard tissue parameters to soft-tissue appearance in treatment planning has been observed.

In the past, it was difficult to study smile esthetics as little was known about the variables that alter the smile and the absence of a realistic model made it challenging. However, with the advent of digital imaging, manipulation was possible. There are many factors that affect an esthetic smile such as buccal corridor, gingival display, arch form, tooth shade, and incisal exposure.

The buccal corridor is one of the inevitable factors that recently seized clinician's attention.

Buccal corridors are defined as the spaces present between the most visible posterior teeth in the smile

to the inner commissure of the lips.<sup>[1,2]</sup> The knowledge about buccal corridor is very important to orthodontists especially when arch expansion is done.<sup>[3]</sup>

Miller stated that professionals readily detects asymmetry or unesthetics with the surrounding environment.<sup>[4]</sup> For this reason, professional opinions regarding facial attractiveness may not agree with the perceptions and expectations of lay people.

Moore *et al.* stated that broader smiles are preferred over narrow smile by both male and female raters.<sup>[2]</sup> There

**Address for correspondence:** Dr. Ann Nimmy Rajeev, Department of Dentofacial Orthodontics and Orthopaedics, Vivekanandha Dental College for Women, Elayampalayam, Tiruchengode, Tamil Nadu - 637 205, India. E-mail: purplenimmy@gmail.com

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

**For reprints contact:** reprints@medknow.com

**How to cite this article:** Rajeev AN, Vinoth S, Nagalakshmi S, Rajkumar BK, Dhayanithi D, Kumar P. Evaluation of buccal corridor sizes in esthetic smile perception among general dentists and laypersons. J Indian Acad Dent Spec Res 2018;5:20-4.

| Access this article online   |  |
|--|--|
| <b>Quick Response Code:</b><br> | <b>Website:</b> www.jiadsr.org         |
|  | <b>DOI:</b> 10.4103/jiadsr.jiadsr_4_18 |

has been contradicting literature about the importance of buccal corridor in smile esthetics.<sup>[5,6]</sup>

The aim of the study is to evaluate and to correlate the influence of the size of buccal corridor on the perception of esthetic smile among general dentists and laypersons.

## MATERIALS AND METHODS

Ethical clearance for the study was obtained from the Institutional Ethical Committee (VDCW/IEC/22/2016). The method of manipulation of the photograph and type of study was explained to the individual whose photograph was taken.

A frontal intraoral photograph of a woman with ideally aligned teeth and esthetically pleasing lips was selected. The smile arc was consonant such that the lower lip coincided with the curvature of the incisal edges of the maxillary anteriors [Figure 1].

The original photograph was manipulated using a computer software program, Adobe Photoshop CS3. The visible dentition was altered with various compositions of buccal corridor [Figure 2]. The percentage of buccal corridor was calculated as the ratio of difference between the inner intercommissural width and visible maxillary dentition divided by the inner intercommissural width multiplied by 100.

Buccal corridor ratio =

$$\frac{\text{Inner commissure width} - \text{visible maxillary dentition width} \times 100}{\text{Inner commissure width}}$$

As the visible maxillary dentition width increases, the buccal corridor decreases, and it would result in narrow buccal corridors. Five images were created: narrow (2%), medium narrow (10%), medium (15%), medium broad (22%), and broad (28%). The five images of altered buccal corridor were then arranged randomly.

The smile raters were 40 general dentists and 40 laypersons of which males and females were included proportionately in the study. Those who had already undergone orthodontic treatment were excluded from the study. A visual analog scale (VAS) score sheet, with 50 mm, as shown in [Figure 3] was used for rating the smile attractiveness. VAS was corroborated as it was simple and for most freedom to express a personal response style.

The smiles were to be graded using the VAS from least attractive to most attractive. The raters were asked to mark anywhere along the scale but in a vertical fashion. The scores were then entered into Microsoft Excel sheet.



Figure 1: Ideal smile

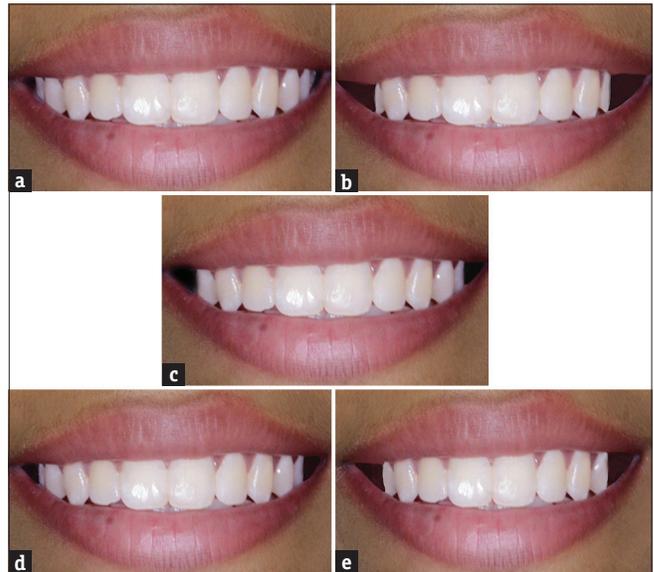


Figure 2: Manipulated buccal corridors. (a) 2%, (b) 28% (c) 15%, (d) 10%, (e) 22%

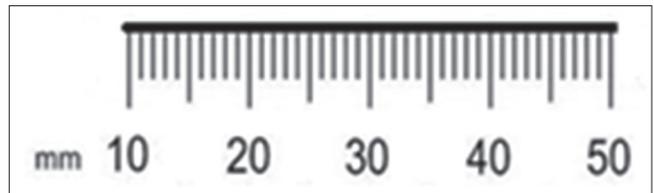


Figure 3: Visual analog scale

## Statistical analysis

To compare the distributions of the mean scores between the general dentists and laypersons, unpaired *t*-test was used. To compare the distribution of mean scores between male and female judges, unpaired *t*-test was used. In all tests,  $P < 0.05$  was set as the level of statistical significance. The data were tabulated and analyzed using the software programme SPSS version 16.0 (SPSS Inc., Chicago, United States).

## RESULTS

The demographic data of the participants in this study are given in Table 1. Of the 80 individuals, an equal distribution of male and female laypersons and dentists were involved in this study.

A homogeneous relationship was seen between smile fullness and smile attractiveness in this study among general dentists and laypersons. The wider the smile (small buccal corridor), the more attractive the smile was graded. As the smile became narrower (large buccal corridor), the smile was evaluated as less attractive by the raters. There was no significant gender difference in judging the influence of the size of buccal corridor

**Table 1: Table of distribution**

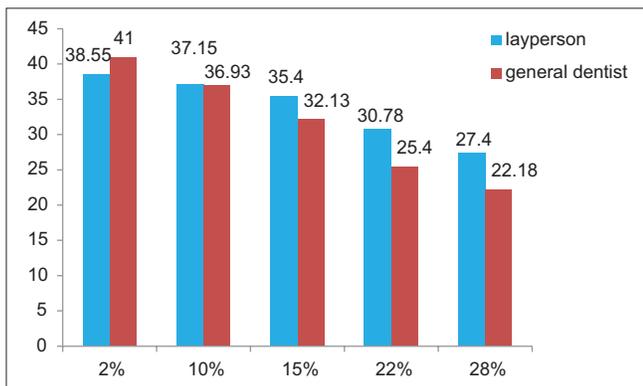
| Group      | Gender      |               | Total |
|------------|-------------|---------------|-------|
|            | Male, n (%) | Female, n (%) |       |
| Laypersons | 20 (50)     | 20 (50)       | 40    |
| Dentist    | 20 (50)     | 20 (50)       | 40    |
| Total      | 40 (50)     | 40 (50)       | 80    |

n: Total number of persons

**Table 2: Comparison of different buccal corridor sizes among general dentists and laypersons**

| Percentage of buccal corridor | Group      | n  | Mean  | SD    | SEM  | t    | P       |
|-------------------------------|------------|----|-------|-------|------|------|---------|
| 2                             | Laypersons | 40 | 38.55 | 10.33 | 1.63 | 1.32 | 0.191   |
|                               | Dentist    | 40 | 41.00 | 5.58  | 0.88 |      |         |
| 10                            | Laypersons | 40 | 37.15 | 9.06  | 1.43 | 0.12 | 0.907   |
|                               | Dentist    | 40 | 36.93 | 8.06  | 1.27 |      |         |
| 15                            | Laypersons | 40 | 35.40 | 5.86  | 0.93 | 2.39 | 0.019*  |
|                               | Dentist    | 40 | 32.13 | 6.41  | 1.01 |      |         |
| 22                            | Laypersons | 40 | 30.78 | 9.38  | 1.48 | 2.66 | 0.009** |
|                               | Dentist    | 40 | 25.40 | 8.65  | 1.37 |      |         |
| 28                            | Laypersons | 40 | 27.40 | 8.30  | 1.31 | 2.91 | 0.005** |
|                               | Dentist    | 40 | 22.18 | 7.77  | 1.23 |      |         |

\*Significant at 5%, \*\*Significant at 1%. n: Total number of persons, SD: Standard deviation, SEM: Standard error of mean



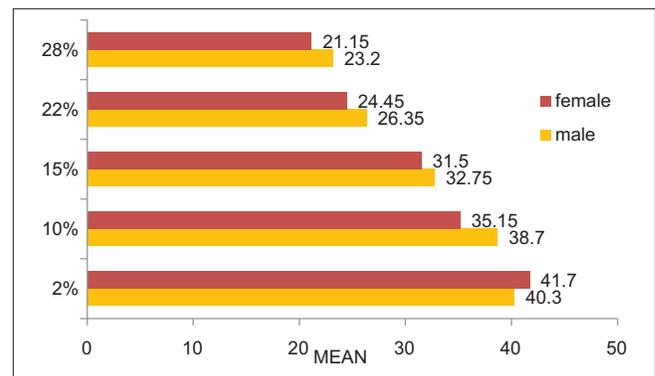
**Figure 4:** Comparison of different buccal corridor sizes among general dentists and laypersons

on smile attractiveness for both general dentists and laypersons. The mean scores of smile attractiveness are shown in Table 2 and Figure 4. The VAS scores decreased gradually from 2% to 28% to become clinically significant showing that both layperson and general dentist preferred minimal buccal corridor. There was no significant difference in grading the influence of size of buccal corridors on the smile attractiveness between the male and female general dentists. The mean scores for each level of buccal corridor for the male and female general dentists are shown in Table 3 and Figure 5. Unpaired *t*-test detected no significant differences between male and female laypersons at any degree of smile fullness [Table 4 and Figure 6]. Overall, male raters of general dentists and laypersons demonstrated no significant difference [Table 5 and Figure 7]. Similarly, female raters in both general dentist and layperson showed no significant difference [Table 6 and Figure 8].

## DISCUSSION

From the perspective of a layperson, attainment of a beautiful smile is the most important result of the orthodontic treatment, along with the restored function. In contemporary orthodontics, the smile on the facial appearance has been given great importance.<sup>[7]</sup> Youngsters are more focused on the appearance of the anterior teeth than to occlusion.<sup>[8]</sup> Understanding about ideal smile and incorporating the knowledge into the practice are an undeniable necessity in establishing a successful orthodontic practice. Various factors influence the attractiveness of smile such as smile arc, gingival display, tooth color, etc. The present study was done to evaluate the influence of buccal corridor on smile attractiveness as this domain of an aesthetic smile has not been discussed much in the literature.

Recently, more attention was given toward the altered perceptions of smile among dentists and laypersons.<sup>[9,10]</sup> This difference could be due to the formal training of smile esthetics to the dentists. The present study also



**Figure 5:** Comparison of different buccal corridor sizes among male and female general dentists

**Table 3: Comparison of different buccal corridor sizes among male and female general dentists**

| Percentage of buccal corridor | Gender | n  | Mean  | SD    | SEM  | t     | P     |
|-------------------------------|--------|----|-------|-------|------|-------|-------|
| 2                             | Male   | 20 | 40.30 | 6.114 | 1.37 | 0.790 | 0.435 |
|                               | Female | 20 | 41.70 | 5.048 | 1.13 |       |       |
| 10                            | Male   | 20 | 38.70 | 6.284 | 1.41 | 1.411 | 0.166 |
|                               | Female | 20 | 35.15 | 9.332 | 2.09 |       |       |
| 15                            | Male   | 20 | 32.75 | 6.758 | 1.51 | 0.612 | 0.544 |
|                               | Female | 20 | 31.50 | 6.143 | 1.37 |       |       |
| 22                            | Male   | 20 | 26.35 | 7.478 | 1.67 | 0.690 | 0.495 |
|                               | Female | 20 | 24.45 | 9.790 | 2.19 |       |       |
| 28                            | Male   | 20 | 23.20 | 8.655 | 1.94 | 0.832 | 0.411 |
|                               | Female | 20 | 21.15 | 6.831 | 1.53 |       |       |

n: Total number of persons, SD: Standard deviation, SEM: Standard error of mean

**Table 4: Comparison of different buccal corridor sizes among male and female laypersons**

| Percentage of buccal corridor | Gender | n  | Mean  | SD     | SEM   | t    | P     |
|-------------------------------|--------|----|-------|--------|-------|------|-------|
| 2                             | Male   | 20 | 36.55 | 10.600 | 2.370 | 1.23 | 0.225 |
|                               | Female | 20 | 40.55 | 9.918  | 2.218 |      |       |
| 10                            | Male   | 20 | 37.60 | 7.742  | 1.731 | 0.31 | 0.758 |
|                               | Female | 20 | 36.70 | 10.398 | 2.325 |      |       |
| 15                            | Male   | 20 | 34.65 | 6.133  | 1.371 | 0.81 | 0.425 |
|                               | Female | 20 | 36.15 | 5.622  | 1.257 |      |       |
| 22                            | Male   | 20 | 30.35 | 8.887  | 1.987 | 0.28 | 0.779 |
|                               | Female | 20 | 31.20 | 10.061 | 2.250 |      |       |
| 28                            | Male   | 20 | 27.85 | 8.725  | 1.951 | 0.34 | 0.737 |
|                               | Female | 20 | 26.95 | 8.062  | 1.803 |      |       |

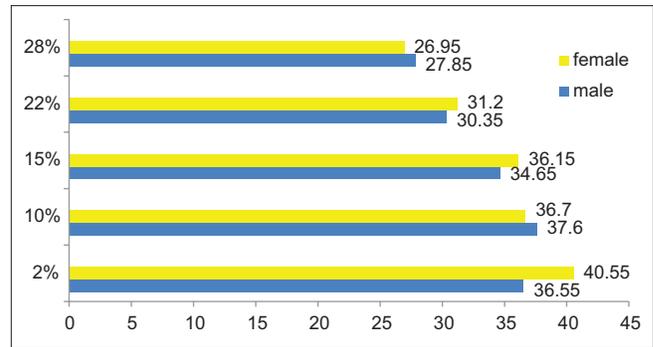
n: Total number of persons, SD: Standard deviation, SEM: Standard error of mean

**Table 5: Comparison of different buccal corridor sizes among male general dentists and laypersons**

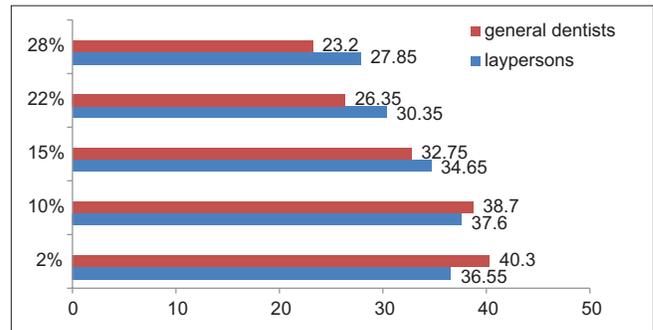
| Percentage of buccal corridor | Gender     | n  | Mean  | SD    | SEM  | t    | P     |
|-------------------------------|------------|----|-------|-------|------|------|-------|
| 2                             | Laypersons | 20 | 36.55 | 10.60 | 2.37 | 1.37 | 0.179 |
|                               | Dentist    | 20 | 40.30 | 6.11  | 1.37 |      |       |
| 10                            | Laypersons | 20 | 37.60 | 7.74  | 1.73 | 0.49 | 0.625 |
|                               | Dentist    | 20 | 38.70 | 6.28  | 1.41 |      |       |
| 15                            | Laypersons | 20 | 34.65 | 6.13  | 1.37 | 0.93 | 0.358 |
|                               | Dentist    | 20 | 32.75 | 6.76  | 1.51 |      |       |
| 22                            | Laypersons | 20 | 30.35 | 8.89  | 1.99 | 1.54 | 0.132 |
|                               | Dentist    | 20 | 26.35 | 7.48  | 1.67 |      |       |
| 28                            | Laypersons | 20 | 27.85 | 8.73  | 1.95 | 1.69 | 0.099 |
|                               | Dentist    | 20 | 23.20 | 8.65  | 1.94 |      |       |

n: Total number of persons, SD: Standard deviation, SEM: Standard error of mean

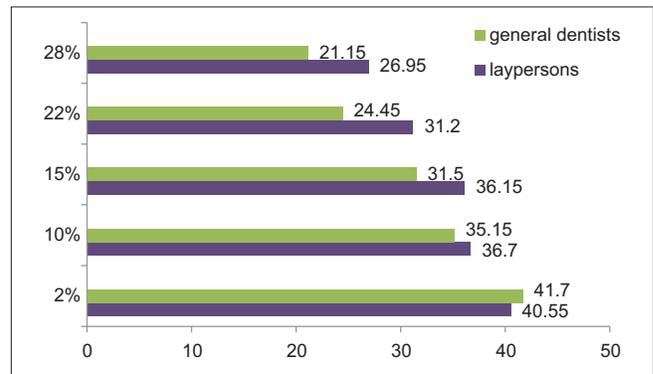
demonstrates the difference in perception among the dentists and laypersons in evaluating smile. Parekh *et al.* in his findings have stated 14% and 19% as excessive buccal corridor. Thus, the range used in this study was



**Figure 6: Comparison of different buccal corridor sizes among male and female laypersons**



**Figure 7: Comparison of different buccal corridor sizes among male general dentists and laypersons**



**Figure 8: Comparison of different buccal corridor sizes among female general dentists and laypersons**

sufficient for correlating the influence of the size of the buccal corridor on smile esthetics.<sup>[2]</sup>

The VAS was used in this study as it is simple and reproducible.<sup>[8,11,12]</sup> Adobe Photoshop was used to manipulate images.<sup>[9,12]</sup> As the number of teeth displayed increased, the VAS scores also increased which means that the size of buccal corridor decreased. The laypersons and general dentist preferred smiles with 2% and 10% buccal corridor as esthetic smile similar to the study done by Moore *et al.*<sup>[2]</sup>

In this study, both laypersons and dentists preferred minimal buccal corridor which is similar to other

**Table 6: Comparison of different buccal corridor sizes among female general dentists and laypersons**

| Percentage of buccal corridor | Gender     | n  | Mean  | SD    | SEM  | t    | P     |
|-------------------------------|------------|----|-------|-------|------|------|-------|
| 2                             | Laypersons | 20 | 40.55 | 9.92  | 2.22 | 0.46 | 0.647 |
|                               | Dentist    | 20 | 41.70 | 5.05  | 1.13 |      |       |
| 10                            | Laypersons | 20 | 36.70 | 10.40 | 2.33 | 0.50 | 0.623 |
|                               | Dentist    | 20 | 35.15 | 9.33  | 2.09 |      |       |
| 15                            | Laypersons | 20 | 36.15 | 5.62  | 1.26 | 2.50 | 0.017 |
|                               | Dentist    | 20 | 31.50 | 6.14  | 1.37 |      |       |
| 22                            | Laypersons | 20 | 31.20 | 10.06 | 2.25 | 2.15 | 0.038 |
|                               | Dentist    | 20 | 24.45 | 9.79  | 2.19 |      |       |
| 28                            | Laypersons | 20 | 26.95 | 8.06  | 1.80 | 2.45 | 0.019 |
|                               | Dentist    | 20 | 21.15 | 6.83  | 1.53 |      |       |

n: Total number of persons, SD: Standard deviation, SEM: Standard error of mean

studies by Moore *et al.* and Loi *et al.*<sup>[2,13]</sup> Moore *et al.* recognized no significant differences in the ratings of male and female individuals or between male and female judges. In this study also, no significant difference was found in the esthetic scores between male and female raters of general dentists and laypersons.

In the present study, the laypersons have preferred 15% buccal corridor as also pleasant smile when compared to general dentists. This corroborates with the findings of studies which shows that broader smiles are preferred by laypersons.<sup>[2,12]</sup> These findings were in contrast with other studies which have reported that the buccal corridor was not critical in smile esthetics.<sup>[5,6]</sup>

Laypersons were able to discriminate the various buccal corridor sizes in the five images. These findings show that the laypersons also observed the minor variations in smile. The perception of smile attractiveness varies between individuals and is influenced by the social environment. If the orthodontist's perception does not match with the patient's perception of esthetics, the treatment goal will not be achieved inspite of improvement in function.

Orthopedic or surgical expansion of maxilla can be considered when there is transverse maxillary deficiency along with large buccal corridor. However, the reduction of buccal corridor should not be considered the rationale for maxillary expansion in an otherwise normal maxilla. Buccal corridors not only tells about the transverse relationship but also about the sagittal relation of the maxilla. If the maxilla is placed posteriorly, the size of the buccal corridor increases and vice versa.

## CONCLUSION

1. Both general dentists and laypersons preferred smiles with narrow or medium narrow buccal corridor (2%–10%) to those with medium broad and broad (22%–28%)
2. The laypersons also preferred 15% (medium) buccal corridor compared to general dentists
3. There was no significant sex difference in judging the influence of the size of buccal corridor among the male and female raters of both general dentists and laypersons
4. General dentists and laypersons evaluated smile similarly
5. Our results show a similar esthetic perception among general dentists and laypersons. This could be due to the influence of media, television, Internet, etc.

## Financial support and sponsorship

Self-supported.

## Conflicts of interest

There are no conflicts of interest.

## REFERENCES

1. Fresh JP, Fisher RD. The dynesthetic interpretation of the dentogenic concept. *J Prosthet Dent* 1958;8:558-81.
2. Moore T, Southard KA, Casco JS, Qian F, Southard TE. Buccal corridors and smile esthetics. *Am J Orthod Dentofacial Orthop* 2005;127:208-13.
3. Sarver DM, Ackerman MB. Dynamic smile visualization and quantification: Part 2. Smile analysis and treatment strategies. *Am J Orthod Dentofacial Orthop* 2003;124:116-27.
4. Miller AA, Arbor A. Psychological considerations in dentistry. *JADA* 1970;81:941-8.
5. Hulsey CM. An esthetic evaluation of lip-teeth relationships present in the smile. *Am J Orthod* 1970;57:132-44.
6. Ritter DE, Gandini LG, Pinto Ados S, Locks A. Esthetic influence of negative space in the buccal corridor during smiling. *Angle Orthod* 2006;76:198-203.
7. Espeland LV, Stenvik A. Perception of personal dental appearance in young adults: Relationship between occlusion, awareness, and satisfaction. *Am J Orthod Dentofacial Orthop* 1991;100:234-41.
8. Parekh S, Fields HW, Beck FM, Rosenstiel SF. The acceptability of variations in smile arc and buccal corridor space. *Orthod Craniofac Res* 2007;10:15-21.
9. Kokich VO Jr., Kiyak HA, Shapiro PA. Comparing the perception of dentists and lay people to altered dental esthetics. *J Esthet Dent* 1999;11:311-24.
10. Brisman AS. Esthetics: A comparison of dentists' and patients' concepts. *J Am Dent Assoc* 1980;100:345-52.
11. Ioi H, Nakata S, Counts AL. Effects of buccal corridors on smile esthetics in Japanese. *Angle Orthod* 2009;79:628-33.
12. Zange SE, Ramos AL, Cuoghi OA, de Mendonça MR, Suguino R. Perceptions of laypersons and orthodontists regarding the buccal corridor in long- and short-face individuals. *Angle Orthod* 2011;81:86-90.
13. Loi H, Nakata S. Effects of buccal corridors on smile esthetics in Japanese. *Angle Orthod* 2009;79:628-33.