

The Effects of Buccal Corridors on Smile Esthetics in Dentists and Orthodontic Patients

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Abstract

Aim: The purpose of this study was to evaluate the influence of the size of buccal corridors on the assessment of smile esthetics by dentists and orthodontic patients.

Method: One female individual, who has acceptable micro-esthetic features, was chosen and spontaneous smile was captured by a comical movie. The video image of smiling with maximum visibility of teeth and gingivae was selected. Buccal corridors were modified digitally from 0% to 20% compared with the inner inter-commissural width. Using a visual analog scale, 61 dentists and the 61 orthodontic patients rated the attractiveness of 5 smiles. To compare the distributions of the mean scores between orthodontic patients and dentists, between the male and female raters for each of the rater groups, Student *t* test was conducted.

Results: There was no significant sex difference except for 5% buccal corridor in judging the effects of buccal corridors on the smile attractiveness for both dentists and orthodontic patients. The difference in the evaluation the effects of buccal corridors on smile esthetics between dentists and orthodontic patients was statistically significant only for 5% buccal corridor ($p < 0.05$). The dentists assigned the highest scores to 10% buccal corridors and the orthodontic patients assigned the highest scores 15% buccal corridors. Both dentists and orthodontic patients assigned the lowest scores to 20% buccal corridors.

Conclusions: Both dentists and orthodontic patients preferred medium smiles to narrower smiles. Therefore large buccal corridors should be included in the problem list during treatment planning.

Keywords: orthodontics, smile, esthetic.

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INTRODUCTION

The smile plays an important role in facial expression. It influences a person's perceived attractiveness and it is the cornerstone of social interaction (1). Smile esthetics is associated with multiple factors, including the dentition and surrounding soft tissue (2). One of the smile components is the presence or absence of buccal corridors. In the smile, bilateral spaces appear between the buccal surface of the most visible maxillary posterior teeth and the lip commissure, called negative spaces (NSs), black spaces or buccal corridor (3-5). Hulsey (4) examined the "buccal corridors" as a ratio: distance between the maxillary canines/distance between the corners of the smile. He then observed that the pattern of the scatter plot diagram showed that the buccal corridor ratio was not related to the smile scores. Some authors suggested that the presence or absence of a buccal corridor while smiling is not esthetically critical (6), whereas some claim that smiles with a larger buccal corridor are less esthetically pleasing (1, 7-11).

Roden-Johnson et al (6), using computer simulations of buccal corridors spaces, validated Hulsey's original findings using smiles with three different arch forms to display absent and large buccal corridor spaces, which were then rated on a visual analog scale (VAS). Orthodontists preferred normal to broad arch forms compared with untreated, narrower arch forms, whereas lay people demonstrated no preference. More significantly, buccal corridor spaces did not have an effect on the smile ratings of

orthodontists, general dentists, and lay people. In contrast, Moore et al (8) found that laypersons could differentiate between different percentages of buccal corridor space except when they became minimal. The purpose of this study was to evaluate the effects of changes in buccal corridors and their interactions on the perceptions of smile attractiveness as judged by dentists and orthodontic patients by using digital manipulated images.

MATERIAL AND METHODS

This descriptive analytical study was conducted on dentists and orthodontic patients with no history of dental training. The sample size was calculated to be 61 participants in each group.

One frontal intraoral photograph of a woman with ideally aligned teeth and displaying esthetically smiling lips was obtained from a female colleague. These images were modified (CS4; Adobe Photoshop, San Jose, Calif) to create bilaterally symmetrical teeth and lips. The amount of buccal corridor was calculated as the difference between the inner inter-commissural width and the visible maxillary dentition width divided by the inner inter-commissural width. The ratio was reported as a percentage. As the visible maxillary dentition width increases, the buccal corridor decreases, and it would result in narrow buccal corridors. Five sizes of buccal corridors were created: narrow (0%), medium-narrow (5%), medium (10%), medium-broad (15%), broad (20%). Five images were arranged in the order of the amount of buccal corridor spaces and displayed on size A-4 paper (Figure 1).



Figure 1. Series of 5 images illustrating the range of buccal corridors created: **A:** narrow (0%), **B:** medium- narrow (5%), **C:** medium (10%), **D:** medium-broad (15%), **E:** broad (20%).

The subjective esthetic value of each smile was rated using a visual analog scale. This rating scale was designed for minimal constraints and the most freedom to express a personal response style. The VAS was 100 mm long, and raters used their own esthetic values to rank each smile from least attractive to most attractive. An esthetic score was obtained by multiplying the distance between the least attractive (zero) and the hash mark by two. Namely, the esthetic score was distributed from 0 to 100, with 0 being the minimum and 100 the maximum esthetic value. The photos were also randomly displayed on raters. To compare the distributions of the mean scores between orthodontic patients and dentists, between the male and female raters for each of the rater groups, Student *t* test was conducted. The minimum level of statistical significance was set at $P < 0.05$.

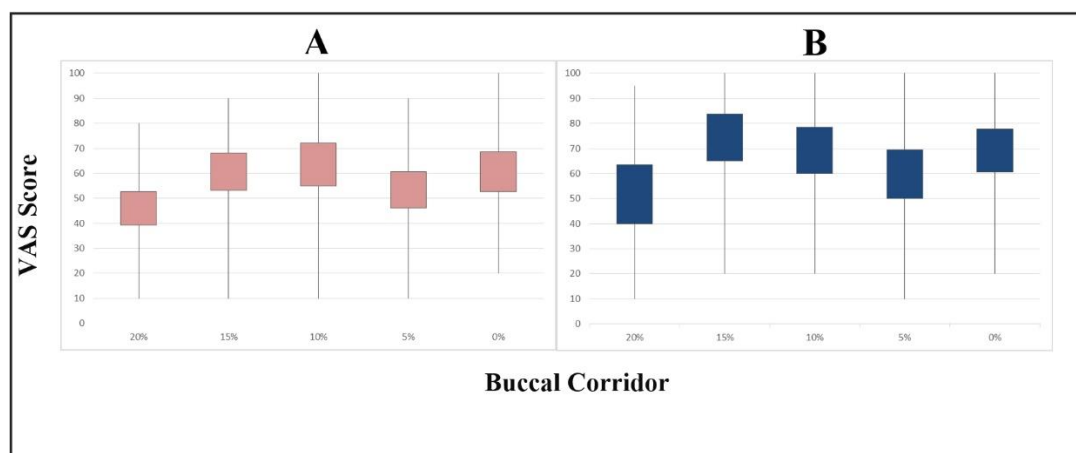


Figure 2. Mean values and ranges of the esthetic scores for each buccal corridor space: **A,** Female orthodontic patients; **B,** Male orthodontic patients.

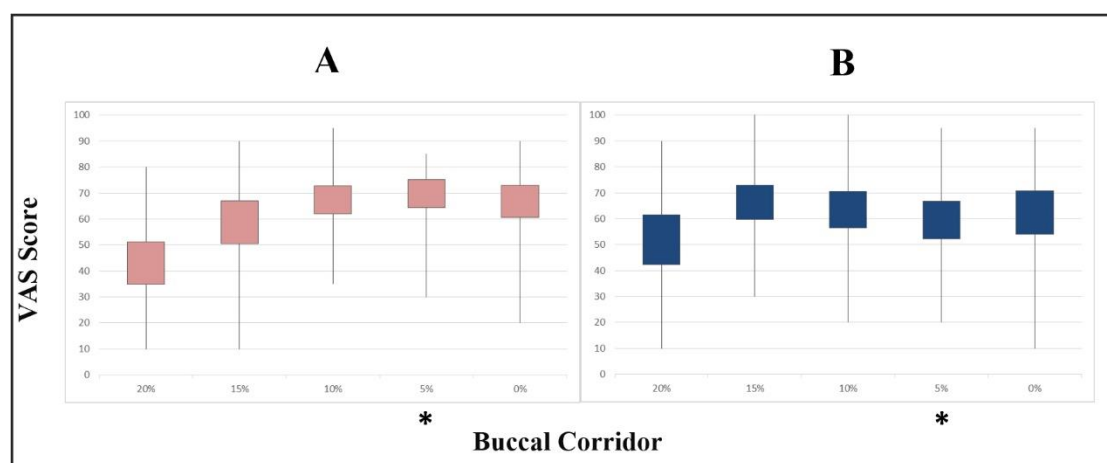


Figure 3. Mean values and ranges of the esthetic scores for each buccal corridor space: **A**, Female dentists; **B**, Male dentists. * Statistically significant.

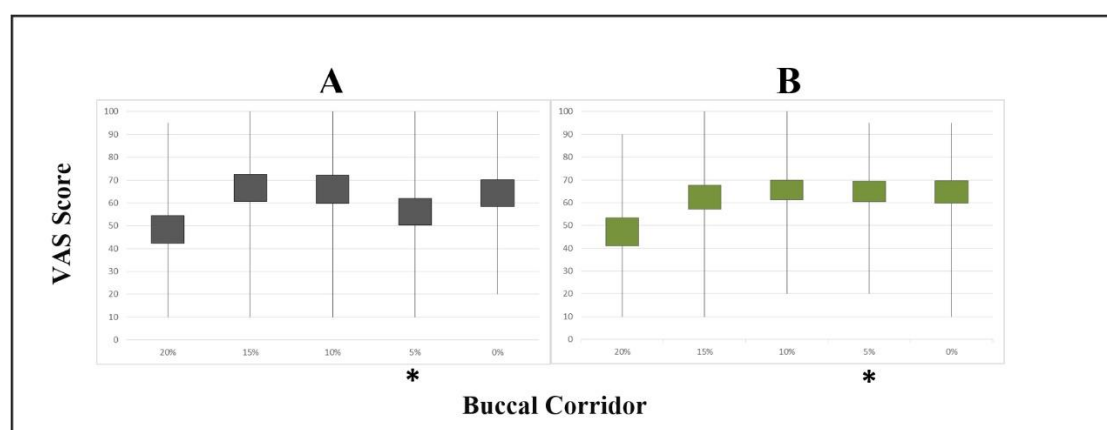


Figure 4. Mean values and ranges of the esthetic scores for each buccal corridor space: **A**, Orthodontic patients; **B**, Dentist

RESULTS

A total of 61 dentists (40 men, 21 women; aged 29.6 ± 2.6 years) and 61 orthodontic patients (31 men, 30 women; aged 16.9 ± 2.5 years) included in the study (Table-1).

Broad buccal corridors were considered least attractive in all groups, however this difference was only significant in female dentists ($p < 0.05$). In contrast narrow buccal corridor was considered most attractive in all groups without any significant difference (Table-1).

TABLE 1. Descriptive data of study groups and results.

Groups	n	VAS Scores (mm)				
		Broad (%20)	Medium-broad (%15)	Medium (%10)	Medium-narrow (%5)	Narrow (%0)
Dentists	61	47,41 ± 23,97	62,56 ± 20,24	65,42 ± 16,83	64,63 ± 17,02*	64,60 ± 19,61
Female	21	42,96 ± 22,74	58,75 ± 22,86	67,34 ± 14,91	69,78 ± 15,05†	66,87 ± 17,21
Male	40	51,86 ± 25,21	66,37 ± 17,62	63,51 ± 18,75	59,48 ± 19,00	62,34 ± 22,02
Patients	61	50,63 ± 25,68	65,01 ± 22,75	66,63 ± 24,62	56,75 ± 22,98	65,89 ± 22,98
Female	30	46,26 ± 21,60	68,02 ± 23,48	65,26 ± 23,84	55,50 ± 22,53	62,78 ± 22,65
Male	31	55,00 ± 29,76	62,00 ± 22,02	68,00 ± 25,41	58,00 ± 23,43	69,00 ± 23,31

Note: All data presented as mean ± standard deviation.

n: number; VAS: visual analog scale.

*: $p < 0.05$ Student-t test results of inter-group comparisons

†: $p < 0.05$ Student-t test results of intra-group comparisons

In the dentist group, the mean esthetic scores (VAS) for women were higher in medium-narrow buccal corridor (5% buccal corridors) than men but this result was not also statistically significant (Table-1) Considering the results in the patient group, it was seen that the effect of buccal corridor width on smile esthetics did not show a statistically significant difference between male and female patients. For both dentists and orthodontic patients, broad buccal corridor (20% buccal corridors) was rated least attractive. The orthodontic patients and dentists have similar tendencies except for medium-narrow buccal corridor (5% buccal corridors) in rating the preferences of buccal corridor spaces. Ratings of medium-narrow buccal corridor (5% buccal corridors) were lower for orthodontic patients than for dentists.

DISCUSSION

The VAS is one of the most common tools used to assess pain intensity and has been shown to be a valid, reliable, and reproducible method of measuring subjective pain (12). As many investigators (9, 13-15) have used the VAS method to judge attractiveness, use of the VAS method in scoring esthetics should also provide simple, rapid, and reproducible results. In this study, we also used VAS method. This study focused on the effects of buccal corridors on smile attractiveness when judged by orthodontic patients and dentists.

No significant difference was shown in the esthetic scores except for medium-narrow buccal corridor (5% buccal corridors) in dentists between the male and female raters for both the orthodontic patients and dentists. Moore et al (8) and Ioi et al (1) found no significant difference in judging smile esthetics between male and female judges. Martin et al (9) and Gracco et al (6) also reported that rater's genders were not significant in rating of buccal corridor preferences.

In this study, the orthodontic patients and dentists have similar tendencies except for medium-narrow buccal corridor (5% buccal corridors) in rating the preferences of buccal corridor spaces. Broad buccal corridor (20% buccal corridors) was rated least attractive for both orthodontic patients and dentists. Roden-Johnson et al (6) found a difference in esthetic perceptions among orthodontists, general dentists, and laypersons for buccal corridor spaces. Moore et al (8) reported that a broader smile was judged by laypersons to be more attractive than a narrow smile. Parekh et al (16) stated that laypersons and orthodontists have similar preferences when the acceptability of buccal corridors and smile arcs are considered. Krishnan et al (14) also indicated that there was no perception difference between dental specialists and laypersons on overall smile evaluation. Ker et al (17) reported that the ideal buccal corridor size was 16%, and their acceptability range was 8% to 22%.

CONCLUSIONS

- No significant difference was shown for judging the effects of buccal corridors except for medium narrow buccal corridor (5% buccal corridor) on the smile attractiveness between the male and female raters for both the orthodontic patients and dentists.
- Both the orthodontic patients and dentists preferred medium smiles to narrow smiles.
- Large buccal corridors should be included in the problem list during orthodontic diagnosis and treatment planning.

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