

EFFECT OF TOOTH- GINGIVAL DISPLAY AND BUCCAL CORRIDOR SPACE ON SMILE ATTRACTIVENESS BASED ON THE PRECEPTION OF ORTHODONTIST AND GENERAL DENTIST.

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ABSTRACT: INTRODUCTION - The smile influences a person's attractiveness and is the cornerstone of social interaction. In orthodontic treatment, esthetics have been associated with profile enhancement so, patient-driven esthetic diagnosis and treatment planning have become important. The purpose of this study was to evaluate the effect of influence of the tooth gingival display and buccal corridors on smile attractiveness as evaluated by orthodontists and general dentists.

MATERIALS AND METHODS – A comparative cross sectional study of sample size 60 was conducted in which 30 orthodontist and 30 general dentist were randomly selected. These two groups were given information regarding the study and data collection was done using google questionnaire form consisting of 12 questions (Annexure -1). Each participant was asked to assess and rank the buccal corridor and tooth-gingival display figures on a scale of 1 to 5, with 5 being the most appealing and 1 being the least.

RESULT – On evaluation, statistically significant difference in the assessment of tooth display and buccal corridor width on smile attractiveness between an orthodontist and a general dentist was noted.

CONCLUSION – Orthodontists prefer smiles with small buccal corridor space (5%) and smile revealing complete central incisor display with less than 2mm gingival exposure. For both groups, a broad buccal corridor (15%) and gingival display of two millimetres and greater were indicators of a less appealing smile.

KEYWORDS – buccal corridor, tooth gingival display, adobe photoshop CS3 software. The views of general dentists towards a change in buccal corridor width (5%, 10%) are less discriminating than those of orthodontists.

INTRODUCTION

A smile is a crucial component of facial expression. It is the basis of social interaction and affects how someone is seen to be attractive¹. Smile aesthetics has evolved into a priority for orthodontists and their patients and has become a key indicator of orthodontic success. It is essential for orthodontists to use every effort to create a harmonious equilibrium that gives each patient the most beautiful smile possible. When orthodontic treatment improves an unsightly smile, the person feels happier and more confident. The smile arc and buccal corridors, two of the eight elements of a

balanced smile, have recently drawn the attention of orthodontists².

A smile is the culmination of many qualities, positive and negative. The exhibition zone of the smile is framed³ by the upper and lower lips, which also frame the gingival scaffold and the space in the oral cavity. Numerous factors have been linked to the aesthetics of smiles, including lip shape, smile index, inciso-gingival display, golden proportion, smile arc, and buccal corridor width.³

The path of the maxillary central incisor, lateral incisor, and canine points should be followed by the smile arc. It should also be in accordance with the

lower lip's curvature. The canines should be at the same level as the gingival edges of the central incisors, which should be positioned apically to those of the lateral incisors. For females and males, there should be roughly 2mm and less than 1mm of gingival display respectively.⁴⁻⁷

In 1992, Peck et al.⁸ determined that the gingival smile line is unaffected by the length of the upper lip, the height of the incisor crowns, the angle of the mandibular plane, or the angle of the palatal plane. They detailed how orthodontists and surgeons have been trained to see high gingival smile lines as undesirable. They noted that the anterior vertical maxillary excess, increased lip-raising muscle strength, and additional characteristics such as an extreme overjet and overbite all affect the biological mechanics of the gingival smile line. They also observed that the sex of the individual had a significant impact on where the gingival smile line appeared. Women typically have a 1.5 mm higher smile line than males.^{7,8}

In order to ensure that dentures looked natural, the buccal corridor idea was developed in the 1950s. This aspect of smile aesthetics, also known as lateral dark space, lateral negative space, or "shadow tunnel," refers to the dynamic space that develops when a person smiles between the labial surface of the maxillary posterior teeth and the inner mucosa of the soft tissues that form the corners of the mouth and the cheeks. The buccal corridor, as Frush and Fisher⁹ described as the area between the buccal surfaces of the back teeth and the corners of the mouth while smiling, also affects oral beauty. It has been said that a simple buccal corridor display is more appealing. Orthodontists, conventional dentists, and laypeople have long had different ideas about smiles and aesthetics. Additional research, however, has revealed a significant difference between orthodontists' and general dentists' perceptions of what defines an appropriate smile arc and buccal corridors.^{9,10}

Additionally, none of them have examined general dentist and orthodontist judgements of tooth gingival show and buccal corridor. The goal of the current study was to determine how orthodontists

and general dentists evaluate the beauty of smiles in relation to the tooth gingival show and buccal corridors.

AIM AND OBJECTIVES:

AIM: To evaluate and compare the effect of tooth- gingival display and buccal corridor space on smile attractiveness based on the perception of orthodontist and general dentist.

OBJECTIVES:

- To evaluate and compare the effect of tooth- gingival display on smile attractiveness based on the perception of orthodontist and general dentist.
- To evaluate and compare the effect of buccal corridor space on smile attractiveness based on the perception of orthodontist and general dentist.

MATERIAL AND METHODS

Study design – A comparative cross sectional study was conducted of sample size 60 in which 30 orthodontist and 30 general dentist were randomly selected. These two groups was given information regarding the study and data collection was done using goggle form questionnaire consisting of 12 questions (Annexure -1). On Google Form survey, each participant was asked to assess and rank the buccal corridor and tooth-gingival display figures on a scale of 1 to 5, with 5 being the most appealing and 1 being the least. Out of 60 total 57 of them responded to the questionnaire.

Development of a Series of Images

A female with concurrent dental midline alignment of her anterior teeth was captured in one frontal smiling photograph. The lower lip coincided with the curvature of the incisal edges of the maxillary incisors and canines. This image was modified using Adobe Photoshop CS3 (Adobe Systems, CA, USA) software to make the desired changes for evaluation of buccal corridor space and tooth gingival display. The buccal corridor width would become shorter as the width of the dental arch increased resulting in broad smiles. Buccal

corridors were altered by digitally removed teeth from the distal aspects of the dentition where the teeth met with the lateral commissures of the smile in three distinct dimensions : 5%, 10%, and 15%. In which image with 5% buccal corridor is considered as control. The three images were arranged from narrowest buccal corridor to widest. (Fig. 1)

To evaluate tooth-gingival display by altering the lip length with increasing lip length and 4mm incisor show, normal lip length with complete incisor show and 2 mm of gingival display considered as control, and decreasing lip length with complete incisor show and 4 mm of gingival display. The images were arranged in order of increasing tooth-gingival display.(Fig. 2)



Fig. 1. Sequence of the three images illustrating different width of buccal corridor altered by digitally removed teeth from the distal aspects of the dentition where the teeth met with the lateral commissures of the smile with increasing contrast incrementally from 5% to 15%. (5%, narrow; 10%, medium; 15%, broad)

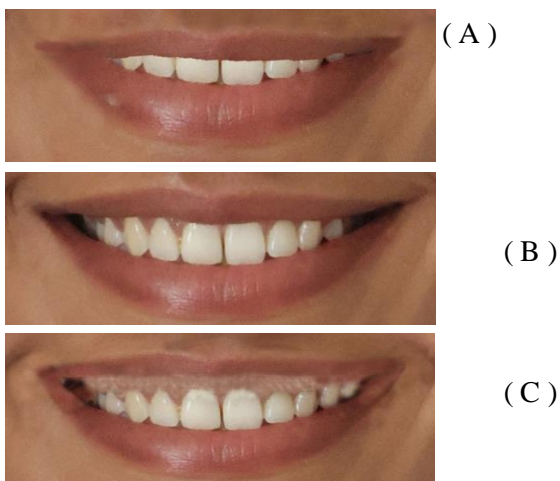


Fig. 2. Sequence of the three images illustrating different tooth-gingival display. (A, 4 mm incisal display; B, complete incisor with 2mm gingival display; C, complete incisor show with 4 mm gingival display)

Statistical analysis

Following data collection, data was coded and expressed in MS Excel worksheet (Microsoft, USA). Estimated values were expressed along with 95% confidence intervals. Data analysis was done using IBM Statistical Package for Social Sciences (Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.) Continuous data was presented by mean and standard deviation (SD). Discrete data was presented as frequency and percentage. For comparing proportions, two proportion Z test was used. For analysis, p-value less than 0.05 was considered statistically significant.

Results

There was statistically significant difference in the evaluation of tooth display and buccal corridor width on smile attractiveness between an orthodontist and a general dentist. Therefore, the pooled data of ratings of orthodontist and general dentist for smile attractiveness were used for the following analysis.

Buccal corridor

The current findings showed that the most attractive and least appealing images had buccal corridor widths of 5% and 15%, respectively. Between 5% and 15%, there was a considerable variation in buccal corridor width. The picture with a 5% buccal corridor width received the highest scores, according to a comparison of the ratings. Age and gender had no impact on the judgement of a smile's attractiveness, but the raters' occupation influenced. The orthodontist and general dentists graded the effect of buccal corridor size on the smile's attractiveness differently, with substantial differences. The orthodontist and general dentists' ratings for buccal corridor space were 5%, 10%, and 15% are shown in Table 1.

Table 1: Occupation-wise response on image for buccal corridor space:

| Image | Response | General Practitioner | | Orthodontist | | p value |
|--------------------------------|-------------------|----------------------|-------|--------------|-------|--------------------------------|
| | | n | % | N | % | |
| Buccal corridor space with 5% | Very unattractive | 2 | 6.7% | 2 | 7.4% | $z=0.109$, $p=0.912$ NS |
| | Unattractive | 4 | 13.3% | 2 | 7.4% | $z=0.727$, $p=0.465$ NS |
| | Average | 11 | 36.7% | 6 | 22.2% | $z=1.190$, $p=0.234$ NS |
| | Attractive | 6 | 20% | 13 | 48.1% | $z=2.250$, $p=0.024^*$ |
| | Very Attractive | 7 | 23.3% | 4 | 14.8% | $z=0.813$, $p=0.417$ NS |
| Buccal corridor space with 10% | Very unattractive | 1 | 3.3% | 1 | 3.7% | $z=0.075$, $p=0.936$ NS |
| | Unattractive | 8 | 26.7% | 5 | 18.5% | $z=0.732$, $p=0.465$ NS |
| | Average | 6 | 20% | 13 | 48.1% | $z=2.250$, $p=0.024^*$ |
| | Attractive | 8 | 26.7% | 6 | 22.2% | $z=0.389$, $p=0.696$ NS |
| | Very Attractive | 7 | 23.3% | 2 | 7.4% | $z=1.646$, $p=0.098$ NS |
| Buccal corridor space with 15% | Very unattractive | 1 | 3.3% | 6 | 22.2% | $z=2.169$, $p=0.030^*$ |
| | Unattractive | 11 | 36.7% | 9 | 33.3% | $z=0.263$, $p=0.794$ NS |
| | Average | 9 | 30% | 9 | 33.3% | $z=0.270$, $p=0.787$ NS |
| | Attractive | 4 | 13.3% | 1 | 3.7% | $z=1.283$, $p=0.200$ NS |
| | Very Attractive | 5 | 16.7% | 2 | 7.4% | $z=0.191$, $p=0.849$ NS |

Image of buccal corridor space with 5% shows Only 6 (20%) general practitioners as opposed to 13 (48.1%) orthodontists found the image

attractive with statistically significant difference between the groups ($p=0.024$).

Image with buccal corridor space 10% shows Thirteen (48.1%) orthodontist found the image average as opposed to 6 (20%) general practitioners who found the image average and the difference between the groups was statistically significant($p=0.024$).

Image of buccal corridor space with 15% shows there were 6 (22.2%) orthodontist as compared to only 1 (3.3%) general practitioner who found the image very unattractive and the difference between the groups was statistically significant ($p=0.030$).

Tooth gingival display

The smile revealing the complete central incisors was considered the most attractive. A 4 mm gingival display showed the least attractive; while a 4 mm central incisor display was the unattractive. The scoring results related to tooth gingival display and comparative illustration of the scores of tooth gingival display showed in table 2.

Table 2: Occupation-wise response on image for tooth gingival display:

| Image | Response | General Practitioner | | Orthodontist | | p value |
|--------------------------|-------------------|----------------------|-------|--------------|-------|--------------------------------|
| | | n | % | N | % | |
| complete incisor display | Very unattractive | 1 | 3.3% | 1 | 3.7% | $z=0.075$, $p=0.936$ NS |
| | Unattractive | 6 | 20% | 3 | 11.1% | $z=0.918$, $p=0.357$ NS |
| | Average | 9 | 30% | 7 | 25.9% | $z=0.341$, $p=0.727$ NS |
| | Attractive | 6 | 20% | 13 | 48.1% | $z=2.250$, $p=0.024^*$ |
| | Very Attractive | 8 | 26.7% | 3 | 11.1% | $z=1.485$, $p=0.136$ NS |
| | complete central | Very unattractive | 9 | 30% | 7 | 25.9% |

| | | | | | | |
|---|-------------------|----|-------|----|-------|------------------------------|
| I incisor with 4mm gingival display | Unattractive | 8 | 26.7% | 6 | 22.2% | $z=0.389$ $p=0.696$ NS |
| | Average | 4 | 13.3% | 8 | 29.6% | $z=1.506$ $p=0.131$ NS |
| | Attractive | 4 | 13.3% | 5 | 18.5% | $z=0.536$ $p=0.589$ NS |
| | Very Attractive | 5 | 16.7% | 1 | 3.7% | $z=1.592$ $p=0.111$ NS |
| 4mm of central incisor display | Very unattractive | 15 | 50% | 12 | 44.4% | $z=0.419$ $p=0.674$ NS |
| | Unattractive | 5 | 16.7% | 6 | 22.2% | $z=0.530$ $p=0.596$ NS |
| | Average | 1 | 3.3% | 2 | 7.4% | $z=0.687$ $p=0.490$ NS |
| | Attractive | 3 | 10% | 5 | 18.5% | $z=0.924$ $p=0.357$ NS |
| | Very Attractive | 6 | 20% | 2 | 7.4% | $z=1.366$ $p=0.170$ NS |

NS- Not significant

* -Statistically significant

Image of smile revealing complete central incisor shows that there were 13 (48.1%) orthodontists as compared to 6 (20%) general practitioners who found the image attractive and the difference between the groups was statistically significant ($p=0.024$).

Image of smile revealing complete central incisor with 4mm gingival display was found to be unattractive by general practitioners and orthodontist with no significant difference between the groups ($p>0.05$).

Image of smile revealing 4 mm of central incisor display was found to be very unattractive by general practitioners and orthodontist with no significant difference between the groups ($p>0.05$).

Discussion

The extent of gingival display and the dimension of the buccal corridor were the two characteristics of smile aesthetics that were the focus of this study. In this study, 30 orthodontists and 30 general dentists were chosen as raters to examine the impact of these characteristics on the evaluation of smile beauty¹¹.

Orthodontists often consider a variety of characteristics when deciding what orthodontic treatments to recommend, thus this research was created to focus on aspects impacting smile attractiveness. A successful orthodontic practise can only be established with understanding of the ideal smile and use of that knowledge in the treatment process. The attractiveness of a smile is influenced by a number of elements, including the smile's arc, gingival display, tooth colour, etc.¹² In the current study, the effect of the buccal corridor and tooth gingival display on the attractiveness of a smile were assessed. Orthodontists and general dentists had significantly different perceptions of these factors.

In this study, a photograph limited to mouth was altered using the Adobe Photoshop CS3 (Adobe Systems, CA, USA) programme to achieve the desired changes in buccal corridor space and tooth gingival display. These changes were then rated using a range of scales (very attractive, attractive, average, unattractive, and very unattractive). In 2005, other researchers Roden-Johnson et al.¹³ assessed the attractiveness of smiles using a visual analogue scale (VAS). A VAS may signify different things to different raters, and raters will utilise certain elements of the scale and disregard others. By contrast, using the former technique to rate aesthetics yields straightforward, quick, and reliable results.

Hunt et al¹⁴ in 2002 conducted a study in which they considered gingival exposure during smile was regarded as unattractive in both male and female images. They found that the ratings were symmetrical around 0mm of gingival exposure and that the range of rating scores awarded between -2mm and +2mm was relatively small. However, with 3mm or more of gingival display, the attractiveness ratings reduced substantially. Extrapolating these results to the clinical situation it is suggested that the acceptable range for gingival exposure lies between 0mm and 2mm with an ideal of no gingival exposure.

In this study, the smile revealing complete central incisor with minimal or no gingival exposure found attractive to 13 (48.1%) orthodontist as compared to 6 (20%) general practitioners with statistically significant difference. Gingival exposure of 4mm and central incisor display of 4mm found unattractive by both the groups with no significant difference. All raters (general dentist and orthodontists) specifically general dentist were less sensitive to a change of 1mm of gingival display. All groups seemed gingival display of 2 mm or higher to be unattractive. This is in accordance with the findings of Hunt et al.¹⁴, who found in 2002 that a gingival display of more than 2 mm was seen as less appealing. A gingival show of more than 1 mm, according to Geron and Atalia¹⁵ in 2005, was considered unpleasant, while Kokich et al.¹⁶ in 2006 observed that general practitioners and laypeople did not detect gingival display during smiling until it was at least 4 mm. Nevertheless, despite the general perception of earlier research that as gingival show increased, smile attractiveness

decreased, the threshold at which a smile was judged unpleasant varied¹⁴⁻¹⁷.

According to a study by Martin et al¹⁸ in 2007 one of the many elements influencing smile aesthetics, both orthodontists and laypeople likes smiles with no or little buccal corridor space over those with large buccal corridor space. The picture with the narrower buccal corridor space (5%) was considered to be appealing in this study by 6 (20%) general practitioners as compared to 13 (48.1%) orthodontists, with a statistically significant difference between the groups. This supports the views of several other authors, including Sarver et al.¹⁹ (2007) and Sarver and Ackerman et al.²⁰ (2003), who believe that short buccal corridors are more appealing. It also supports the findings of Moore et al.²¹ (2005), who found that laypeople prefer smiles with little or no buccal corridor space.

This study assessed the levels of buccal corridor attractiveness from 5% to 15%. The pictures were altered from 0% to 26% and 2% to 28% in related earlier research examining the impact of buccal corridors on smile aesthetics. In light of prior research, the assessed range used in this study was enough for examining how buccal corridors affect the aesthetics of a smile. We discovered that: (1) the amount of buccal corridors had an impact on the evaluation of smile aesthetics; and (2) there were clinically significant differences between orthodontic and general dentist assessments of buccal corridor space and gingival show. (3) In terms of assessing the aesthetics of smiles, general dentists and orthodontists generally exhibited comparable tendencies, while

general dentists were less sensitive to the impact of buccal corridor space and tooth gingival display. However, considering the presence of buccal corridor space and tooth gingival display, the profession of the rater had an impact on smile attractiveness scores. This is in contrast to Krishnan et al.²² studied in 2008, which claimed that dental students and orthodontists scored buccal corridor preferences similarly. According to the findings of Parekh et al.²³ in 2006, who indicated that both orthodontists and laypeople favoured minimum buccal corridor space, wide buccal corridors were considered unpleasant in the present study. However, Roden Johnson et al. in 2005 hypothesised that buccal corridor space was not a major factor in the evaluation of smile aesthetics.

This study demonstrates a difference in how general dentists and orthodontists evaluate smiles. Here, orthodontists evaluated the smiles differently from general dentists with respect to aesthetics. This may be because orthodontists often have more formal training in smile aesthetics than general dentists.

Conclusions

In this investigation, we evaluated the perceptions of orthodontists, general dentists to intentionally altered dental esthetics. This study found that the attractiveness of a person's smile is influenced by the amount of buccal corridor width and tooth gingival exposure.

1. Orthodontists prefer smiles with small buccal corridor space (5%) and smile revealing complete central incisor display with less than 2mm gingival exposure .

2. General dentist are less discriminating than Orthodontists in their perceptions to a change of width of buccal corridor size (5% ,10%) .

3) Both the groups found less attractive smile with wide buccal corridor (15%) and gingival display of 2 mm or more.

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ANNEXURE – 1

Smile Analysis

The beauty of smile influenced by buccal corridor space and tooth-gingival display based on the perception of orthodontist and general dentist.

Instruction to Responders:

We would request to all the responders to rate the Image on a scale of 1 to 5. (1- very unattractive and 5- very attractive)

Description of the image has been given below the image.

1.Name of the respondent*

Your answer

2. email address *

Your answer

3. Age of the responder*

4. Gender of the responder*

5. Current Occupation*

6. Years of experience in current profession? *

Your answer

7. Rate the below images on a scale of 1 to 5 based on the buccal corridor space. 1 is very unattractive and 5 is very attractive. *



1 2 3 4 5

8. Rate the below image on a scale of 1 to 5 based on buccal corridor space. 1 is very unattractive and 5 is very attractive. *



1 2 3 4 5

9. Rate the below image on a scale of 1 to 5 based on buccal corridor space. 1 is very unattractive and 5 is very attractive. *



1 2 3 4 5

10. Rate the below image on scale of 1 to 5 based on tooth gingival display. 1 is very unattractive and 5 is very attractive.

*



1 2 3 4 5

11. Rate the below image on a scale of 1 to 5 based on tooth gingival display. 1 is very unattractive and 5 is very attractive. *



1 2 3 4 5

12. Rate the below image on a scale of 1 to 5 based on tooth gingival display. 1 is very unattractive and 5 is very attractive. *



1 2 3 4 5

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