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Original Article

Dentistry Section

Perception of Orthodontists on Posed and Dynamic Smile in Terms of Buccal Corridor Space: A Pilot Study

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ABSTRACT

Introduction: Smile analysis, is an important component of diagnosis and treatment planning. One component of smile analysis is the buccal corridor space. This "negative space" helps orthodontists in planning for a more aesthetic post treatment smile. Studies regarding smile analysis were done with the help of static images. A more comprehensive evaluation can be made with the help of dynamic images.

Aim: To access the difference in perception of orthodontists on posed and dynamic smile in terms of buccal corridor space.

Materials and Methods: The present pilot study was conducted in the Department of Orthodontics at Karpaga Vinayaga Institute of Dental Sciences, Chengalpattu, Tamil Nadu, India, from September 2024 to December 2024. Fifteen subjects (six males, nine females) aged 18 to 25 years were selected for the study. The subjects were made to sit upright and a video camera at a distance of 10 feet from the subject was stabilised. The subjects were asked to smile and then say the English phrase "Chelsea eats cheesecake on the Chesapeake" and multiple images were captured. The smiles were divided into two groups. Group A: Posed smile and Group B: dynamic smile. The image that was captured before saying the phrase was selected as posed smile and the image that best represented the broadest smile was selected as the dynamic smile. A Google form was created, in which both the posed and dynamic smile pictures were mixed and uploaded. The form was circulated to ten experienced Orthodontists for evaluation. Subjective evaluation was done using Visual Analogue Scale (VAS) to rate the smiles based on buccal corridor space in terms of attractiveness and treatment priority needs.

Results: A total of 150 responses were recorded for both posed and dynamic smiles. The scoring given by each Orthodontist for each question was summed up to produce the results. Both posed and dynamic smile were found to have moderate level of attractiveness in terms of buccal corridor space. It also shows that, the broader the buccal corridor space, the need for treatment increases.

Conclusion: Even though posed smile is considered to be used as a standard for smile analysis in diagnosis and treatment planning, dynamic smile evaluation can also be taken into account for a better understanding of smile variables.

Keywords: Facial analysis, Smile arc, Smile analysis, Treatment planning

INTRODUCTION

The current paradigm shift has turned its focus on smile evaluation as the primary factor for aesthetics in orthodontic treatment. Many patients, especially, young adults are more concerned about their appearances which push orthodontists to improve on smile assessment and devise precise treatment goals [1]. Smile analysis, as part of the overall facial analysis, thus becomes an important component of diagnosis and treatment planning. The aesthetics of a smile is influenced by many components such as the amount of gingival display, the presence of a smile arc, lip to tooth ratio, amount of incisor show during rest and buccal corridor space [2].

Frush JP and Fisher RD (1958) defined buccal corridors as the spaces between the facial surfaces of the posterior teeth and the corners of the lips when the patient is smiling. It is measured from the mesial line angle of maxillary first premolar to interior portion of commissure of lips during smiling. This space is also referred to as negative space or blank space [3]. In orthodontics, the width of the buccal corridor space serves as an important diagnostic indicator for assessing the necessity of arch expansion. A wider buccal corridor often suggests a constricted maxillary arch, thereby implying that expansion procedures may be needed. Studies have shown that buccal corridor has an influence on the smile aesthetics of an individual [4-9]. Hulsey CM (1970) had compared the attractiveness of orthodontically treated and untreated subjects in his study. He found that buccal corridor space has minimal influence and did not impact the smile score [4]. It has been stated that in individuals lacking buccal corridor space, their smile seemed unrealistic and denture like making them look older [1]. Thus, orthodontists aim to provide minimal amount of buccal corridor show during finishing of treatment.

There are different classifications of smiles given by various authors, Ackerman JL et al., classified smiles as posed and dynamic smile. The posed or static social smile is a voluntary smile a person uses in social settings or when being photographed. A spontaneous or dynamic smile is involuntary and represents the emotion a person is experiencing at that moment. During posed and dynamic smile, there appears to be a difference in the amount of exposure of buccal corridor space. The dynamic smile naturally reveals more buccal corridor space than posed smile [5].

Smile analysis is usually done based on static images. Dynamic image measurements were not preferred because they were considered to be difficult to reproduce and had variability. The use of videography and multiple burst images has made it possible to capture and evaluate dynamic smiles. Iunes A et al., had evaluated the level of attractiveness of posed and spontaneous smile photographs and found that spontaneous smiles were more attractive than posed smiles. However, a definite component of smile analysis was not used to evaluate the smiles in the study [6]. Assessment of components of smile with the help of both posed and dynamic smile images can provide a more comprehensive insight for smile aesthetics [7]. Young patients in today's generation have a heightened awareness and concern regarding facial aesthetics, especially on the appearance of their smile. Hence, the components of smile have been incorporated into routine orthodontic treatment.

Recent studies have not focused on buccal corridor space as a component for smile evaluation [6-8] The perception of smile attractiveness in previous studies have been evaluated using posed or static smile photographs [10-12]. Assessment of components of smile with the help of both posed and dynamic smile images can provide a more comprehensive insight for smile aesthetics [7]. Thus, the aim of the present study was to compare the difference in perception of posed and dynamic smile in evaluating buccal corridor space and to access the difference in level of attractiveness and treatment priority needs in terms of buccal corridor space.

MATERIALS AND METHODS

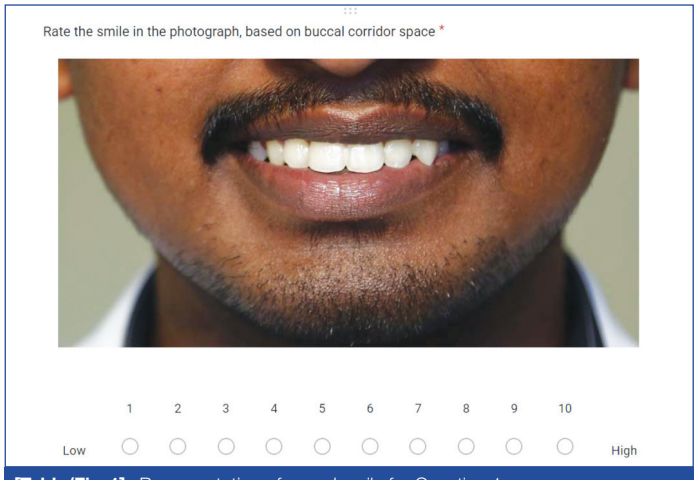
This pilot study was conducted in the Department of Orthodontics at Karpaga Vinayaga Institute of Dental Sciences, Chengalpattu, Tamil Nadu, India, from September 2024 to December 2024. Ethical approval was obtained from the Institutional Ethical Committee of Karpaga Vinayaga Institute of Dental Sciences. (IEC/KIDS/2024/IV/013).

Inclusion and Exclusion criteria: Inclusion criteria for the study were subjects within the age group of 18 to 25 years, with a full set of teeth in the maxillary and mandibular arches (except third molars), having Class I malocclusion with minimal crowding or spacing. Exclusion criteria were subjects who had undergone previous orthodontic treatment, had any congenitally missing teeth, extracted teeth due to caries or for orthodontic purposes, periodontally compromised condition and gross facial or dental anomalies.

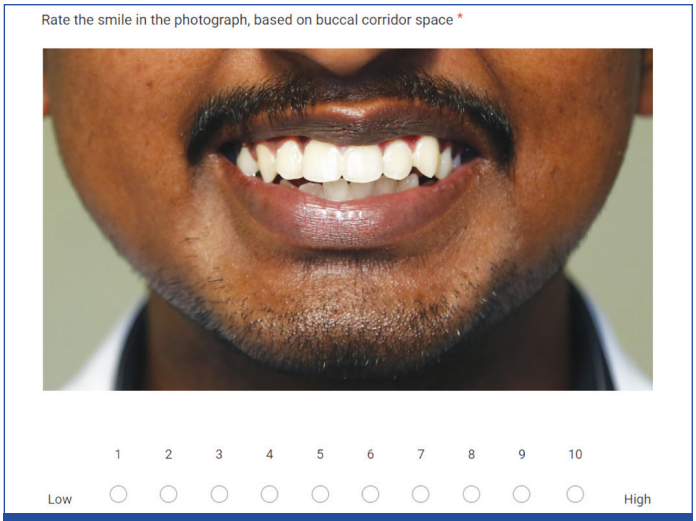
Study Procedure

Fifteen untreated subjects who came to the department were selected by simple random sampling technique. The subjects were seated in an upright position in front of a white backdrop. A video camera (Nikon D3200, Nikon Corporation, Tokyo, Japan) was positioned at a distance of 10 feet from the subject. The camera was stabilised using a tripod stand to ensure consistent framing. Each individual was asked to smile and say the English phrase "Chelsea eats cheesecake on the Chesapeake" and multiple images were captured [9]. The smile image captured before saying the phrase was selected as the posed smile. The broadest smile while saying the phrase was selected as the dynamic smile. The selected smiles were grouped into two groups Group A posed smile and Group B dynamic smile.

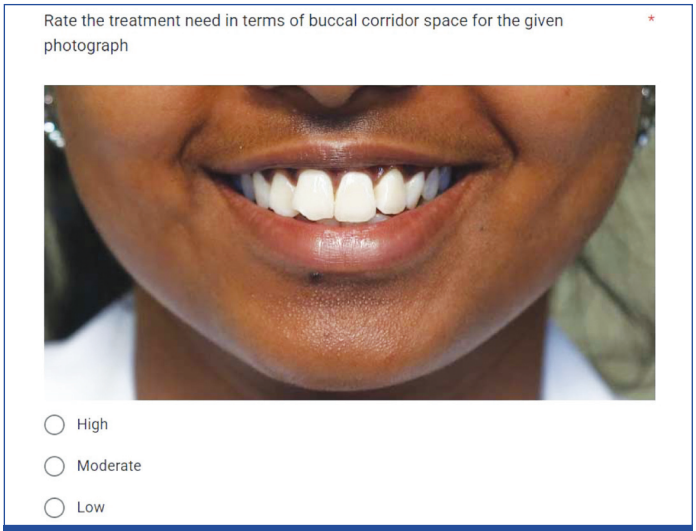
A Google Form titled "Smile Evaluation Based on Buccal Corridor Space" was created for the study. Selected smile photographs were cropped and zoomed-in images of the smiles were uploaded to the form. The questionnaire consisted of two sections, each containing a single question: 1) "Rate the smile in the photograph based on buccal corridor space," [Table/Fig-1,2]; and 2) "Rate the treatment need in terms of buccal corridor space in the given photograph" [Table/Fig-3,4]. The form was circulated to ten experienced orthodontists, who participated in the evaluation. A VAS ranging from 1 to 10 was used to assess the photographs based on perception. The scale was divided as low (1-3), moderate (4-7) and high (8-10) for easy understanding [8].



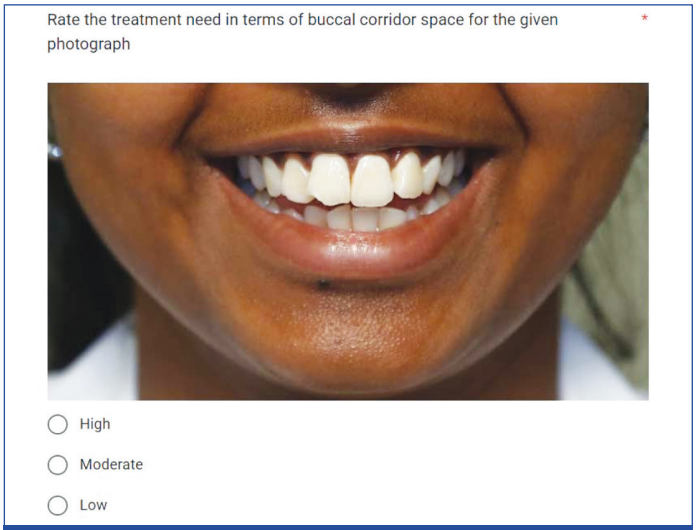
[Table/Fig-1]: Representation of posed smile for Question 1.



[Table/Fig-2]: Representation of dynamic smile for Question 1.



[Table/Fig-3]: Representation of posed smile for Question 2.



[Table/Fig-4]: Representation of dynamic smile for Question 2.

STATISTICAL ANALYSIS

Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) Software Version 21. The values obtained from the Google form was entered in Microsoft Excel and the mean scores of the values for each Orthodontist was found. Chi square test was used to obtain the results. p value <0.05 implied statistical significance.

RESULTS

The Google form was circulated to ten experienced Orthodontists who participated in the study. The scoring given by each Orthodontist for each question was summed up to produce the results. A total of 150 responses were recorded for both posed and dynamic smiles. 6 (40%) males and 9 (60%) females were included to be photographed with a mean age of 22±3 years [Table/Fig-5].

Variables		n (%)
Gender	Male	6 (40)
	Female	9 (60)
Mean age (years)		22±3
Total		15 (100)

[Table/Fig-5]: Demographic data of samples photographed.

[Table/Fig-6] shows the results for the question "(1). Rate the smile in the photograph based on buccal corridor space". Results showed both posed and dynamic smile have been rated in the moderate range of the scale (rating score between 4-7). Moderate level of attractiveness was the average response obtained. Overall, there was no statistically significant difference (p-value=0.091) between posed and dynamic smile based on buccal corridor space.

	Question 1			
Smile	High n (%)	Moderate n (%)	Low n (%)	p-value
Posed	18 (12)	91 (60.67)	41 (27.33)	0.091
Dynamic	32 (21.33)	83 (55.33)	35 (23.33)	

[Table/Fig-6]: Comparison of smile attractiveness between posed and dynamic smile.
-*p-value <0.05 implies statistical significance

[Table/Fig-7] shows the results for the question "(2) Rate the treatment needs in terms of buccal corridor space for the given photograph". Results show no statistically significant difference (p-value=0.141) between posed and dynamic smile in terms of treatment needs. Both posed and dynamic smile were rated on the moderate range (rating score between 4-7) of the VAS by majority of orthodontists.

	Question 2			
Smile	High n (%)	Moderate n (%)	Low n (%)	p-value
Posed	39 (26)	82 (54.67)	29 (19.33)	0.141
Dynamic	47 (31.33)	65 (43.33)	38 (25.33)	

[Table/Fig-7]: Comparison between posed and dynamic smile on the basis of treatment. needs.
-*p-value <0.05 implies statistical significance

[Table/Fig-8] shows the relationship between smile attractiveness and treatment needs in relation to buccal corridor space. A correlation coefficient of -0.427 with p-value of 0.002 was observed, indicating a moderate negative correlation between these two parameters. This suggested that as buccal corridor space increases which is typically associated with a lower level of smile attractiveness there is a corresponding increase in perceived treatment needs.

	Treatment Need	
Variable	p-value*	r-value#
Smile attractivess	0.002	-0.427*

[Table/Fig-8]: Correlation between the two.
-# Spearman correlation; -*p-value <0.05 implies statistical significance

DISCUSSION

Smile analysis consists of eight major components [13]. Out of these eight components, the smile arc, amount of gingival display and buccal corridor space has been highly used to assess the attractiveness of smile. In routine practice, smile analysis is carried out with the help of standard social smile photographs [10]. Pisulkar SK et al., compared smiles with and without buccal corridor space [11]. Results showed that smiles with buccal corridor space were found to be more attractive than smiles with reduced or no buccal corridor space. Ritter DE et al., also evaluated the aesthetic influence of buccal corridor space on posed smile photographs [12]. Two orthodontists and two lay persons were selected for evaluation. They concluded that, the negative space did not influence the smile evaluation. The results of these studies depict the results for static or posed smile.

There have been only a few studies on smile analysis using dynamic smile photographs [6,7]. Mahn E et al., compared posed and spontaneous smile photographs to access the smile variables such as smile line and gingival display [7]. They concluded that there exists a difference in treatment needs and planning when accessing posed and spontaneous smile. Iunes A et al., compared the attractiveness of posed and spontaneous smile post orthodontic treatment [6]. Photographs of five patients were used for evaluation by general dentists and laypersons. The study concluded that, spontaneous smile was rated to be more attractive post treatment by all the evaluator groups. However, in this study, the perception of attractiveness was compared between posed and dynamic smile based on buccal corridor space. The present study showed that both posed and spontaneous smile were found to be moderately attractive in terms of buccal corridor space. This states that buccal corridor space has little influence on the smile attractiveness.

Increased buccal corridor space is an indication of a narrow arch form in Orthodontics. A broader dental arch enhances smile aesthetics, as narrower buccal corridors are generally perceived as more visually appealing [14]. Maulik C et al., analysed the components of smile using dynamic smile photographs [9]. Smile photographs of untreated patients, orthodontically treated patients and patients treated orthodontically along with Rapid Maxillary Expansion (RME) were taken into assessment. The study stated that 11.0% of buccal corridor space was considered to be an average value for buccal corridor show in dynamic smile assessment.

Similarly, Moore T et al., evaluated the influence of buccal corridor space on smile attractiveness in static images [2]. Ten smile photographs were digitally altered, having a range of narrow to broad smile fullness. Thirty laypersons used VAS to rate the photographs. Results showed that broader smiles having minimal buccal corridor space was found to be attractive that narrow smiles with large buccal corridor space. A study by Roden-Johnson D et al., states that broader arch forms are found to be more aesthetic than narrow arch forms by both general dentists and orthodontists [15]. Parekh S et al., has reported that both orthodontists and laypersons preferred smiles where the buccal corridors were minimal, emphasising the importance of this factor in smile aesthetics [16].

In this study, a correlation test was done to check if buccal corridor space played a role in smile attractiveness and treatment needs. Results of the present study showed that, there exists a negative corelation between smile attractiveness and treatment needs. This signified that when there was an increase in buccal corridor space, which was perceived to be a lesser attractive smile, there was an increase in the treatment needs. Studies from the literature collectively suggested that an increase in buccal corridor width, leading to a less attractive smile, correlated with an increased perception of orthodontic treatment needs [2,9,15,16]. These findings were similar to this study, which also identified a significant relationship between increased buccal corridor space and the perceived necessity for orthodontic intervention.

Limitation(s)

One major limitation of this study was, it was based on perception of photographs using a VAS. There might have been variations within examiners due to subjective evaluation. Measurement of buccal corridor using a scale might have given a definitive result.

Orthodontists have been trained to have a keen eye and are much more sensitive to smile analysis and treatment planning. The inclusion of laypersons or other dental specialists such as prosthodontists as examiners might have given a different viewpoint in the perception of dynamic smile. Another drawback was the small sample size and small group of examiners. Further studies with a diverse group of examiners can give a better insight into the role of dynamic smile use for smile analysis in day-to-day practice.

CONCLUSION(S)

This study demonstrates that both posed and dynamic smiles exhibited a moderate level of attractiveness in relation to buccal corridor space. Smiles perceived as less attractive were associated with a larger buccal corridor space, which in turn corresponded with a greater need for orthodontic or aesthetic treatment. This indicates a direct relationship between buccal corridor space and treatment needs in dynamic smile analysis. In conclusion, the use of dynamic smile photographs provides a valuable and distinct perspective in smile evaluation and treatment planning. However, further research is necessary to explore the full significance and clinical relevance of dynamic smile analysis.

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