



The Insight Perception Of Selected Aspects Of Smile Esthetics – Smile Arcs And Buccal Corridors: A Cross Sectional Study

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Type of Publication: Original Research Paper

Conflicts of Interest: Nil

Abstract

Introduction: One of the primary goals of Prosthodontist and General dentists is the attainment of ideal facial and dental esthetics. Recently, the field of Prosthodontics has experienced a “paradigm shift” to focus more on esthetics, with specific emphasis to the soft tissues around the mouth. The purpose of this study was to evaluate the effects of changes in smile arcs and buccal corridors, and interactions on the perceptions of smile esthetics as it relates to Prosthodontist, General dentists and Laypersons.

Objective: The purpose of this study was to evaluate the effects of changes in smile arcs and buccal corridors, and interactions on the perceptions of smile esthetics as it relates to Prosthodontist, General dentists and Laypersons.

Aims: The specific aims were: 1) To develop a digital model that can be manipulated in a quantifiable manner to present the variables of interest (i.e., smile arcs and buccal corridors) to Prosthodontist, General dentists and Laypersons. 2) To quantitatively evaluate the effects of changes in smile arcs and buccal corridors and combinations thereof using the digital model on the perceptions of smile esthetics as judged by a sample of Prosthodontist, General dentists and Laypersons .via a survey 3) To assess the effects of changes in smile arcs and buccal corridors and combinations thereof on the perceptions of smile esthetics acceptability as judged by a sample of Prosthodontist, General dentists and Laypersons via a survey 4) To determine the possible effects of Prosthodontist, General dentists and Laypersons characteristics on the variables related to the esthetics of the smile.

Methodology: A smile photograph was taken of an adult female. The image was modified to obtain five different buccal corridor widths and was assessed by different evaluators grouped into general dentist, Prosthodontic residents, and laypersons who rated the attractiveness of each smile by means of a visual analog scale (VAS). Sample size was 97 participants to rate the picture. Non-probability purposive sampling was done. The data was analyzed and mean and SD were calculated for the scores of rating. ANOVA and Tukey's post hoc test was applied to compare the different ratings of buccal corridors in three groups. The data of this cross sectional study was collected from general population belonging to different communities, general dentists and Prosthodontic residents of Sardar Patel Post Graduate Institute of Dental and Medical Sciences, Lucknow from August 2022 to March 2022.

Results: There were 97 participants who responded to the images. Highest scores were obtained for Image 1 having buccal corridor width ratio of 16% followed by image no. 3 having buccal corridor width ratio of 10% and lowest scores were obtained for Image no. 6 having least buccal corridor widths ratio that is 34% followed by image no 5 having 26% buccal corridor widths. Among the groups of participants, the highest scores were

given by laypersons for all images. Significant differences were observed between evaluation of groups of Prosthodontic resident and layperson in most images.

Conclusion: There was a remarkable influence of buccal corridor width on smile esthetics, with the 16% ratio group being rated as the most attractive by all three groups.

Keywords: Buccal corridors, Smile, esthetics, Attractiveness

Introduction

Smile is one of the most unique features describing the personality. In humans, it is naturally a manifestation signifying delight, cheerfulness, and enjoyment. An attractive smile increases self-assurance, self-worth and confidence.¹ It is the utmost means by which individuals convey their feelings. It is defined as 'a transformation of face expression encompassing eyes enhancement, uphill bowing of the curls of lips with no sound and reduced alteration of the muscles than in laugh which possibly will precise enjoyment, amusement, care, love, warmth, merriment, sarcasm, or any of many different sentiments.² Its impact, though, is not linked solely to the individual dental beauty.³ The esthetics remain an imprint in the intellect encouraged by its specific insight; hence, the learning of individual attractiveness has ensued in all beliefs throughout past and beauty employs a personal idea. It is a noteworthy part of one's personality and the awareness of the individual and in addition it is imperative in the evaluation that others have of our expression and character.⁴ There are four key features of aesthetic perception of smile: facial, gingival, micro and macro-aesthetics. Smile Esthetics depends upon teeth as well as soft tissue.⁵ Smile analysis includes valuation of smile arc, smile line, tooth and gingival display, presence or absence of buccal corridor widths, facial and dental midlines, proportions of tooth, gingival heights and shade of tooth.⁶ Sarver and Ackerman⁶ acknowledge three basic requirements for assessing dental and facial esthetics: 1) A dynamic and static 3-dimensional evaluation of the face derived primarily from the clinical exam of the patient. 2) A determination of lip-tooth relationships and anterior tooth display at rest during facial animation. 3) An analysis of the dental and skeletal volume of the face and its effects on the soft tissue facial mask. One of potential smile feature is buccal corridors.⁷ However some data on the

perfect size of buccal corridors is available in the literature, maximum of it is stranded in views of clinicians, although the researches that endeavored this issue produced controversial assumptions.⁸ Numerous researches exhibited that broad smiles with reduced negative spaces are cherished and considered more eye-catching.⁹ Lately, extremely wide BCs are denoted by many Prosthodontic consultants as a "negative space," and must be omitted by expansion of the upper arch. It is predictable in the literature of Prosthodontics that one of the configurations of an unnatural denture like smile is the absence of buccal corridors.¹⁰ It might not an easy task to recognize the problem with the smile esthetics because of the variations in opinions among Prosthodontists and laypersons.¹¹ A welcoming and eye catching smile is deliberated as a crucial benchmark by many patients, describing the accomplishment of treatment, even though the attainment of a proportionate smile can be perplexing due to the bias of assessment. It is significant to assess the consequence of the dentition on the smile. A lack of data has prohibited an acceptable considerate of the appealingly proportionate widths of the smile. Consequently, it is essential to generate common guidelines to help clinicians in improving smile esthetics with sufficient treatment objectives fulfillment.¹²

Visual analog scale appears to be reliable for evaluation of smile esthetics.¹³ In present practice of dentistry, an enormous number of patients are demanding a highly aesthetic treatment result.¹⁴ Buccal Corridors can be best assessed on the Frontal Smile Photograph which is now an essential component for Prosthodontic Diagnosis & Treatment Planning. Presence or absence of buccal corridors has been best evaluated by analyzing Buccal Corridor width. Buccal corridors were defined by Frush and Fisher as the space from the buccal surface of visible

posterior teeth and the corners of lips, when the patient is smiling.³

In a study conducted by Bilal R buccal corridors was the 5th most desired feature.¹¹ In a study conducted by Zaib F *et al.* prefer smiles with minimum visible buccal corridors, where male Prosthodontists rated 20% pictures as acceptable and female orthodontist judges rated 23% pictures as acceptable.¹⁵ Abdullah Alper Öz concluded that both Prosthodontists and oral surgeons gave ratings of 12% BC width as the most appealing, whereas group of prosthodontic consultants and laypersons accepted a rating of width of buccal corridors being 0% as the most beautifully agreeable.¹⁰ Lay perceptions of smile esthetics are imperative to better understand the treatment objectives from perspective of a patient. However, it is clear that laypeople can recognize numerous factors which affect smile esthetics. Perception is defined as a reasoning process involving understanding of a stimulus and recognition of the object generating a sensation.¹⁶ This study will help us understand the opinion and perception of laypersons, which often are not given the due importance in the treatment planning. Also it will help Prosthodontic residents realize that they should not impose their own perception of smile and esthetics on their patients. This individual assessment is an effort to validate and expand on earlier studies of smile acceptability and deliver esthetic ideals.

Methodology

It was a questionnaire based cross sectional study. This data of this cross sectional study was collected from general population belonging to different communities, general dentists and Prosthodontic residents of Sardar Patel Post Graduate Institute of Dental and Medical Sciences, Lucknow. Sample size was 97 participants to rate the picture which is calculated by taking anticipated population

proportion (P) as 20% acceptable, margin of error 8% and 95 % Confidence interval. Non-probability purposive sampling was done. Participants, including both males and females of age range 24-34 years were recruited in the study. Three groups of participating evaluators were formed. The first group consisted of 32 Prosthodontic residents from different institutes in Lucknow, the second group comprised of 32 general dentists practicing in different dental hospitals in Lucknow and third group included 33 laypersons. Prosthodontic residents having minimum 2 years of experience in the field were selected, general dentist having minimum 2 years of experience and laypersons were graduates in any field other than dentistry. People who do not give consent to participate were excluded.

The data was collected after taking approval from ethical review board of Sardar Patel Post Graduate Institute of Dental and Medical Sciences, Lucknow, in by taking frontal photograph of 1 female individual of age 23 years by using DSLR camera; Canon 700d. Frontal smile view photograph with the head in naturally relaxed position of the subject will be taken and only close up smile image was framed. Original photograph had ratio of buccal corridor width of 16%. The photograph was modified by software of adobe photoshop 7.0 to obtain 5 different buccal corridor width ratios that is; 8%,10%, 22%, 26% and 34%. (Figure no. 1) Informed consent was taken from the photographed female and all the participating evaluators. All images were printed and were given to participants to rate the facial attractiveness from 1 to 10 of each image by using visual analogue scale keeping 1 as least attractive and 10 as most attractive in a predesigned proforma. The current study altered only the buccal corridor ratio for smiles which eliminated the possibility of other confounding aesthetic variables influencing perceptions.

Figure 1: Modifications for buccal corridor width



The space perceived between the facial surface of the teeth in posterior region and the corners of the lips when the patient smiles is known as the buccal corridor. The measurements are taken from the mesial line angle of maxillary first premolar to the inferior part of the commissure of the lip.¹⁷

The data was statistically analyzed using SPSS 23. Mean and SD were taken for scores given by the participating evaluators for all the images. Differences between ratings by groups of participants were analyzed by applying one-way ANOVA and Tukey's post hoc test taking p-value less than 0.05 as significant.

Results

Table I illustrated the means and standard deviations for the ratings obtained from evaluators for individual

groups., the maximum ratings were attained for Image 1 having buccal corridor width ratio of 16% followed by image no 3 having buccal corridor width ratio of 10% and lowest scores are obtained for Image no. 6 having least buccal corridor widths ratio that is 34% followed by image no 5 having 26% buccal corridor widths. The highest scores are given by laypersons group for all the photographs. Table II demonstrated the statistically significant differences among the groups of evaluators for the perception of smile attractiveness, mostly differences are observed between evaluation of groups of Prosthodontic resident and layperson and are significant for Image no. 2,4,5 and 6. In image 5 and 6 where buccal corridor width was markedly increased Prosthodontic residents differed significantly in ratings with laypersons.

Table 1: Descriptive statistics: mean smile ratings on visual analog scale

IMAGE NO.	BCW RATIO %	PROSTHODONTICS N=32	GENERAL DENTIST N=32	LAYPERSONS N=32
1	16	8.5±1.19	7.6±1.8	8.4±1.17
2	8	4.4±1.17	4.7±2.8	6.4±2.3
3	10	6.3±1.17	6.2±1.9	6.4±2.5
4	22	5.6±2.1	6.3±1.8	6.49±1.3
5	26	3.6±1.6	4.9±2.4	5.4±1.7
6	34	2.2±1.3	2.13±1.3	3.4±2.1

Table 2: Statistical differences in evaluation of smiles by participants

IMAGE NO.	BCW %	PROSTHODONTICS / GENERAL DENTIST		GENERAL DENTIST / LAYPERSONS		LAYPERSONS / PROSTHODONTICS	
		MEAN DIFFERENCE	SIG.	MEAN DIFFERENCE	SIG.	MEAN DIFFERENCE	SIG.
1	16	0.85	0.44	0.83	0.54	-0.46	0.94
2	8	-0.35	0.83	-0.16	0.17	2.07	0.03
3	10	0.95	0.98	0.20	0.90	0.11	0.98
4	22	-0.65	0.31	-0.62	0.37	1.35	0.17
5	26	-1.25	0.29	-0.69	0.33	1.95	0.00
6	34	0.085	0.97	-1.29	0.006	1.205	0.012

Figure 2: Survey Responses

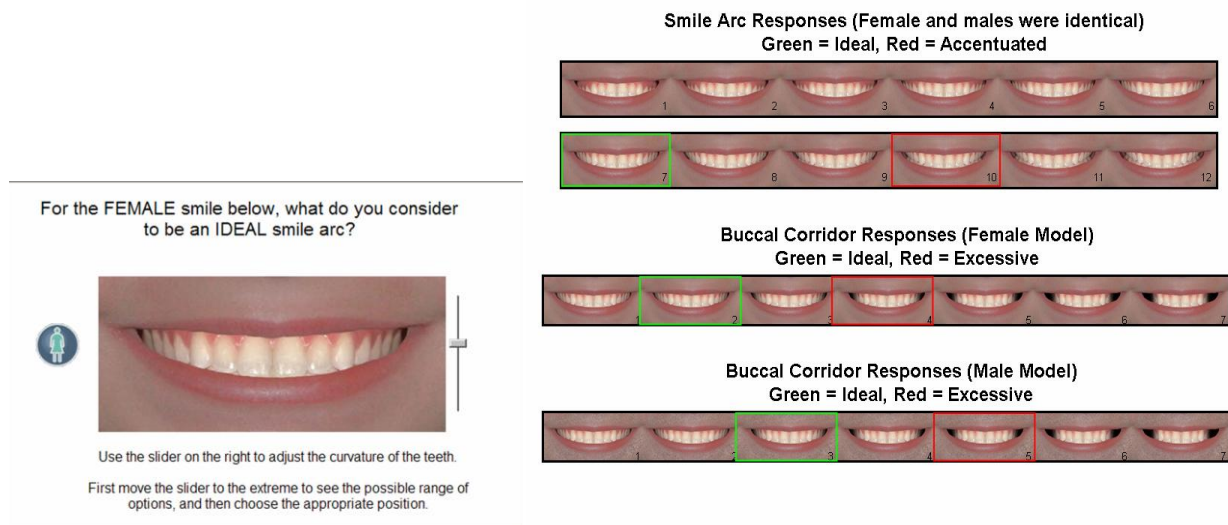
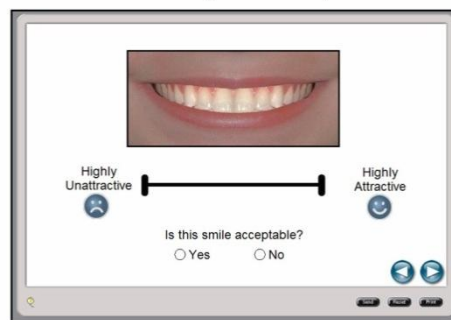


Figure 3: Main Survey Example

Main Survey Example



Discussion

Prosthodontists used to widen the maxilla to relieve crowding, it is noteworthy to know how variations in the display of teeth while smiling affect facial attractiveness. In our study, the image having Buccal Corridor width ratio of 16% appeared to be most attractive among all images and the image having buccal corridor width ratio of 34% were rated to be least attractive followed by image having 26% buccal corridor width ratio which means all three evaluator groups preferred lesser buccal corridor widths. Image having reduced buccal corridor width 8% also received lower ratings by Prosthodontic residents and general dentists whereas laypersons did not critically scored image having reduced buccal corridors. This study also showed that Prosthodontic residents analyzed pictures more critically as compared to laypersons having significant differences in four

pictures. Overall scoring was greater by laypersons as compared to other two groups of evaluators.

In a comparable study, smiling pictures of female were used for assessment; Ioi et al. stated that Prosthodontic specialists and laypersons evaluated a buccal corridor width of 10% and 5%, as the most appealingly attractive. Where as in our study less buccal corridors around 16% are most acceptable and least buccal corridors i.e.; 8% received lower ratings, and smiles with buccal corridor width of 34% received much lower ratings from all three evaluator groups.¹⁸

Outcomes of our study are also in favor with findings of Moore et al, he used full face slides and changed the maxillary dentition to 5 widths. The results of their study also showed that wider smiles were preferred, as shown in our study.¹⁹ The findings of

this study are consistent with that of Parekh et al., he found significantly reduced ratings for smiles having flat smile arcs and increased buccal corridors similar to our study. Our study also showed very low scores for increased buccal corridor space.²⁰ Our study findings also supported results of Martin et al who also concluded that Prosthodontists and laypeople scored smiles having less buccal corridors as more attractive than those with increased buccal corridors.²¹ Our findings are also in agreement with those of Kokich et al, who stated that laypersons, dentists and Prosthodontists have different altitudes of recognition of variations in smile features and that laypersons were the most forgiving.²² However, in a study conducted by Roden-Johnson et al. declared that the extent of buccal corridor width was not an important aspect in the charm of smile. Though, significant dissimilarities were found in the approaches of this study when matched to the present research.¹⁰ Their study showed that the occurrence of buccal corridors does not influence smile esthetics. However, there are variations in how dentists, Prosthodontists, and laypeople scored smiles and in what arch form respective group desires. Ritter et al. examined the significance of different buccal corridor widths, but samples they used were unchanged smile pictures of the subjects¹⁰ which can lead to bias in ratings due to other smile features which affect the smile attractiveness. Furthermore, the number of inspectors are also reduced which affect the outcome of study. They found that buccal corridor width did not influence the attractiveness of smile. Contradicting to our study, McNamara et al. showed significant agreement in the decisions between laypersons and Prosthodontic specialists regarding perception of smile, whereas our findings demonstrated significant differences in four images between Prosthodontic resident and laypersons.²³ A study by Husley proved that smile arc had greater scores and buccal corridors did not have any consequence on smile aesthetics which is contradicting to the present study. The disagreement might be due to different treatment groups taken for evaluation of buccal corridors widths.²⁴ Al Taki et al stated that Prosthodontists showed great precision in tolerating deviations in the smile arc and buccal corridors²⁵ which is similar to findings of our study showing more sensitive ratings made by

Prosthodontic residents among all groups of evaluators.

Conclusions

1. All three groups of evaluators that is Prosthodontic residents, general dentists and laypersons preferred smiles having 16% buccal corridors width ratio.
2. There is no gender or age group difference in ratings given by evaluator groups.
3. Excessive buccal corridor widths i.e.; 34% and minimum buccal corridors widths i.e.; 8% both are rated to be least acceptable by all three evaluator groups.
4. Prosthodontists and general dentists shared more similarities than differences when evaluating smile esthetics in the present study.
5. Differences in ratings were observed among Prosthodontic resident and layperson groups.
6. The layperson group was more forgiving in scoring smile related to buccal corridor width ratio than Prosthodontic residents and general dentists.

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