ORIGINAL ARTICLE POJ 2019:11(1) 9-15

Effect of variations in the smile arc and buccal corridor width on smile esthetics from the perspective of an orthodontist, a general dentist and a lay person

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Abstract

Introduction: The prime focus of orthodontic diagnosis requires analysis of social smile, therefore, it is important to determine and analyze different variables effecting smile esthetics. Hence the aim of presnt study was to evaluate the effects of variations in the perception of smile arc and buccal corridor width on smile esthetics by panel of orthodontists, practicing general dentists and lay-person in Islamabad and Rawalpindi.

Material and Methods: - Sample consisted of 81 participants divided into three groups including 27 orthodontists, general dentists and lay-persons each. A Pro-forma was provided to the participants containing 2 sets of 3 digitally altered smile photographs. Set A consisted of three photoshoped smile pictures with wide, narrow and normal buccal corridor widths. Set B consisted of three photoshoped smile pictures having a straight, consonant and exaggerated smile arcs. The participants chose the best smile picture according to their perception from both the sets.

Results: - Most of the participants in each group preferred narrow buccal corridors width. Thus broader smiles were considered more pleasing. Inter-group comparison for buccal corridors width was done by Pearson chi-square test that revealed no statistical significant difference among all groups except when comparing general dentist and layperson perceptions i.e. $p < 0.034$. For smile arc analysis, consonant smile arc was rated frequently as an ideal characteristic. Inter-group comparison revealed no statistically significant difference among the participant's perceptions.

Conclusions: - Broader smiles are considered more esthetic by dental professionals and orthodontists. Dental professional, orthodontists as well as laypersons had the same perception for a consonant smile arc as ideal. Amongst smile arc variations, consonant smile arc was considered most pleasing.

Keywords: - Perception; smiling; dental esthetics

Introduction

Over the ages aesthetics have played a fundamental role in the lives of people seeking refinement in their appearance. Smile plays a fundamental role in facial esthetics and expression. It is one of the most primitive and convenient form of human communication and emotions.[1] The prime focus of orthodontic diagnosis requires analysis of social smile, therefore, it is important to determine and analyze different variables effecting smile esthetics.[2,3] Some of these most commonly cited factors are smile arc, buccal corridors, incisor protrusion and incisal display, shade of teeth and gingival display.[4,5]

An important feature in smile esthetics is buccal corridors width which can be measured from mesial line angle of maxillary first premolar to the interior portion of the commissure of the lips.[6] Presence of excessive buccal corridor width or its absence can adversely effect smile esthetics by creating either negative 'Dark' spaces or artificial 'Hollywood' smile respectively.[7]

In regard to the Buccal corridors, Frush and Fisher defined it as the "spaces between the facial surfaces of posterior teeth and the

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corners of the lips when the patient is smiling." They also stated that the presence or absence of buccal corridors can be influenced by the antero-posterior position of the maxilla relative to the drape of the lip.[4]

An esthetic smile follows a consonant smile arc which is established when maxillary incisor edges follows the curvature of the lower lip being referred to as a consonant smile arc.[8] Any deviation from this can lead to less attractive smile and may tend to make a younger person look older.[3,4] According to the data gathered by Grabber, the most important factor in smile esthetics, the only one that by itself can change the rating of a smile from acceptable to unaesthetic is the smile arc.[9]

Perception of smile is subjective to each individual depending on their personal, social and professional understanding.[10] Orthodontists are more observant in assessment of smile esthetics as compared to general dentists. This can be attributed to lack of comprehensive knowledge of general practitioners regarding ideal smile parameters.[11,12] The perception of layperson is equally important factor in final orthodontic decision-making regarding treatment plan and final outcome. Various studies have found difference in opinion among orthodontists, general practitioners and laypersons regarding their judgment about smile esthetics.[10,11]

The study will help to assess the perception of orthodontist, general dentist & laypersons regarding changes in buccal corridor width and smile arc orientation and help in defining the role of these variables in treatment planning for an orthodontic patient.

Material and Methods

This cross-sectional study was carried out on a sample of 81 participants for evaluation of their perception on smile esthetics. The sample collection was done in Islamabad and Rawalpindi using convenience sampling technique. The sample was divided into three groups on 1:1 ratio including 27 orthodontists, 27 general dentists and 27 lay-persons. Any orthodontist or general dentist with mental illness or with a disability e.g. blindness were excluded from the study. Laypersons with any knowledge regarding dentistry were also excluded from the study.

To evaluate the comparison in the perception of these three groups smile photographs were used, which were taken from the study conducted by Taki et al[7]that consisted of smile arc and buccal corridor variations.

A Pro-forma was provided to the participants containing 2 sets of 3 digitally altered photographs. Set A was designed to judge perception of buccal corridors hence consisting of three photoshoped smile pictures with wide, narrow and normal

(a) (b) (c)

Figure 1: Set A Representative photographs illustrating changes in buccal corridor (a) wide buccal corridors (dark corners) (b) Narrow buccal corridors (Hollywood smile). (c) Normal buccal corridors.

(a) (b) (c)

Figure 2: Set B Illustration of alterations in the smile arc. (a) Straight smile arc (b) Consonant smile arc (c) Exaggerated smile arc

buccal corridor widths. Set B consisted of smile arc variations, with three photoshoped smile pictures having a straight, consonant and exaggerated smile arcs. The participants chose the best smile picture according to their perception out of set A and set B.

Data was analyzed using SPSS version 22.0 and the results were in the form of frequencies and percentages. Pearson chi-square test was used to compare the difference between the groups. The level of significance was set at P value < 0.05.

Results

The frequencies and percentages of perceptions by an orthodontist, a general dentist and a lay person when shown smile pictures with wide, narrow and normal buccal corridors are shown in Table I and Fig. 1. The results of the present study indicates that, out of 27 participants in each group 21 general dentists, 19 orthodontists & 12 laypersons preferred narrow buccal corridors. Hence broader smile was selected as the most attractive. Inter-group comparison done by Pearson Chi-Square Test revealed no statistical significant results among all groups except when comparing general dentist and layperson perceptions i.e. p < 0.034 (Table III). When analysis of smile arc was done, it revealed that out of 27 participants in each group, 21 general dentists, 15 orthodontists and 17 laypersons rated consonant smile arc as an ideal characteristic (Table II & Fig. 2). Inter-group comparison revealed no statistically significant difference among the participant's perceptions (Table III).

Table I: Frequencies of buccal corridors as perceived by an orthodontist, a general dentist and a lay person

Set A	Frequencies		
Buccal Corridor	**Orthodontists**	**General Dentist**	**Lay Person**
Wide	3	5	10
Narrow	19	21	12
Normal	5	1	5
Total	27	27	27

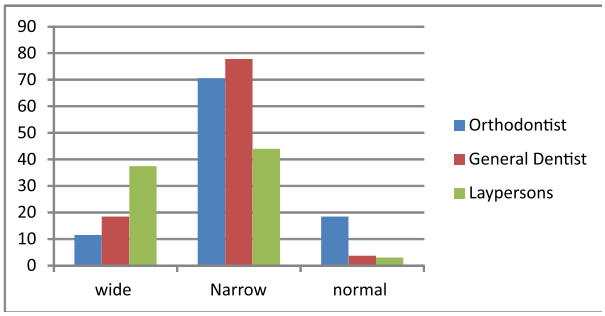

Figure 3:
Percentages of Buccal corridors rating by an orthodontist, general dentist and layperson

Table II: Frequencies of smile arc as perceived by an orthodontist, a general dentist and a lay person

Set B	Frequencies		
Smile Arc	Orthodontists	General Dentist	Lay Person
Straight	10	3	5
Consonant	15	21	17
Exaggerated	2	3	5
Total	27	27	27

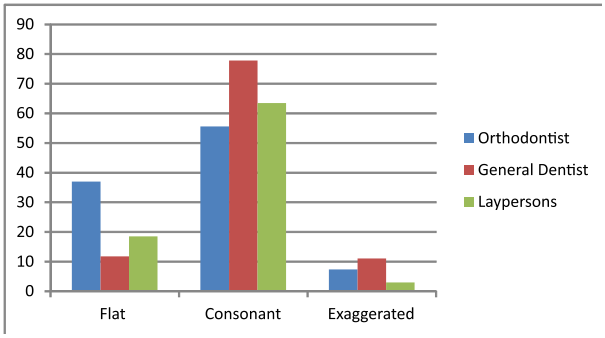

Figure 4: Percentages of Smile arc rating by an orthodontist, general dentist and layperson

Table III: Intragroup comparison of buccal corridors and smile arc (most acceptable choice)

Smile variable	Group Comparison	p value
Buccal corridor	**Orthodontist x general dentist**	**0.195**
	General dentist x layperson	**0.034*** **
	Orthodontist x layperson	**0.069**
Smile arc	**Orthodontist x general dentist**	**0.083**
	General dentist x layperson	**0.491**
	Orthodontist x layperson	**0.215**

P value significant * < 0.05**

Discussion

Perception is the immediate or intuitive recognition or appreciation, as of moral, psychological, or aesthetic qualities. Dental professionals and general population may differ in their perceptions or preferences for smile esthetics to a considerable degree.[13,14] In the present study, close-up smile images were used to assess the perception amongst the three groups that is orthodontist, general dentist and laymen. This is in contrast to Moore et al.[4], Parekh et al.[11] and Elhiny et al.[12], who suggested the use of full face photographs. Nascimento et al. however found no significant difference among these strata when full face and close up views of mouth were presented to the raters[2] and so it is suggested to use lip containing photos when assessing the smile so as to avoid unnecessary distractions.[15]

The results of the present study showed differences in perception of buccal corridors variation on smile esthetics among all groups but the results were not statically significant except when general dentist and laypersons were compared ($p<0.034$). This is in contrast to the study conducted by Elham et al. on Jordanian population that revealed that there was no significant difference between perception of laypersons and dental practitioner regarding buccal corridor width.[16] Most of the orthodontists (70.5%) and general dentists (77.8%) selected narrow buccal corridors as ideal and hence preferred

broader smiles in the present study. Zaib et al.[6] also concluded similar findings that dental practitioners and orthodontist preferred smiles with minimum buccal corridors.

In this study, laypersons perception came out to be 44.4% for narrow buccal corridors and 37% for the wide buccal corridors as ideal, which showed that though majority of them chose broader smiles but still were less decisive in judging ideal buccal corridors width as compared with the other groups. The result is in agreement to the study by Martin et al.[8] and Moore et al.[4] who stated that preference of an ideal smile by layperson is the one filled with dentition. Ker et al.[17]also emphasized that laypersons can identify the smile characteristics. Husley[18]on the other hand stated that no significant preference was given by laypersons in determining smile attractiveness. This difference can be attributed as Husley calculated "inter-canine /inter-molar width ratio rather than space between the buccal surfaces of the posterior teeth and the corner of the mouth when smiling as a measure of buccal corridor width (as defined by Frush and Fisher).[19]

In a comparative study done between orthodontists and laymen, it was found that excessive buccal corridors were rated most unattractive by both groups which coincides with our study. [12] Similar results for buccal corridors width between orthodontists and laypersons were also stated by Zange et al.[20] and Huma et al.[21] The results of this study are also in agreement with study conducted by Gaikwad et al[22] which concluded that all evaluators preferred minimal buccal corridors but orthodontist and general dentist were more precise in judging the buccal corridors as compared to laypersons.

The present study concluded that most of the orthodontists, general dentists and laypersons from their respective groups chose the consonant smile arch as the ideal. The results of the present study are in harmony with the study of Parekh et al[11] who reported no significant difference in the preferences of orthodontists and laypersons in assessing smile arc and buccal corridor space. Similar results have been reported in the study by Krishnan et al.[23] Mahshid et al., who concluded that laypersons are capable of recognizing the characteristics of an ideal smile.[24] In a study by Talic et al.[25] it was ascertained that dentists gave a lower score as compared to laypersons. Kokich in studying the variations in perceptions however concluded otherwise and documented that laypersons as compared to the orthodontists and general dentists are less condemnatory about the perception of smile esthetics.[26] In line with our study, Mokhtar et al. also found that consonant smile arc is considered ideal when altered smile pictures were shown to both orthodontist and laypersons.[27] On the contrary Janson[1] et al stated that smile attractiveness is not affected by smile arc when studied on actual patients. Alhaija et al[16] in their study concluded that cultural differences exist in relation to smile evaluation. Indians and Arabs selected ideal smile arcs while Caucasians selected excessive smile arcs.[7] Thus general dentists, specialists and laypersons are in consensus with the Arab and Indian dental professional as most chose the ideal smile arch as esthetic. Sohail K et al. also concluded similar results that laypersons, general dentists and orthodontists have more similarities than differences when smile esthetics were evaluated.[28] Thus it would not be wrong to state that small asymmetries are often ignored by many specialists while finishing a case thinking that most patients and laypersons are unable to detect them. However the results of the present and many previous studies have concluded that the perception amongst specialists and patients is more or less the same.

Conclusions

- General dentists and orthodontists preferred wider smiles. While laypersons

were less critical in deciding ideal buccal corridor width for an ideal smile.

- In case of perception of a smile arc dental professional, orthodontists as well as layperson had the same perception for a consonant smile arc as ideal.
- Keeping the above findings in mind, while treating an orthodontic patient the clinicians should plan to avoid flat smile arc and excessively wide buccal corridors at the end of treatment.

References

1. Janson G, Branco NC, Fernandes TMF, Sather R, Garib D, Laris PRJ. Influence of orthodontic treatment, midline position, buccal corridor and smile arc on smile attractiveness. Angle Orthod 2011;81:153–61
2. Nascimento DC, Santos ERD, Machado AWL, Bittencourt MAV. Influence of buccal corridor dimensions on smile esthetics. Dental Press J Orthod 2012;17(5):145-50
3. Proffit WR, Fields Jr HW, Sarver DM. Contemporary orthodontics. Canada: Elsevier Health Sciences; 2006. 150-219p
4. Moore T, Southard KA, Casko JS, Qian F, Southard TE. Buccal corridors and smile esthetics. Am J Orthod Dentofacial Orthop 2005; 127(2):208-13
5. Akyalcin S, Frels LK, English JD, Laman S. Analysis of smile esthetics in American Board of Orthodontic patients. Angle Orthod 2014;84(3): 486-91
6. Zaib F, Hameed W. Effect of buccal corridors width on smile esthetics. Pak Orthod J 2009;1(1):1-5
7. Taki A, Khalesi M, Shagmani M, Yahia T, Kaddah F. Perceptions of altered smile esthetics: A comparative evaluation in orthodonist, dentists and laypersons. Int J Dent 2016;1-11
8. Martin AJ, Buschang PH, Boley JC, Taylor RW, McKinney TW. The impact of buccal corridors on smile attractiveness. Eur J Orthod 2007; 29(5):530–7
9. Grabber LW, Vanarsdall RL, Vig K W. L,Huang GJ. Orthodontics: Current principles and techniques. USA: Elsevier; 2017.6th edition, 208-44p
10. Saffarpour A, Ghavam M, Saffarpour A, Dayani R, Fard MJK. Perception of laypeople and dental professionals of smile aesthetics. J Dent 2016; 13(2):85-91
11. Parekh SM, Fields HW, Bech M, Rosenstiel S. Attractiveness of variations in smile arc and buccal corridor space as judged by orthodontist and layman. Angle orthod 2006;76(4):557-63
12. Elhiny OA, Hashash AY. Buccal corridors: A fact or a myth in the eyes of a layman. J Dent 2016;15(4):700-04
13. Pogrel MA. What are normal esthetic values? Journal of Oral and Maxillofacial Surgery 1991;46(9):963-9
14. Prahl-Anderson B, Boersma H, van der Linden FP, Moore AW. Perception of dentofacial morphology by laypersons, general dentists and orthodontists. The Journal of the American Dental Association 1979;98(2):209-12
15. Gracco A, Cozzani M, D'Elia L, Manfrini M, Pevereda C, Siciliani G. The smile buccal corridors: aesthetic value for dentists and laypersons. Prog Orthod 2006;7(1):56-65
16. Abu Alhaija ES, Al-Shamsi NO, Al-Khateeb S. Perceptions of Jordanian laypersons and dental professionals to altered smile aesthetics. Eur J Orthod 2011;33(4):450-6
17. Ker AJ, Chan R, Fields HW, Beck M, Rosential S. Esthetics and smile characteristics from the layperson's perspective: A Computer-Based Survey Study. JADA 2008;139(10):1318-27
18. Husley CM. An esthetic evaluation of lip-teeth relationships present in the smile. Am J Orthod 1970;57:132-44
19. Frush JP, Fisher RD. The dynesthetic interpretation of the dentogenic concept. J Prosthet Dent 1958;8:558-81
20. Zange SE, ramos AL, Cuoghi OA, Mendonca MR, Suguino R. Perceptions of laypersons and orthodontists regarding the buccal corridor in long and short face individuals. Angle Orthod 2011;81(1): 86-90
21. Kiani H, Bashir U, Durrani OK, Zulfiqar K. Comparison of difference in perception between Orthodontists and laypersons in terms of variations in buccal corridor space using visual analog scale. Pak Orthod J 2013;5(2):67-72
22. Gaikwad S, Kaur H, Vaz CA, Singh B, Taneja L, Vinod KS, Verma P. Influence of smile arc and buccal corridors on facial attractiveness: A Cross-sectional Study. Journal of Clinical and Diagnostic Research 2015;10(9):20-3
23. Krishan V, Daniel ST, Lazar D, Asok A. Characterization of posed smile by using visual analog scale, smile arc, buccal corridor measures and modified smile index. Am J Orthod Dentofacial Orthop 2008;133(4); 515-23
24. Mahshid M Khoshvaghti A, Varshosaz M, Vallaei N. Evaluation of "golden proportion" in individuals with an esthetic smile. J Esthet Restor Dent 2004;16(3)185-92
25. Talic N, Alomar S, Almaidhan A. Perception of Saudi dentists and lay people to altered smile esthetics. Saudi Dent J 2013;25(1):13-21
26. Kokich VO, Kokich VG, Kiyak HA. Perceptions of dental professionals and laypersons to altered dental esthetics: asymmetric and symmetric

situations.Am J Orthod Dentofacial Orthop 2006;130(2):141-55

27. Mokhtar HA , Abuljadayel LW, Al-Ali RM, Yousef M. The Perception of smile attractiveness among Saudi population. Clinical, Cosmetic and Investigational dentistry 2015;7:17-23

28. Sohail K , Nawaz E, Durrani OK, Akram D, Imtiaz A, Iqbal A, Bhatti WA, Bashir U. Comparison of perceptions of laypersons, dentists and orthodontists to altered smile esthetics. Pak Orthod J 2015;7(2) 76-82