ORIGINAL ARTICLE

The Influence of the Vertical Position of the Canine on the Perception of Smile Esthetics by Orthodontists and General Dentists

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ABSTRACT

Background: The influence of the vertical position of the canine on the perception of smile esthetics by orthodontists and general dentists is not known and is objective of this study.
Methods: Smile photograph of the male subject showing the gingival zeniths was selected and the modified images were used varying from 1.0mm of intrusion to 1.0mm of extrusion, with and without the gingival display.
Results: For both orthodontists and general dentists, the canine vertical position modifications had no statistically significant difference (*P<0.005*) and the gingival exposure had significant influence on the smile with 1mm extrusion for both the orthodontist and general dentist and the standard smile for the orthodontists only.
Conclusion: Orthodontists were more critical in their assessment for most of the smile photographs.
Keywords: Intrusion, extrusion, smile attractiveness, symmetry, esthetics

INTRODUCTION

During the recent years, the achievement of excellence in facial esthetics and smile has become the key priority of patients visiting the dentists. This is alsoone of the reasons why the orthodontists around the world are working hard to integrate various techniques into their clinical practice to concentrate on the smile esthetics[1]. Nevertheless, beauty is subjective and there is no perfect norm for it.

There are various elements of smile.[1-10] It is not unusual, that the orthodontists, in order to create a pleasant smile and well balanced gingival margins, tend to alter the position of the maxillary canines vertically. This would result in the alteration of the relationship of gingival margins and incisal edges of the anterior teeth and may also lead up to the creation of unattractive steps. From a clinical perspective, the literature cites that there is a greater perception of any alteration in smile if it is nearer to the dental midline, hence deeming the vertical position of the central incisors fairly crucial, which has also been justified in several previous studies evaluating the relationship of a pleasant smile with various vertical positions of the central incisors[8,11].

There is little research available which investigates the features of gingival position as well as the incisal edge position of the canine vertically without any change in its size. Also, there was a lack in literature which assessed the previous mentioned variables by the general dentists in comparison with the orthodontists. Hence, the aims and objective of this study was to investigate the influence of the vertical position of the canine on the perception of smile esthetics by orthodontists and general dentists.

MATERIALS AND METHODS

The approval of this study was taken from the ethical review board of University of Lahore (UCD/ERCA/20/41a) and the informed verbal consent was taken from all the participants of the study. This was a cross-sectional study which was carried out on seventy-four participants which were divided into the 2 groups of thirty-seven orthodontists and post-graduate residents of orthodontics and thirty-seven general dentists. To evaluate whether there was a statistically significant difference among the orthodontists and the general dentists, the smile photographs were used from the study carried out by Paiva et al[12] (Figure 1). In these photographs one standard smile image was modified and only the vertical position of the maxillary canine along with the gingival margins was manipulated i.e., 0.5 mm intrusion, 1mm intrusion, 0.5mm extrusion and 1mm extrusion was carried out along with the gingival apparatus of the canine. In the other 5, along with the latter, the upper lip was modified, and manipulation was done to form a low smile.

The inclusion criteria for both the groups had both genders from the ages of 20-60 years. The exclusion criteria for the orthodontist group were the post graduate residents of orthodontics in their first year of training and for the general dentist; any dentist pursuing any postgraduate specialty was excluded.

A presentation using the Microsoft PowerPoint software (version 16.39; Microsoft, Redmond, Wash) was made which had all the 10 images. The first slide which consisted of all the 10 smile photographs, categorized according to the type of smile (with/without exposure of the gingival margins) was shown to the participants for 20 seconds. In addition, all of the 10 photographs were shown randomly with an automatic slide show with 15 seconds of display time to each photograph. The participants were not allowed to go back to the previous slide or for the re-evaluation of the images.

Each participant was provided with a sheet which had 10 scales, and each scale measured 100mm and was graded from 0-100. These scales were numbered according to the order of the pictures in the presentation but without mentioning any characteristic of the smile. The participants were instructed to mark using VAS scale as shown in Figure 2.

The evaluators were unaware of the research subject. Adigital electronic calliper (Series 600- Manual, Absolute Digimatic; Auto Motor Zuberhor, Hannover, Germany) was used to measure the scores in millimeters.

Statistical analysis was done by using SPSS version 23.00. The normaility of the data was checked thought the Shapiro-Wilk test. The frequency and percentage were calculated for qualitative variables i.e gender. The median and interquartile range was calculated for quantitative variables. A Mann-Whitney test was used for both intra-group and intergroup comparison.

RESULTS

The total evaluators were seventy-four which were divided into two groups out which thirty- two evaluators (43.8%) were male and forty-one (56.2%) were female. The orthodontists' group (n=37) had twenty women (54.1) and seventeen men (45.9%). The general dentists' group (n=36) had twenty-one women (58.3%) and fifteen men (41.7%). One participant from the general dentist group didn't mark one scale hence their response was excluded.

On the basis of the analysis of the smile with the gingival display, the orthodontist gave highest score to the standard smile (median 50) while the general dentist group gave the highest score to the smile with 0.5mm intrusion (median 52.5). The lowest score was given to 1mm extrusion of the canine by both the groups (medians, 20 and 20.5)

On the basis of the analysis of the smile without the gingival display, the highest scores for both the orthodontist and general dentists were given to the low standard smile (medians 70 and 60 respectively) and the smile with 0.5mm intrusion (medians, 55 and 57, respectively). The lowest score was given to the smile by both the groups with 1mm extrusion without any gingival display (medians, 10 and 11, respectively). On the smile without the gingival show with 1mm extrusion the orthodontists as well as general dentists scored it less, as compared to the one with the gingival show and this result was statistically significant. Moreover, the standard smile with the gingival show was given a lesser score by the orthodontists and it was also statistically different as shown in Table 1.

Table 1. Descriptive statistics of orthodontists' and general dentists' scores and intergroup and intragroup comparisons (IQR= interquartile range)

	Median	IQR	Intragroup comparison	Median	IQR	Intragroup comparison	
Smile with gingival show							
0.5mm intrusion	47	(65-30)	A	52.50	(68.75-32.25)	A	0.382
1mm intrusion	30	(50-20)	B	50	(67.50-30)	B	0.042
Standard smile	50	(65-30)	AB	40	(57.50-30)	C	0.263
0.5mm extrusion	40	(57-30)	A	49	(60-29.25)	A	0.916
1mm extrusion	20	(33.50–10.50)	AB	20.50	(32.25-15.25)	AB	0.996
Smile without the gingival show							
Low smile 0.5 mm intrusion	55	(69.50– 30)	A	57	(73.75-32.50)	A	0.554
Low smile 1mm intrusion	40	(51-24.50)	B	30	(44.75-22)	B	0.357
Low standard smile	70	(77.50-50)	AB	60	(86-36.25	C	0.568
Low smile 0.5mm extrusion	40	(49.5-29)	A	30	(50-20)	A	0.171
Low smile 1mm extrusion	10	(20-5.50)	AB	11	(29.75-10)	AB	0.425

*Different letters in the same column show statistically different results e.g. AB

Figure 1 (The top row indicates 0.5mm intrusion, 1mm intrusion, standard smile, 0.5mm extrusion and 1mm extrusion. The bottom row indicates the low smile with 0.5mm intrusion, 1mm intrusion, low standard smile, 0.5mm extrusion and 1mm extrusion)

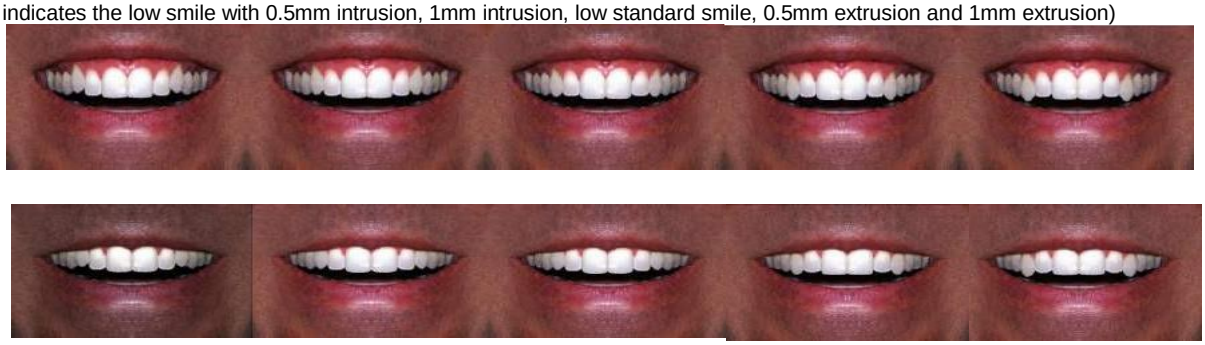
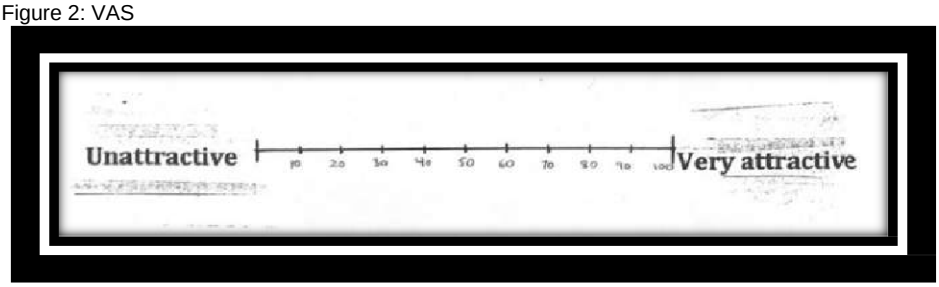


Figure 2: VAS



DISCUSSION

According to a number of authors, the components of the face e.g. the nose, shape of the face and the eyes do not influence the perception of the smile[4,13] while several other studies have stated that the smile perception is more relevant when close-up photographs are assessed as compared to the full-face photographs and it often leads to fewer distractions and better focus towards the dental alterations[14,15]. Hence we chose the close up photographs rather than the full face images.

For this particular study, the participants were presented with an introductory 20 second slide which had all the photographs so as to reduce the bias as it has been proven that the evaluators appear to grant the higher scores in the comparison studies when they are unaware of the what the next photograph will be[16].

In this study, the extreme modifications to the vertical position of the canine were deemed more unattractive and unpleasing. For both the groups, the highest scores were given to the standard smile with no gingival show as well as the standard smile with the gingival show was favored by orthodontists which supports the study of Correa et al,[17]which states that alterations in the canine's gingival margins for up to 0.5mm and 1.0 mm are not detrimental to the smile esthetics when evaluated by an orthodontist or laypersons respectively. In this study, we observed that there was an increased trend for rejection of smiles with extrusions of canine as compared to the canine intrusions.

In our study, our objective was to bring about changes in the vertical position of the canine which ultimately led to the changes of the gingival margins and incisal edge positions, with the gingival show as well as without it, with the help of lip modification. There were no changes made to the exposed gingivae in order to quantify it or the esthetics that are related to it.

According to the studies by Arnett et al [15]and Hunt et al[18], smile is considered more attractive if there is slight gingival display. For the gingival smile, our results were different from our expectations since the unevenness of the gingival show lead to the less pleasing smile for the evaluators especially since the evaluators could see both the incisal edges and the gingival margins together. In this study, lower scores were given to the smiles with the gingival show because of the difference in the contours of the gingival margins of the canines due to the intrusion and extrusion of canines. The reason behind this, could be the disharmony between the alignment of the gingival margins[19,20]. Previous studies stated that the canine's gingival margins asymmetries >0.5mm are thought of as unesthetic[17] and also that the symmetric changes are more acceptable as compared to the asymmetric changes[21].

From the general dentists' point of view, the smile with 1mm intrusion with the gingival show had a statistically different result as compared to the orthodontist group as former gave a higher score to the smile while the latter scored it less. The orthodontists could get great guidance in the decision making for orthodontic treatment as the smile photographs with greater disharmonies of the gingival margins were rejected in our study and were given lesser scores. For cases, where the lateral incisors are missing congenitally which is more common unilaterally, one of the possible treatment plans is the substitution of lateral incisors with the canine and subsequently the canine with the first premolar. After the attainment of the new position, the gingival margin of the premolar is below the gingival margin of the contralateral canine which is esthetically unpleasant.

In more complicated cases such as those of impacted canines, the orthodontists are greatly concerned regarding the periodontal conditions of the canine, once it is brought into the arch after traction. The canines which are more buccally located seem to have a more crucial periodontal status as compared to those which are palatally located[22]. Hence at the end of the treatment, such a condition requires a higher risk of esthetic commitment.

Frequently, during the finishing stage of the orthodontic treatment, the canines are extruded so as to attain better canine guides. But, as the gingival margins follow the extrusive movement, which leads to a disharmony in the contour of the gingiva, these movements brought about by the orthodontist can result in an esthetic prejudice, especially in cases where there is gingival display during smiling. Furthermore, it results in prominent canine cusps which ultimately leads to a straight or reverse smile, where the central incisors' incisal edges are above the incisal edges of the canine cusps which is highly unesthetic[23-25].

According to our study, extrusions of 1mm were considered highly unesthetic by both the groups of evaluators; which contraindicated the study of Pinho et al [11], which stated that alterations of up till 2mm in the canine cusps were not perceptible to orthodontists and laypersons. Hence, when the canine extrusion is imperative for the attainment of better function of the occlusion and is contemplated as unesthetic, then such extrusive movements should be done in the mandibular canines which have a decreased esthetic significance.

In order to improve the lateral functional guidance during the bonding of the appliance as well as wire bending in the finishing stage, the orthodontists should be mindful of the negative influence of the extrusive movement of the canine on the smile attractiveness. The intent of this study was to establish the acceptable esthetic limits for the vertical position of the canine, and this information would be of great help for the orthodontists when planning treatments especially without sacrificing the esthetics.

Limitation: The aspects such as the color and inclination, shape and size of the teeth as well as the elements of the gingival tissue can affect the overall perception of the smile esthetics. Hence, more research pertaining to this topic is required.

CONCLUSIONS

Both the orthodontists and general dentists graded the standard smile without the gingival display as most attractive followed by the smile with 0.5 mm intrusion. The smiles with 1mm extrusion were graded the lower scores and were deemed unattractive by both the groups, in general. The orthodontists were more critical and discerning in their evaluations as compared to the general

dentist by grading lower scores to most of the images assessed. There was a statistically significant difference in the esthetic evaluations of smiles specifically with 1mm of extrusion of canine, with and without the gingival show, by both groups of evaluators

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