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Midline Deviation: Catch The Match

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Abstract

Smile aesthetics is one of the most important reasons for patients to seek orthodontic treatment. One of the goals of orthodontic treatment is to achieve coincident maxillary dental midline with facial midline. A properly placed midline contributes to the desirable effect of balance and harmony of the dental composition.

Objective

The aim of our study is to determine the perception of maxillary dental midline deviation from facial midline and to evaluate how much is considered aesthetically acceptable by the laymen and by orthodontists.

Methods

Frontal facial smiling photographs of one male and one female individuals were captured, these images were digitally altered to create two other images with maxillary dental midline shifted 1mm and 3mm from the facial midline, respectively. A total of 200 individuals including 100 laymen and 100 orthodontists served as evaluators for

comparing the images. Responses were tabulated and statistical analysis was performed.

Results

0rthodontists were found to be more critical in evaluating dental aesthetics than the laymen, when the midline discrepancies exists. With midline discrepancy of 3mm both laymen and orthodontists were sensitive in perceiving the deviation. Laymen could not accept the same in females and orthodontists did not accept in both males and females

Conclusion

Matching midlines are the preferred choice for a pleasing smile. Orthodontists are more sensitive in perceiving midline deviation than laymen.Deviation of more than 3mm is aesthetically unacceptable by both orthodontists and laymen.

Keywords: Smile, Midline, Aesthetics.

Introduction

Smile aesthetics is one of the mostimportant reason for patients to seek orthodontic treatment.[1] Since the patient decision to undertake orthodontic treatment is based primarily on aesthetic considerations, the evaluation and understanding of factors that influence their decision is of key importance to the orthodontists.[2] One of the goals of orthodontic treatment is to achieve thedental midline which coincides with the facial midline which acts as an important functional component of occlusion and also contributes to the desirable effect of balance and harmony in facial esthetics.[3] The anatomical reference point used to evaluate facial midline are nasion, philtrum and soft tissue pogonion.[4] Aesthetically, the dental midline is the most important focal spot in the smile.[5] Appealing smile perceptions varies from person to person and is influenced by social environment. Professional opinion regarding the evaluation of facial aesthetics may or may not compliment with the perception of patients or laymen. [6,7]

The aim of our study is to determine the perception of maxillary dental midline deviationfrom facial midline and to evaluate how much is considered aesthetically acceptable by the laymen and by orthodontists.

Materials And Method

The study is designed to quantify the extent to which the deviation of maxillary dental midline from the facial midline would be acceptable between two group of evaluators namely laymen and orthodontists. Frontal facial smiling photographs of one male and one female individuals were captured, theseimages were digitally altered to create two other images with maxillary dental midline shifted 1mm and 3mm from the facial midline, respectively(Fig 1). Thus there were 3smile images each of male and female. A total of 200 individuals including 100 laymen and 100 orthodontists served as evaluators for comparing the images. Survey forms were distributed among the patients and their bystanders seeking dental treatment. The forms were also sent to orthodontists via email. All the evaluators responded positively to the survey.In the survey, following questions were included(Fig 1).

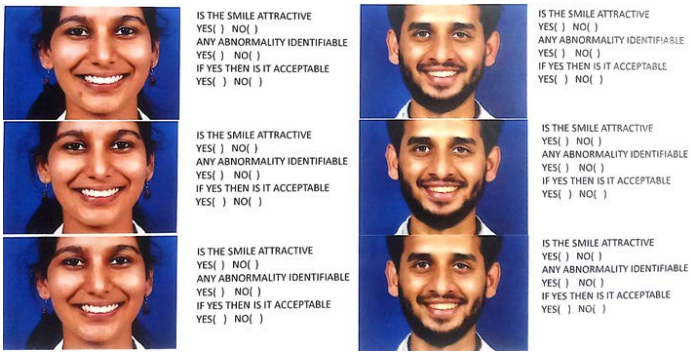
1) Is the smile attractive?

2) Any abnormality identifiable?

3) If yes, is it acceptable?

The perception of midline deviation by the two group of evaluators was assessed and the mean acceptance of midline deviation in male and female photographs by laymen and orthodontists was determined.Statistical analysis was performed. The total time period of the study was 3 months.

Fig 1: Female and male photographs with questionnaires



Results

The frequency of attractive smiles by laymen and orthodontists are summarised in Table 1 and 2 respectively. The results of our study showed that only 4% of laymen could perceive abnormality in smile in 1mm midline deviated cases of male image and 16% of the defect was perceived in female image for the same. More than 55% of laymen could detect abnormality in 3mm midline deviated cases of both male and femaleimages.3 mm deviation in female photograph was not acceptable by 44% of laymen and28% of laymen could not accept the smile with 3 mm midline deviation in male photograph.1mm of deviation was acceptable in both male and female photograph by most of the laymen with a 72% acceptance.(Table 2)

50% of orthodontists found 1mm of midline deviation to be acceptable in both male and female photograph, the other 50% of orthodontist could not accept this 1mm midline deviation in both male and female photograph. 3mm of deviation was not acceptable by 70% of the orthodontistsin male photograph (Table 3). And 30% of orthodontists, although could detect, also accepted this midline deviation of 3mm in male photograph. In female photograph with a deviation of 3mm, 50% of orthodontists could accept this deviation.

Table 1: Laymen Frequency Table

Zerodevm (0mm deviation male)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	50	100.0	100.0	100.0

Zerodevf (0mm deviation female)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	50	100.0	100.0	100.0

Onedevm (1mm deviation male)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	14	28.0	28.0	28.0
	1.00	36	72.0	72.0	100.0
	Total	50	100.0	100.0	

One devf (1mm deviation female)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	14	28.0	28.0	28.0
	1.00	36	72.0	72.0	100.0
	Total	50	100.0	100.0	

Threedevm(3mm deviation male)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	14	28.0	28.0	28.0
	1.00	36	72.0	72.0	100.0
	Total	50	100.0	100.0	

Threedevf (3mm deviation female)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	22	44.0	44.0	44.0
	1.00	28	56.0	56.0	100.0
	Total	50	100.0	100.0	

Table 2: Number of laymen who could identify the abnormality

Onedevm

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	48	24.0	96.0	96.0
	1.00	2	1.0	4.0	100.0
	Total	50	25.0	100.0	
Missing	System	150	75.0		
Total		200	100.0		

One devf

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	42	21.0	84.0	84.0
	1.00	8	4.0	16.0	100.0
	Total	50	25.0	100.0	
Missing	System	150	75.0		
Total		200	100.0		

Three devm

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	20	10.0	40.0	40.0
	1.00	30	15.0	60.0	100.0
	Total	50	25.0	100.0	
Missing	System	150	75.0		
Total		200	100.0		

Three devf

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	22	11.0	44.0	44.0
	1.00	28	14.0	56.0	100.0
	Total	50	25.0	100.0	
Missing	System	150	75.0		
Total		200	100.0		

Table 3: Orthodontists- Frequency Table

Zero devm

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	50	100.0	100.0	100.0

Zerodevf

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	50	100.0	100.0	100.0

One devm

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	25	50.0	50.0	50.0
	1.00	25	50.0	50.0	100.0
	Total	50	100.0	100.0	

One devf

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	25	50.0	50.0	50.0
	1.00	25	50.0	50.0	100.0
	Total	50	100.0	100.0	

Three devm

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	35	70.0	70.0	70.0
	1.00	15	30.0	30.0	100.0
	Total	50	100.0	100.0	

Three devf

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	25	50.0	50.0	50.0
	1.00	25	50.0	50.0	100.0
	Total	50	100.0	100.0	

Table 4: Comparison between laymen and orthodontists (1=laymen,2=orthodontists)

Ranks

	VAR00013	N	Mean Rank	Sum of Ranks	P value
Zerodevm	1.00	50	50.50	2525.00	
	2.00	50	50.50	2525.00	1
	Total	100			
Zerodevf	1.00	50	50.50	2525.00	
	2.00	50	50.50	2525.00	1
	Total	100			
Onedevm	1.00	50	56.00	2800.00	
	2.00	50	45.00	2250.00	0.025
	Total	100			
Onedevf	1.00	50	56.00	2800.00	0.025
	2.00	50	45.00	2250.00	
	Total	100			
Threedevm	1.00	50	61.00	3050.00	
	2.00	50	40.00	2000.00	0.000
	Total	100			
Threedevf	1.00	50	52.00	2600.00	
	2.00	50	49.00	2450.00	0.550
	Total	100			

Table 5: Karls Pearson coefficient test

R value between smile esthetics and	Male	Remark	Female	Remark
1mm	-0 .4810	Weak negatively correlated	-0.5288	Moderately negative correlation
3mm	-0.6032	Highly negatively correlated	-0.9011	Highly negatively correlated

Statistical Analysis

The measured values were evaluated for comparing statistical significance with Mann –Whitney test using SPSS version 2.1.

P value ($P<0.005$) was used to determine statically significant difference between smile esthetics and midline

shift. Karls Pearson correlation test was used to correlate the smile esthetics with midline deviation.

Significant difference($p<0.005$)was noted between responses in 3mm midline deviation images by the laymen and theorthodontists(Table 4).Karl Pearson coefficient test showed high negative correlation between 3mm midline deviation in both male and female photograph (Table 5).

Discussion

Facial aesthetic evaluation is an important part of orthodontic treatment planning.[8]Achieving coincident dental midline with facial midline is an important component of aesthetic smile and functional occlusion. Hulsey et al quoted that a symmetrical dental arrangement is an important component of attractive smile.[9]

Achieving coincidence between maxillary dental and facial midline can be vexing. Complete correction of midline can result in a prolonged treatment time, multiple tooth extractions and complex mechanics. Therefore orthodontist must justify whether to correct or accept midline deviation, the most important factor in such a decision might be the degree to which the deviation affects the perceived smile aesthetics.[10]

Kokich et al evaluated the effects of small variations in tooth position and the relationship of teeth with their surrounding tissues and the author found that there was a significant difference in perception of smile aesthetics between orthodontists and laymen.[11]

The present study aimed to evaluate the impact of dental midline deviation on smile aesthetics in male and female photographs witha deviation of1mm and 3mm. The study also determined the amount of deviation which could be recognised and accepted by laymen and orthodontists. Our study used a novel approach of generating multiple smiling images of a male and a female individual with 1mm and 3 mm of dental midline deviation to left side from the facial midline.

The results of our study showed that the most attractive smile was perceived when facial midline coincided with the maxillary dental midline by both laymen and orthodontists. This is analogous to the findings of Tjan et al who stated that a smile was highly acceptable when the dental midline and facial midline coincide.[12]

Only 4% of the laymen could detect the midline deviation of 1mm in the male photograph but 16% of the laymen could detect midline deviation in the female photograph. Of which, 72% of laymen could accept this midline deviation in both male and female photograph indicating that 1mm midline deviation is acceptable by the laymen.

50% of the orthodontists found 1mm of deviation to be attractive and acceptable in both male and female photographs but the other 50% of orthodontists could not accept 1mm midline deviation in both male and female photographs and planned to treat depending on the other facial parameters.

More than 55 % of laymen could detect abnormality in 3mm deviated smile image of both male and female. 44 % of laymen did not accept the smile with 3mm midline deviation in female photograph and 28% of the laymen did not accept the smile with 3mm midline deviation in male photograph. This showed that most of the laymen could detect the midline deviation and less acceptance was seen in female photograph of 3mm deviation requiring an orthodontic treatment for correction of the deviation.

JamillaBarross Ferreira et al observed that laymen were able to identify deviations from the midline starting from 1mm to 3mm, it seems only from a deviation of approximately 3mm that the smile was considered not aesthetically pleasing by laymen.[13]This finding is in correspondence with our results.

70% of the orthodontists did not accept 3mm of midline deviation in both male and female photographs.And 30% of orthodontists, accepted this midline deviation of

3mmalthough could detect the same. This showed the sensitivity of orthodontists for detecting any facial deviation requiring an orthodontic treatment protocol.

As the midline discrepancy was increased to 3mm, both groups showed sensitivity to the deterioration in dentofacial aesthetics though in varying percentages.

In summary, we can state that coinciding midlines are the preferred choice for both laymen and orthodontists. 1mm midline deviation can be perceived as well as accepted by the laymen but orthodontists did not accept this deviation of 1mm. 3mm midline deviation was not acceptable by orthodontists in both male and female photographs but laymen did not accept it in females.

3mm of midline deviation was not acceptable by laymen and orthodontists when compared to 1mm midline deviation. These findings are in corroboration with Jeffery et al who proposed that any amount of midline deviation more than 2 mm would not be acceptable and considered unaesthetic. On the contrary, Ker et al and Springer et al found an acceptance of 3mm maxillary midline deviation to be attractive, whereas Pinho et al found a midline deviation of 4mm to be generally acceptable.[14] The observations in this study were different from the result of our study which could be due to difference in the facial types and ethnicity of the individual.

Ryan et al carried out a study and observed that the female subjects with an increased deviation showed significantly lower attractiveness compared to the male subjects, indicating that the threshold of midline deviation acceptance is higher in males compared to females, this fact is in concordance to the observation of Zhang et al who found female acceptance threshold to be lower than those of male.[15]This observation is also similar to the results of our study.

Significant difference was noted between the responses of laymen and orthodontists in 1 mm and 3mm midline deviation smiles. Kokich et al in his study quoted that orthodontists and laymen detect specific dental esthetic discrepancies at varying levels of deviation,[16]which helps in making specific treatment recommendations.

Karls Pearson coefficient showed a high negative correlation between smile aesthetics and a deviation of a maxillary midline by 3 mm.

In the present study, the orthodontists were found to be more critical in evaluating dental aesthetics than the laymen, when the midline discrepancies exists.With midline deviation of 3mm both laymen and orthodontists were sensitive in perceiving the deviation. Laymen could not accept the same in females and orthodontists did not accept 3mm deviation in both males and females.

Conclusion

1. Matching midlines are the preferred choice for a pleasing smile.
2. Orthodontists are more sensitive in perceiving midline deviation than laymen.
3. Deviation of more than 3mm is aesthetically unacceptable by both orthodontists and laymen.

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