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Original Research Article

A comparative study to evaluate the influence of the incisal inclinations of maxillary central incisors in gujarati men and women on the perception of smile esthetics among orthodontists, general dentists and lay persons

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ABSTRACT

Background: The aim of this study is to investigate the influence of different incisal inclinations of the maxillary central incisors in an analysis of full face and close up views of the smile on the perception of smile esthetic in Gujarati men and women between orthodontists, general dentists and laypersons.

Materials and Methods: Frontal smile and Lateral profile photographs were digitally altered at full-face view and close-up view of adult men and women aged 15-30 years were used. The patient wase made to sit with a natural head position. Six incisal labial and lingual inclinations of the central incisors were simulated with changes of 5 degree. Alterations in the labially inclined direction were labeled as positive and those in the palatally inclined direction were labeled as negative. The positions were denominated as follows: 5 °, 10 °, 15 °, -5 °, -10 ° and –15 °, according to incisal inclination changes of the central incisors. To simulate the different incisal inclinations adobe Photoshop CS 8.0 was used. The top limit of the full-face image was a region little above the top of the head and the bottom limit was the base of the neck. The images were randomly assembled in an album that were presented to 40 orthodontists, 40 general dentists and 40 laypersons who evaluated the attractiveness of the images by using Visual Analogue Scale.

Results : 10^{o} was found to be most attractive incisal inclination.

1. Introduction

A successful orthodontic treatment result is the one which satisfies the patient and societal of beauty.[1] Perception has been defined as the process by which patterns of environmental stimuli are organized and interpreted; it can be influenced by a variety of physical, physiological and social factors. These perceptions may be passed on to other public through various other means and every individual perception may vary.[2]

An orthodontic treatment takes into consideration various aspects such as the alignment of teeth, the jaw relations and the temporomandibular joint along with esthetics.[2] Exclusively considering the hard tissue in treatment plan will not help an individual to achieve desired result. So, the soft tissue also should be considered. For example, the display of the maxillary dentition during rest and smiling is considered youthful and esthetically pleasing. Because the soft tissues of the face like lips, nose, and chin depends on the under lying hard tissue, an unfavorable change in the incisor position can lead to poor soft tissue outcome. Thus, incisal inclination is an important factor to be considered in esthetics.[2]

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When it comes to facial attractiveness, a lot of factors play a role, amongst which one of the most important factors is smile. A smile is a combination of soft tissue and dental harmony. According to the regional distribution of the population, there has been varying soft tissue features, along with varying growth patterns. Thus, a single set of opinion for arrangement of teeth doesn't work for all the regional populations. When in orthodontics, we live in an era of preadjusted bracket system, where we have a common prescription for tip, torque and angulation. But with regionally varying soft tissue features, the hard tissues supporting the soft tissues cannot go with a common prescription for all humans. Thus, when collecting opinions from a group of orthodontists, a group of general dentists and a group of lay persons (graduates of any other field than dentistry) we can finally come to a conclusion of an attractive smile amongst Gujarati population.

Incisal exposure and soft tissue when in harmony creates the best smile. Soft tissue features are very much depended on incisal inclination. Thus, this gives a clear idea on importance of incisal inclination to smile and which ultimately adds to facial attractiveness. So, to target the smile esthetics of regional population of Gujarat this study was conducted which ultimately aimed to enhance the smile attractiveness of the Gujarati population on the basis of perception of Orthodontists, dentists and lay persons.

Figure 1: Subject 1

2. Materials and Methods

A cross sectional study was carried out. Lateral smile photographs which were digitally altered at full-face view and close-up view of adult men and women aged 15-30 years will be used. Their maxillary anterior dentition was be healthy with absence of restorative procedures. At the distance of 0.5 meter, lateral face profile and the front face images were captured using Nikon 60D. The patient was made to sit with a natural head position. Six incisal labial and lingual inclinations of the central incisors was simulated with changes of 5 degree. Alterations in the labially inclined direction were labeled as positive and those in the palatally inclined direction were labeled as negative. The positions were denominated as follows: 5 °, 10 °, 15 °, -5 °, -10 ° and –15 °, according to incisal inclination changes of the central incisors. To simulate the different incisal inclinations adobe Photoshop CS 8.0 was used. The top limit of the full-face image will be a region little above the top of the head and the bottom limit will be the base of the neck. The images were randomly assembled in an album that were presented to 40 orthodontists, 40 general dentists and 40 laypersons who evaluated the attractiveness of the images by using Visual Analogue scale.

Figure 2: Subject 2

Figure 3: Subject 3

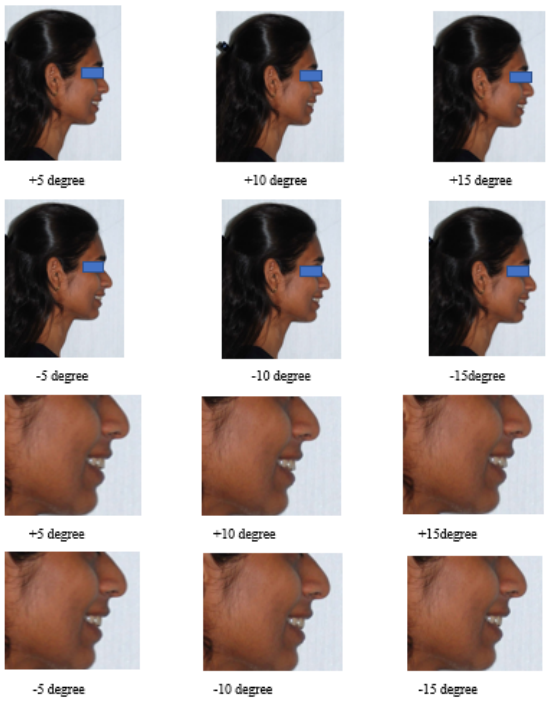

Figure 4: Subject 4

2.1. Statistical analysis

Statistical analysis was performed using SPSS 20.0. Descriptive statistics (ie, mean and standard deviation) were calculated for the age of raters, and median and interquartile range were calculated for the VAS scores from each category of incisor inclinations in altered groups. To compare the VAS scores between groups of raters, the Mann-Whitney U test was applied. The level of significance was kept at P = 0.05.

3. Result

After obtaining the consent and evaluation sheet from all the participants, the results were entered in a spreadsheet and statistically analysed.

In Table 1, the statistics scored by the group of orthodontists have been mentioned. From this we can conclude that, highest rating was secured by the profile view with 10˚ angle (7.37 ± 1.51) and least value was secured by Profile view with 15˚ angle (6.26 ± 1.73). Statistically, significant difference was observed in smile aesthetic scale in orthodontist group.

The same has been shown in Figure 5, where graphical presentation has been shown of the statistical analysis of scores given by the orthodontist.

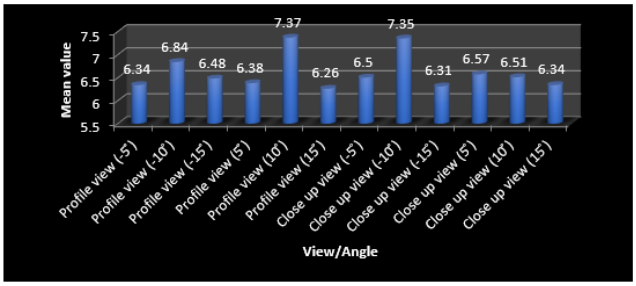

Figure 5: Smile aesthetic score wise distribution in orthodontist

Table 2 and Figure 6 shows the statistical analysis of the data obtained from the group of general dentists where, the highest rating was observed in profile view with -10˚ angle (7.80 ± 1.59) and the least value was observed in Close up view with 5˚ angle (4.69 ± 2.26). Statistically, significant difference was observed in smile aesthetic scale in General dentist group.

Table 3 and Figure 7 discusses the statistical analysis of the data obtained from the group of lay persons where, the highest ratings was observed in profile view with -10˚ angle (7.55 ± 1.46) and least value was observed in Close up view with 5˚ angle (3.64 ± 1.78). Statistically, significant difference was observed in smile aesthetic scale in Lay person group.

Table 4 and Figure 8 shows the score wise distribution amongst all three groups. Significant difference was observed for all 6 different incisal inclination amongst the

Table 1: Smile Aesthetic score wise distribution in Orthodontist

View	Angle	Number	Smile Aesthetic scale	
			Mean	SD
Profile view	- 5˚	80	6.34	1.77
	- 10˚	80	6.84	1.48
	- 15˚	80	6.48	1.75
	5˚	80	6.38	1.69
	10˚	80	7.37	1.51
	15˚	80	6.26	1.73
Close up view	- 5˚	80	6.50	1.55
	- 10˚	80	7.35	1.30
	- 15˚	80	6.31	1.94
	5˚	80	6.57	1.62
	10˚	80	6.51	1.94
	15˚	80	6.34	1.68
P Value	< 0.001*			

(Level of Significance P ≤ 0.05, * Significant, ** Non Significant)

Table 2: Smile Aesthetic score wise distribution in General dentist

View	Angle	Number	Smile Aesthetic scale	
			Mean	SD
Profile view	- 5˚	80	5.55	1.84
	- 10˚	80	7.80	1.59
	- 15˚	80	5.49	1.80
	5˚	80	4.93	1.86
	10˚	80	6.20	2.34
	15˚	80	4.94	1.78
Close up view	- 5˚	80	5.29	1.80
	- 10˚	80	7.56	1.62
	- 15˚	80	5.04	1.83
	5˚	80	4.69	2.26
	10˚	80	5.41	2.62
	15˚	80	5.75	8.08
P Value	< 0.001*			

Level of Significance P ≤ 0.05, * Significant, ** Non Significant

Table 3: Smile aesthetic score wise distribution in lay person

View	Angle	Number	Smile Aesthetic scale	
			Mean	SD
Profile view	- 5˚	80	4.98	1.50
	- 10˚	80	7.55	1.46
	- 15˚	80	5.16	1.43
	5˚	80	4.35	1.31
	10˚	80	5.51	2.19
	15˚	80	4.90	1.46
Close up view	- 5˚	80	5.51	1.72
	- 10˚	80	5.34	1.62
	- 15˚	80	4.55	1.79
	5˚	80	3.64	1.78
	10˚	80	5.61	2.25
	15˚	80	4.20	1.68
P Value	< 0.001*			

Level of Significance P ≤ 0.05, * Significant, ** Non Significant

Table 4: Smile aesthetic score wise distribution among all groups

View	Angle	Groups	Number	Smile Aesthetic scale		P Value
				Mean	SD	
Profile View	- 5˚	Orthodontist	80	6.34	1.77	< 0.001*
		General dentist	80	5.55	1.84	
		Lay person	80	4.98	1.50	
	- 10˚	Orthodontist	80	6.84	1.48	< 0.001*
		General dentist	80	7.80	1.59	
		Lay person	80	7.55	1.46	
	- 15˚	Orthodontist	80	6.48	1.75	< 0.001*
		General dentist	80	5.49	1.80	
		Lay person	80	5.16	1.43	
	5˚	Orthodontist	80	6.38	1.69	< 0.001*
		General dentist	80	4.93	1.86	
		Lay person	80	4.35	1.31	
	10˚	Orthodontist	80	7.38	1.51	< 0.001*
		General dentist	80	6.20	2.34	
		Lay person	80	5.51	2.19	
	15˚	Orthodontist	80	6.26	1.73	< 0.001*
		General dentist	80	4.94	1.78	
		Lay person	80	4.90	1.46	
Close-up view	- 5˚	Orthodontist	80	6.50	1.55	< 0.001*
		General dentist	80	5.29	1.80	
		Lay person	80	5.51	1.72	
	- 10˚	Orthodontist	80	7.35	1.30	< 0.001*
		General dentist	80	7.56	1.62	
		Lay person	80	5.34	1.62	
	- 15˚	Orthodontist	80	6.31	1.94	< 0.001*
		General dentist	80	5.04	1.83	
		Lay person	80	4.55	1.79	
	5˚	Orthodontist	80	6.58	1.62	< 0.001*
		General dentist	80	4.69	2.26	
		Lay person	80	3.64	1.78	
	10˚	Orthodontist	80	6.51	1.94	0.006 *
		General dentist	80	5.41	2.62	
		Lay person	80	5.61	2.25	
	15˚	Orthodontist	80	6.34	1.68	0.017*
		General dentist	80	5.75	8.08	
		Lay person	80	4.20	1.68	

Level of Significance P ≤ 0.05, * Significant, ** Non Significant

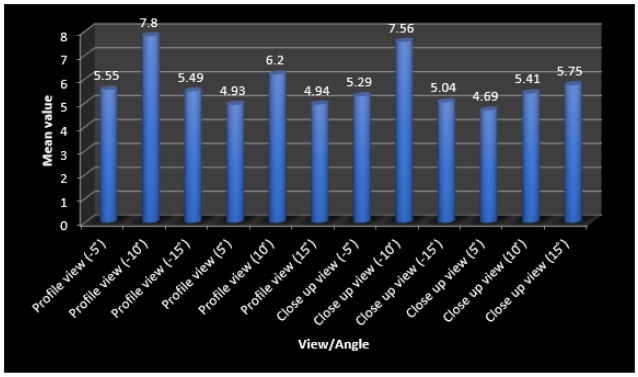

Figure 6: Smileaesthetic score wise distribution in general dentist

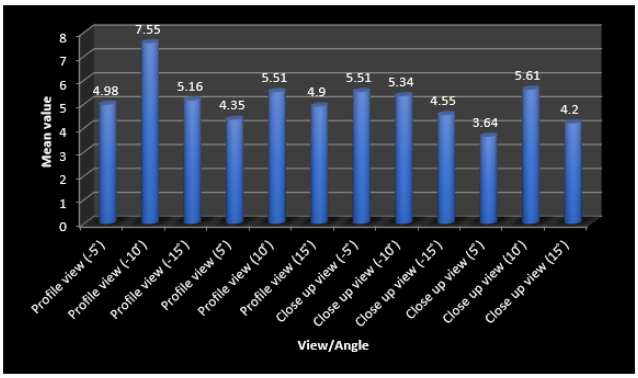

Figure 7: Smile aesthetic score wise distribution in lay person

three groups. Amongst all the 3 groups,5˚, 10˚, 15˚, - 5˚ and - 15˚ angle in profile view received highest score from the orthodontist and the least score from the lay persons.

Also, The Significant difference was observed for all 6 different incisal inclination amongst the three groups. Amongst all the 3 groups, - 5˚ angle in Close-up view received the highest score from the orthodontist and the least score from the General dentists.

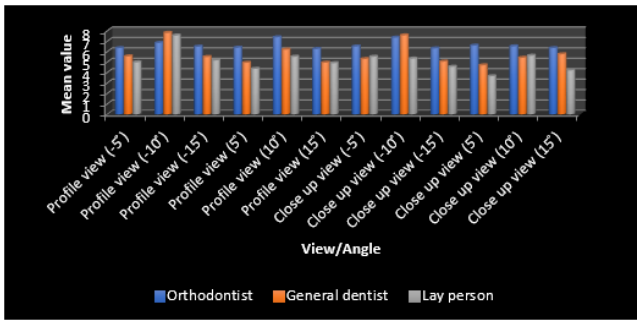

Figure 8: Smileaesthetic score wise distribution among all groups

4. Discussion

The aim of this study was to investigate the influence of different incisal inclinations of the maxillary central incisors in an analysis of full face and close up views of the smile on the perception of smile esthetic in Gujarati men and women between orthodontists, general dentists and laypersons. This study evaluated the different incisal inclination on maxillary central incisors, on the terms of esthetic purpose. Analysis of the data found that General dentist and lay person had different perceptions than the orthodontists. The group of Orthodontists gave the highest rating to +10˚ central incisor inclination, while the other two groups of general dentists and lay persons gave the highest ratings to the -10 ˚. The result found here has high clinical application as for the diagnosis and treatment planning of smiles in different dental specialties, for example, Prosthodontics, Cosmetic dentistry, and Orthodontics.

In a recent study, only orthodontists and Lay Persons were asked to evaluate subjects on the basis of facial attractiveness.[1] The inclusion of General Dentists as raters is crucial as they are the first to assess patients and refer them to specialists. The knowledge of their preferences will help generate a better zone of acceptability.[3]

In our study, all panels of raters provided the highest scores to -10˚ incisal inclinations. These results vary in concordance with Ali US et al.[2] who found normal inclinations to be the most attractive among the panelists. However, Ghaleb et al.[4]found that 5 ˚ are the most preferred incisal inclinations among orthodontists and General dentists, implicating that having slightly protrusive maxillary incisors are considered to be more esthetic among professionals.

There has been a similar study on smile esthetics with considering buccal corridor width in Malaysian population by Nimbalkar et al., which said in three different facial types the 15% of buccal corridor that is the medium buccal corridor was found most attractive amongst the evaluators of three different ethnic group of Malaysian population.[5]

Najafi et al in his study compared smile esthetics in 3 different mandibular position by altering the incisal inclination. He concluded that it was difficult to achieve a normal incisal inclination in orthognathic mandible and excessive inclination is not aesthetic in jaw deficiencies.[6]

A similar study by johnston et al., conducted a study amongst 92 social science students to rate the silhouette of skeletal class 1 AP relation of digitally altered lower anterior facial height in the total anterior facial height. The most ratings were received by average Lower anterior facial height and least were received by short anterior facial height.[7]

From the Orthodontic point of view, these results are of high relevance. By analyzing the Tables 1, 2 and 3, the group of orthodontists hold a different perception than the general dentists & the lay persons. This result demonstrates the additional 10˚ inclination is more esthetic for the group of orthodontists, whereas, 10˚ retroclination is more esthetic from the perception of the general dentists and the lay persons. These results are in disagreement to different studies which concluded that Lay Persons perception could be altered by various features such as hair, nose, and chin.[8,9]

Thus, it is necessary to evaluate the soft tissue profile and plan the inclination of central incisors, as required for the individual. For the orthodontist, this information involves taking decision in planning the torque expression.

We have simulated the photographs of 2 Gujarati men and 2 Gujarati women. Our results have shown that individual features of each evaluated photograph did not affect the evaluators' opinions because the attractive smiles for all the orthodontists were +10˚ and for all the participants of group, general dentists and lay persons where the attractive smiles were -10 ˚.

It is important to notice the soft tissue changes on inclining or retroclining the maxillary central incisors, such as the lip strain and fullness. This study shows that the inclination of teeth is an area of personal choice in terms of esthetics, for which, it cannot be hypothesized.

Nevertheless, this is the result of a digitally simulated photographs, without considering the dynamics of phonetics. As esthetic is of a subjective nature, it is imperative that planning the final tooth inclination must be individually discussed with patients, to ascertain the expectations on conclusions of the treatment.

Table 5: Smile aesthetic score wise distribution among all groups (Pair wise)

View	Angle	Groups		P Value
Profile View	- 5˚	Orthodontist	General dentist	0.011*
			Lay person	< 0.001*
		General dentist	Lay person	0.087**
	- 10˚	Orthodontist	General dentist	< 0.001*
			Lay person	0.009*
		General dentist	Lay person	0.551**
	- 15˚	Orthodontist	General dentist	0.001*
			Lay person	< 0.001*
		General dentist	Lay person	0.437**
	5˚	Orthodontist	General dentist	< 0.001*
			Lay person	< 0.001*
		General dentist	Lay person	0.070**
	10˚	Orthodontist	General dentist	0.001*
			Lay person	< 0.001*
		General dentist	Lay person	0.088**
	15˚	Orthodontist	General dentist	< 0.001*
			Lay person	< 0.001*
		General dentist	Lay person	0.898**
Close-up view	- 5˚	Orthodontist	General dentist	< 0.001*
			Lay person	0.001*
		General dentist	Lay person	0.679**
	- 10˚	Orthodontist	General dentist	0.652**
			Lay person	< 0.001*
		General dentist	Lay person	< 0.001*
	- 15˚	Orthodontist	General dentist	< 0.001*
			Lay person	< 0.001*
		General dentist	Lay person	0.223**
	5˚	Orthodontist	General dentist	< 0.001*
			Lay person	< 0.001*
		General dentist	Lay person	0.002*
	10˚	Orthodontist	General dentist	0.008*
			Lay person	0.037*
		General dentist	Lay person	0.846**
	15˚	Orthodontist	General dentist	0.726**
			Lay person	0.016*
		General dentist	Lay person	0.111**

Level of Significance P ≤ 0.05, * Significant, ** Non Significant

4.1. Limitations of the study

The limitations of our study are that there was no comparison between the perception of different gender. Similarly, the perception should also hold equal importance in frontal view, so the perception should be taken that way too. This study was performed taking into consideration skeletal and dental class I, harmonious profiles, with no dental deformities, whereas in cases with class II and class III the perceptions might be different. Also, when the incisal inclination was altered, the soft tissue was no altered, but it is a proven fact that incisal inclination plays an important role in lip support. When the perceptions were noted, the panelists were judging a simulated photograph, which didn't demonstrate the phonetics and other functions, in accordance to incisor inclinations, which is a matter of huge concern in orthodontics.

4.2. Scope of the study

The further scope of the study includes a clear idea of varying smile esthetics in Gujarati population. This will ease the communication amongst the dentist of varied specialities such as prosthodontics, endodontics and Orthodontists.

5. Conclusion

Based on the findings of this research, we can conclude that the perception of orthodontists, general dentists and lay persons varies. A slight retroclined incisors were rated as most attractive by the lay persons and general dentists, whereas the orthodontists rated a slightly proclined incisors to be most attractive. No statistically significant difference

was seen in the ratings of a close up view and profile view. Thus, hair and other facial features does not play significant role in smile esthetics. These digitally simulated photos did not depict the oral functions, which are also of utmost importance in orthodontics. Thus, a clinician must give equal importance to esthetics as well as functions, and should give the best suitable for an individual, maintaining the harmony of oral cavity in all aspects.

6. Source of Funding

None.

7. Conflict of Interest

None.

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