Impact of smile parameters as part of orthodontic treatment planning and the influence of smile arc by bracket position modification: A questionnaire and prospective clinical study

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ABSTRACT

Background: Smile is one of the most important factor that contributes to overall facial esthetics and improving the smile features could enhance the facial attractiveness of an individual. This study aimed at evaluating the impact of particular smile parameters as part of orthodontic treatment planning and assess the influence of smile arc by bracket position modification.

Methodology: The clinical study was conducted on 30 subjects divided into three groups (ideal smile arc, flat smile arc reverse smile arc) and the surveyed population comprised of 200 members of IOS. Bracket positioning was changed to convert flat smile arc and reverse smile arc to ideal smile arc. Paired t test was performed to find the level of significance in tip, torque and intercanine width values. An electronic questionnaire was designed in google forms and was sent to each participants. The responses were collected after 4 weeks of distribution date.

Results: Tip values in relation to 13 and intercanine width in group A,tip values in relation to maxillary anteriors except 21, torque and intercanine width in group B and tip values in relation to all maxillary anteriors, torque and intercanine width in Group C were statistically significant. According to the participants' responses, the smile parameters have a great impact in preparing the plan for treatment.

Conclusion: Ideal smile arc can be achieved by modifying bracket positioning and the different smile parameters have a great impact in enhancing the smile of an individual.

Key-words: Smile arc, flat smile arc, reverse smile arc, smile line, buccal corridor, smile symmetry

INTRODUCTION

The main treatment purpose in orthodontics is to create a well-balanced functional occlusion, but another, even more crucial goal is to create a well-balanced smile.[1]Recently, there has been a noticeable increase in attention given to facial aesthetics, and the majority of patients seek orthodontic treatment not only to achieve properly aligned teeth but also to improve their facial aesthetics. In addition to dealing with skeletal and dental issues, modern orthodontics also addresses issues with facial proportions.[2]

For determining whether the patient has a harmonious smile or not, numerous smile parameters have been offered in the dental literature. The smile arc, smile line, smile symmetry, buccal corridor, ratio and symmetry of the maxillary central incisors, midline, and tooth angulation are the most significant ones. [3]There was debate over which factors are more significant and have the greatest influence on smile attractiveness, thus it is critical to determine which characteristics are more important and taken into account. According to Sabri[4], in order to achieve the ideal smile arc, not all patients should have their brackets positioned at the same level.[5] In order to extrude the maxillary incisors or intrude the

maxillary canines, it is crucial to evaluate and visualize the relationship between the incisor-smile arc and place brackets accordingly.[6]
Keeping the above objectives in mind, modification is done in MBT bracket positioning to achieve ideal smile arc and an electronic questionnaire is made based on several smile parameters and is sent to 200 members of Indian Orthodontic Society to evaluate each orthodontist's perception on each smile parameters as their role in achieving esthetic smile.

MATERIAL AND METHOD:

SAMPLE SELECTION

The clinical study was conducted on 30 subjects, age group between 15 and 24 years, undergoing orthodontic treatment in the Department of Orthodontics and Dentofacial Orthopaedics, Jaipur Dental College. After obtaining a clearance from the college ethical committee, an informed written consent was obtained from the patients. For the Questionnaire, the surveyed population comprised of 200 members of Indian Orthodontic Society.
The methodology and protocols involved for the selection criteria of the subjects has been outlined below:

INCLUSION CRITERIA

For clinical study,

1. Both males and females of the age group between 15 and 24 years.
2. Absence of any relevant medical history.
3. Absence of any genetic disorder.
4. No previous orthodontic treatment.
5. Possessing normal size and shape of the teeth.
6. Minimal or absence of crowding.

For Survey,
200 members of Indian Orthodontic Society.

EXCLUSION CRITERIA

For clinical study,

1. Patients with previous history of orthodontic treatment.
2. Patients with syndrome.

METHODOLOGY

- For clinical study, the patients were divided into three groups. Group A consisted of 10 patients with ideal smile arc, Group B consisted of 10 patients with flat smile arc while Group C consisted of 10 patients with reverse smile arc.
- Pre treatment and post treatment frontal smile photographs (fig.1,2,3) and upper impressions (fig.4,5,6) of all the patients were taken using Canon DSLR-EOS 1500D camera and alginate impression material and casts were poured immediately with Orthocal stone.
- Pre treatment and post treatment lateral cephalogram (fig.7, 8, 9) and panaromic radiograph (fig.10,11,12) of all patients were taken using Kodak 8000C Digital Panoramic and Cephalometric System.
- All panoramic radiographs and lateral cephalogram were taken under standard conditions with a cephalostat, by keeping the clinical Frankfort horizontal plane parallel to floor and the facial midline plane in a vertical position.
- Extra oral smile photographs are enlarged to almost live size (5x7) and were used for the evaluation of extrusion or intrusion of the upper anteriors by drawing an ideal smile arc

which is in harmony to the lower lip. This is done by marking points CLab, RLab and LLab on the lower lip.

- Once evaluation of the amount of intrusion or extrusion to be done is measured, brackets were bonded according to the criteria for correction of flat smile arc and reverse smile arc by placing the bracket more gingivally as required to achieve the ideal planned smile arc. Archwires were placed in the following sequence: 0.016 Niti, 0.016 × 0.022 Niti, 0.017 × 0.025 Niti, and 0.019 × 0.025 Niti, with individual ligation. Tip values of upper anteriors (mesiodistal inclination) were evaluated from pre treatment and post alignment panoramic radiographs which was printed out on a normal sheet of paper.
- Torque values of upper central incisors were derived from pre treatment and post alignment lateral cephalogram using Dolphin Software.
- Intercanine width was also evaluated from pre treatment and post alignment study models using a Digital Vernier caliper.
- For Questionnaire Survey, an electronic questionnaire with 20 questions arranged on five main axes, based on four-point Likert scale, was designed for online participation. Each axis was composed of several questions that discuss the main features of smile esthetics.
- Within each axis, a description of each smile parameter is written, to clarify variable situations of the smile feature, to facilitate respondent perception for aspects of a feature of interest.The link of the questionnaire was sent to 200 members via whatsapp and email.The answers were collected after 4 weeks of questionnaire link distribution date.

(a) **(b)**

Figure 1 (a) & (b): Comparision of pre treatment (a) and post alignment photograph (b) : Group A

(a) **(b)**

Figure 2 (a) & (b): Comparision of pre teatment and post alignment photograph : Group B

(b)

(a) (b)

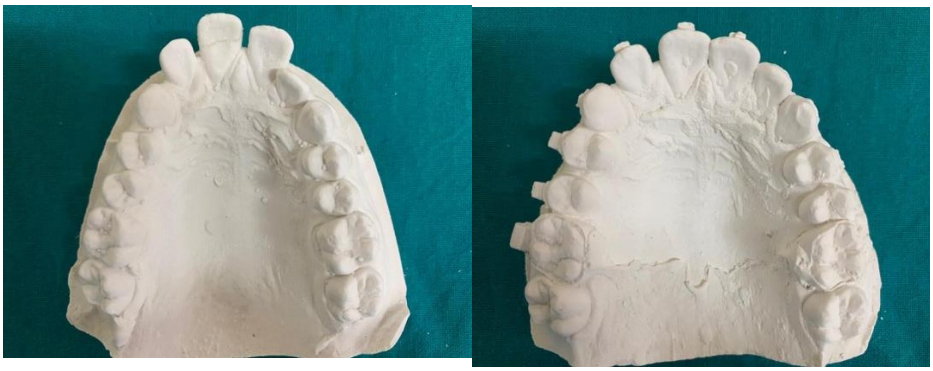
Figure 3 (a) & (b): Comparision of pre teatment and postalignment photograph : Group C

(a) (b)

Figure 4 (a) & (b): Comparision of pre treatment and post alignment Intercanine width : Group A

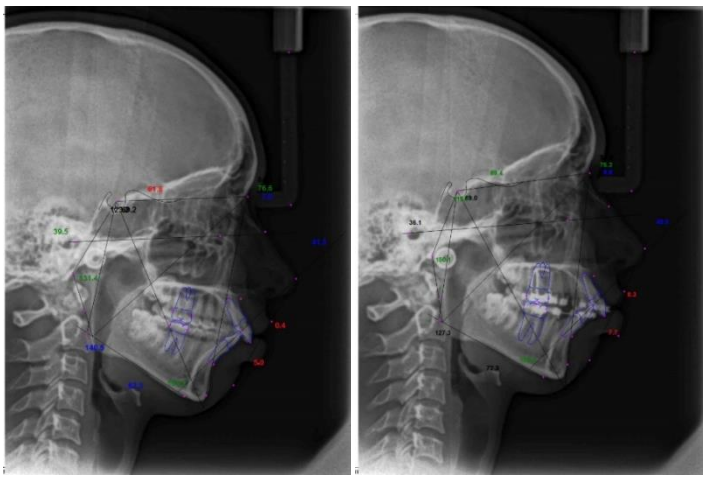
(a) (b)

Figure 5 (a) & (b) : Comparision of pre treatment and post alignment Intercanine width: Group B



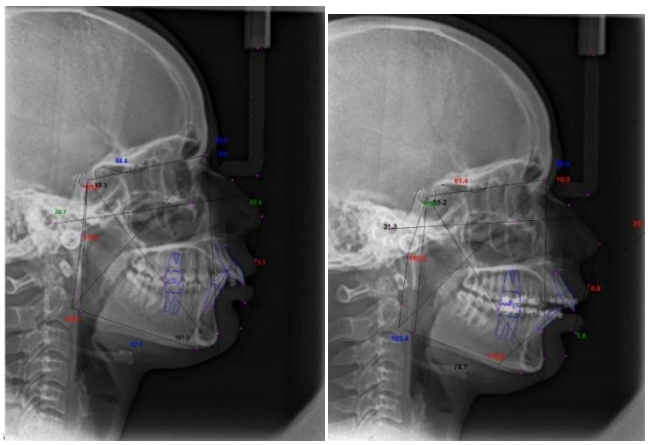
(a) (b)

Figure 6 (a) & (b) : Comparision of pre treatment and post alignment Intercanine width : Group C



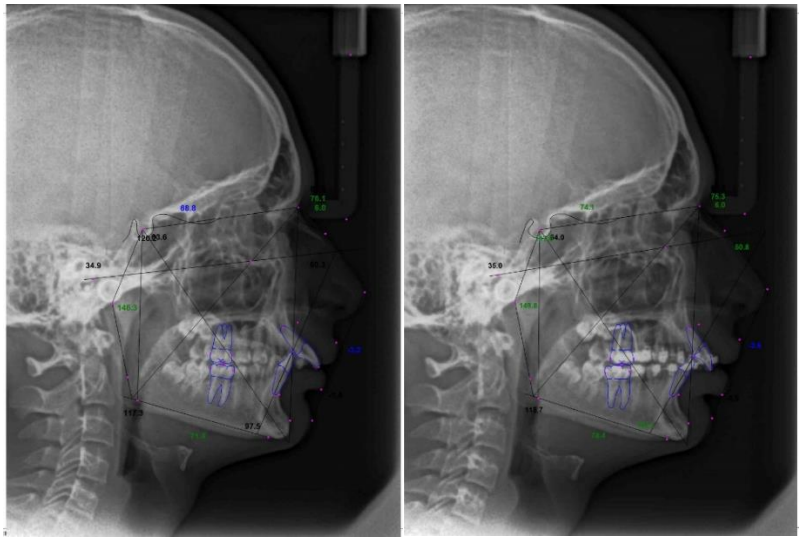
(a) (b)

Figure 7 (a) & (b): Comparision of pretreatment and postalignment Lateral ceph : Group A



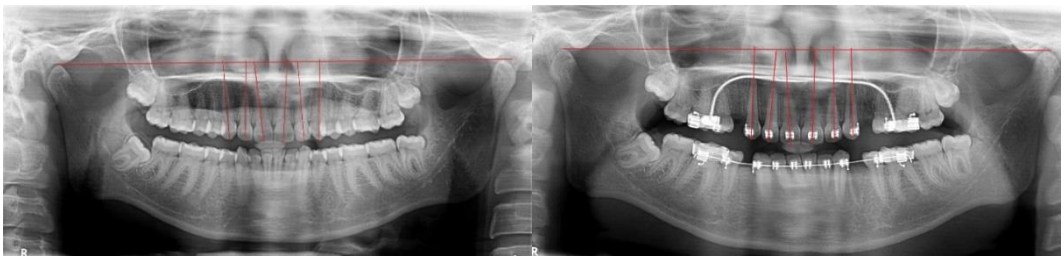
(a) (b)

Figure 8 (a) & (b): Comparision of pre treatment and post alignment Later ceph: Group B



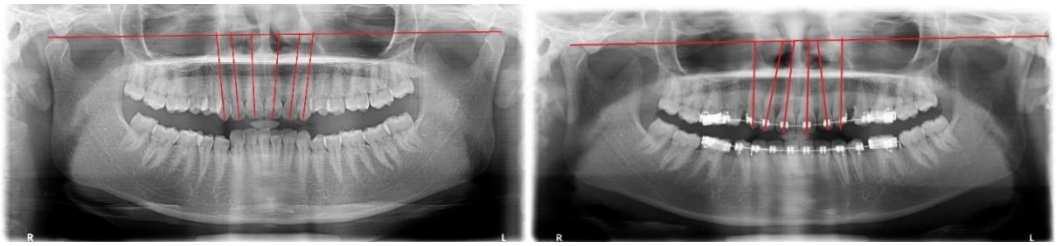
(a) (b)

Figure 9 (a) & (b) : Comparision of pre treatment and post alignment Lateral ceph : Group C



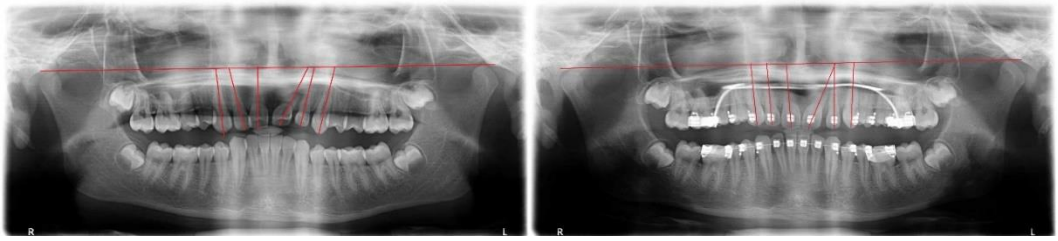
(a) (b)

Figure10 (a) & (b):Comparision of pre treatment and post alignment OPG : Group A



(a) (b)

Figure 11 (a) & (b) : Comparision of pre treatment and post alignment OPG: Group B



(a) (b)

Figure 12 (a) & (b) : Comparision of pre treatment and post alignment OPG: Group C

Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS, version 25.0; SPSS Inc., IBM, INDIA). The $p \leq 0.05$ was considered significant.

RESULTS

All values of the variables were obtained manually and entered into an excel spreadsheet. The mean scores obtained for both groups under different variables were then calculated and tabulated in the following manner for further statistical analysis. Paired student t-test was performed to find the level of significance in tip, torque and inter-canine width values for pre-treatment and post-alignment phases in the study group. The results showed that Group Ahas possessed no statistically significant difference for all the tip values in relation to maxillary anteriors except in 13, there is statistical significance.(**Table 1**), while Group Bhas possessed statistically significant difference for all the tip values in relation to maxillary anteriors except in 21where there is no statistical significance (**Table 2**) and Group Chas possessed a statistically significant difference for all the tip values in relation to maxillary anteriors(**Table 3**). For torque values, the results showed that Group A had not possessed a statistical significant difference for the torque values in relation to maxillary central incisor(**Table 4**) while Group B (**Table 5**) and C (**Table 6**) possessed a statistically significant difference. The results for intercanine width showed that all the three groups possessed a significant difference for the pre treatment and post alignment intercanine width. (**Table 7,8,9)**

Among the participants of questionnaire, 33(47%) were females and 36(56%) were males. Majority of the participants are private practioners.The duration of professional practice of study participants differs variably. (**Table 12)** Regarding the first axis of the questionnaire i.e, smile arc parameter, in the first question, 54.4% strongly agreed that slightly extruded central incisors than laterals and canines is more attractive and 58.8% strongly agreed that convex smile arc gives a youthful look while 54.4% agreed that there should be 0.5 to 1.5 mm step between central incisors and laterals. The statement that achieving ideal smile arc means achieving convex smile arc regardless of patient's gender is strongly agreed by 4.4% **(Table 13)** Discussing about cervical line, 50% strongly agrees that convex form of cervical line is the most ideal form and 66.2% agreed that parallel contact point line with incisal line gives a more esthetic look. Talking about the amount of gingival exposure during smile, 69.1% agreed that upto 2mm of gingival exposure during smile is esthetically acceptable.**(Table 14)** Concerning the importance of buccal corridor, 75% strongly agreed that buccal corridor plays a major role in smile attractiveness 51.5% strongly agreed that intermediate buccal corridor is the most attractive.**(Table 15)** Discussing about smile asymmetry, 51.5% agree that symmetric gingival margin between right and left side is a factor for smile esthetics. **(Table 16)** 64.7% and 29.4% agree and strongly agreed that most esthetic W/H ratio of central incisors is 75% to 85% and 55.9% and 42.6% agreed and strongly agreed that midline deviation equal to or greater than 2.0mm must always be corrected. Likewise, most of the respondents agreed (55.9%) or strongly agreed (44.1%) that closing of black triangles is highly indicated to improve the final results.**(Table 17)**

Table 1: Comparison of pre-treatment and post alignment tip score in Group A

Group A	Mean	SD	Paired Differences	Standard Error Mean	95% CI		t	df	p-value
					Lower	Upper			
Pre tip 11	86.7	3.86	-4.7	2.8	-11.0	1.6	-1.7	9	0.126
Post tip 11	91.4	5.50							
pre tip 12	91.1	1.45	-1	1.0	-3.2	1.2	-1.0	9	0.338
post tip 12	92.1	3.28							
Pre tip 13	87.6	2.99	-2.6	1.1	-5.2	0.0	-2.3	9	0.047*
Post tip 13	90.2	4.94							
Pre tip 21	92.2	3.52	0.3	1.3	-2.7	3.3	0.2	9	0.826
Post tip 21	91.9	5.04							

Pre tip 22	92.1	5.80	-1.4	1.5	-4.7	1.9	-0.9	9	0.368
Post tip 22	93.5	6.79							
Pre tip 23	88.2	4.96	-3.2	1.4	-6.4	0.0	-2.2	9	0.053
Post tip 23	91.4	5.50							

significant when p<0.05 by paired t-test

Table 2: Comparison of pre treatment and post alignment tip score in Group B (flat smile arc)

Group B	Mean	SD	Paired Differences	Standard Error Mean	95% CI		t	df	p-value
					Lower	Upper			
Pre tip 11	83.6	4.93	-4.4	1.73	-8.31	-0.49	-2.55	9	0.031*
Post tip 11	88	4.92							
pre tip 12	84.7	4.42	-6.1	1.43	-9.32	-2.88	-4.28	9	0.002*
post tip 12	90.8	5.22							
Pre tip 13	85.2	3.61	-4.3	1.19	-7.00	-1.60	-3.60	9	0.006*
Post tip 13	89.5	3.72							
Pre tip 21	90.6	2.50	-2.9	0.81	-4.70	-1.07	-3.58	9	0.0059*
Post tip 21	93.5	2.22							
Pre tip 22	90.1	6.01	-4	1.77	-8.00	0.00	-2.26	9	0.005*
Post tip 22	94.1	4.09							
Pre tip 23	86	5.37	-3.6	1.16	-6.22	-0.98	-3.11	9	0.012*
Post tip 23	89.6	5.19							

significant when p<0.05 by paired t-test

Table 3: Comparison of pre treatment and post alignment tip score in Group C

Group C	Mean	SD	Paired Differences	Standard Error Mean	95% CI		T	Df	p-value
					Lower	Upper			
Pre tip 11	84.8	5.2	-3.8	1.7	-7.5	-0.03	-2.3	9	0.048*
Post tip 11	88.6	5.16							
pre tip 12	84.6	5.02	-4	0.8	-5.8	-2.2	-4.9	9	0.001*
post tip 12	88.6	4.84							
Pre tip 13	87.5	3.31	-1.9	0.7	-3.5	-0.3	-2.7	9	0.025*
Post tip 13	89.4	2.41							
Pre tip 21	81.1	8.56	-4	1.1	-6.5	-1.5	-3.6	9	0.006*
Post tip 21	85.1	6.42							
Pre tip 22	84.5	6.06	-5.2	1.1	-7.7	-2.7	-4.8	9	0.001*
Post tip 22	89.7	7.69							
Pre tip 23	87.2	4.66	-4.2	1.3	-7.1	-1.3	-3.3	9	0.01*
Post tip 23	91.4	4.12							

significant when p<0.05 by paired t-test

Table 4: Comparison of pre treatment and post alignment torque score in Group A

Group A	Mean	SD	Paired Differences	Standard Error Mean	95% CI		t	df	p-value
					Lower	Upper			
Pre-torque	111.5	7.29	1.6	2.41	-3.85	7.05	0.66	9	0.52
Post-torque	109.9	9.37							

Table 5: Comparison of pre treatment and post alignment torque score in Group B

Group B	Mean	SD	Paired Differences	Standard Error Mean	95% CI		t	df	p-value
					Lower	Upper			
Pre-torque	116.4	9.37	4.9	1.52	1.47	8.33	3.23	9	0.0103*
Post-torque	111.5	8.50							

Table 6: Comparison of pre treatment and post alignment torque score in Group C

Group C	Mean	SD	Paired Differences	Standard Error Mean	95% CI		t	df	p-value
					Lower	Upper			
Pre-torque	118.4	7.15	9.4	1.18	6.74	12.06	8.00	9	0.000*
Post-torque	109	7.02							

significant when p<0.05, Study Group C: Reverse smile arc

Table 7: Comparison of pre treatment and post alignment inter-canine width score in Group A

Group A	Mean	SD	Paired Differences	Standard Error Mean	95% CI		t	df	p-value
					Lower	Upper			
Pre Intercanine Width	34.6	2.59	-2.15	0.89	-4.17	-0.13	2.40	9	0.0397*
Post Intercanine Width	36.75	2.62							

significant when p<0.05

Table 8: Comparison of pre treatment and post alignment inter-canine width in Group B

Group B	Mean	SD	Paired Differences	Standard Error Mean	95% CI		t	df	p-value
					Lower	Upper			
Pre-Intercanine Width	38.7	3.83	-2.11	0.71	-3.70	-0.50	2.97	9	0.0156*
Post-Intercanine Width	40.8	3.88							

significant when p<0.05

Table 9: Comparison of pre treatment and post alignment inter-canine width score in Group C

Group C	Mean	SD	Paired Differences	Standard Error Mean	95% CI		t	df	p-value
					Lower	Upper			
Pre-inter canine	36.4	3.47	-3.5	0.64	-4.94	-2.06	-5.50	9	0.000*
Post inter canine	39.9	3.54							

*significant when p<0.05

Table 10: Demographic characteristics of participants

Study Variables	Frequency	Percent
Gender		
Male	36	56
Female	33	47
Profession practice location		
College clinic	25	38.8
Govt. health centres	5	7.5
Private clinic	37	56.7
Duration of professional practice		
<5 years	31	46.3
11 - 15 year	4	6
6 - 10 years	32	47.8

Table 11: Orthodontist perception related to smile arc parameter

Results of 4-point Likert scale (%)						
Question Response	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**	**Mean Score**	**Response**
1	0	4.4	41.2	54.4	5.14 ± 3.62	Strongly agree
2	0	1.5	39.7	58.8	5.25 ± 3.73	Strongly Agree
3	1.5	14.7	54.4	29.4	4.58 ± 3.22	Agree
4	20.6	38.2	36.8	4.4	3.30 ± 2.26	Neutral

Table 12: Orthodontist perception related to smile line parameter

Results of 4-point Likert scale (%)						
Question Response	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**	**Mean Score**	**Response**
1	1.5	4.4	44.1	50	5.03 ± 3.58	Strongly agree
2	0	13.2	66.2	20.6	4.52 ± 3.14	Agree
3	0	8.8	70.6	20.6	4.58 ± 3.18	Agree
4	1.5	1.5	69.1	27.9	4.75 ± 3.32	Agree
5	0	1.5	73.5	25	4.75±3.30	Agree

Table 13: Orthodontist perception related to buccal corridor parameter

Results of 4-point Likert scale (%)						
Question Response	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**	**Mean Score**	**Response**
1	1.5	1.5	22.1	75	5.45 ± 3.89	Strongly Agree
2	0	4.4	44.1	51.5	5.10 ± 3.62	Strongly Agree
3	1.5	5.9	64.7	27.9	4.69 ± 3.28	Agree
4	2.9	7.4	63.2	26.5	4.60 ± 3.23	Agree

Table 14: Orthodontist perception related to smile asymmetry parameter

Results of 4-point Likert scale (%)						
Question Response	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**	**Mean Score**	**Response**
1	0	0	51.5	48.5	5.12 ± 3.61	Agree
2	0	4.4	54.4	41.2	4.95 ± 3.54	Agree

Table 15: Orthodontist perception on ratio, proportion and anatomical shape

Results of 4-point Likert scale (%)						
Question Response	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**	**Mean Score**	**Response**
1	1.5	4.4	64.7	29.4	4.73 ± 3.32	Agree
2	0	0	72.1	27.9	4.82 ±3.35	Agree
3	0	0	26.5	73.5	5.49 ± 3.91	Strongly Agree
4	0	1.5	55.9	42.6	5.01± 3.53	Agree
5	0	0	55.9	44.1	5.06±3.55	Agree

DISCUSSION

Recently, there was report on lack of consideration of the smile arc in treatment planning and mechanics by Orthodontist which result in flattening of the smile arc and less esthetic smiles. Keeping this in mind, in the present study, MBT brackets were positioned to achieve a convex smile arc in patients having flat smile arc and reverse smile arc and the opinion of 200 orthodontists regarding the impact of several smile parameters in achieving smile esthetics is taken via a questionnaire survey.

The MBT system developed by Maclaughlin, Bennet and Trevisi is a third generation preadjusted edgewise appliance which introduced a range of improvements and specification changes to overcome the clinical shortcomings of earlier preadjusted edgewise bracket systems.[7]

TIP or CROWN ANGULATION

In normal occlusion, a positive tip is characterized as a distal inclination of the gingival portion of each crown and a negative tip as a mesial inclination of the gingival portion of each crown.[8]In Group A, the result show that there was significant difference only in 13 which is in contrary to a study by Yunus Amin et al and Raghuraj et al where they found a statistically significant value in all the anteriors. [9, 10]In Group B, there was a statistically significant difference for all tip values except 21. Group C has possessed a statistically significant difference in relation to all maxillary anteriors. This would have been occurred

due to placement of bracket more gingivally for extrusion of incisors and more incisally for intrsion of canines or a combination of both.

TORQUE or CROWN INCLINATION

The torque value was evaluated from the pre treatment and post alignment lateral cephalogram by measuring the angle between the upper central incisor and the SN line. In Group A, the results showed that study group A had not possessed a statistical significant difference for the torque values in relation to maxillary central incisor with $p>0.05$. Raghuraj et al evaluated the efficacy of tip and torque of MBT brackets in orthodontic treated individuals and also concluded that torque under expressed in maxillary central incisors. In contrary to this, Yunus Amin et al found that torque was well expressed both in the maxillary central incisors.[9, 10] Problems with expression of torque values built into the appliance may be due to two mechanical reasons. The first is that the area of applied torque is small and is dependent on the twisting action of a relatively thin wire in comparison to the size of the tooth. Second, because a full thickness wire hinders sliding, we utilise 0.19"x 0.25" steel wires in 0.22 slots to slide the teeth. This 0.19" x 0.25" stainless steel wire has a "slop" or "play" of approximately 10° depending on the manufacturing tolerances for the bracket and wire as well as the degree of "rounding" of the wire edges.[7]Results indicate a statistically significant difference between Groups B and C for the torque values in relation to the maxillary central incisor.

Pre-angulated brackets should be bonded at least 4 mm from the incisal edge to express the most consistent and dependable built-in torque since the labial contour of the crown surface varies at different heights on the crown of the same tooth. On the other hand, because the labial surface of the crown is more prone to vary in curvature in this region, a bracket position higher than 4.5 mm from the incisal edge produces a less uniform manifestation of the torque built into the bracket.[14] Another study by Achint Devendra Chachada et al. revealed that when the bracket is moved incisally by 1, 2, or 3 mm, the lingual root torque increases by an average amount.

According to Creekmore and Kunik (1993), they suggested that the bracket height will not change the final torque. [13] On the contrary, the results of the study conducted by M. van Loenen et al show that bracket height does change the amount of torque because of the curvature of the labial surface.[14]

INTERCANINE WIDTH

Measurements obtained for the intercanine width from the maxillary study casts showed increased width in all the three groups with more increase value in reverse smile arc group when compared to ideal and flat smile arc group which was significant.This proved that intercanine width dimensions increase regardless of bracket positioning. Ackermann et al had suggested that broader the archform, the lesser will be the curvature of the maxillary anteriors leading to a flat smile arc. 15 According to the findings of the current study, significant changes in tooth position can be made by adjusting bracket positioning without affecting the harmony between the aesthetic smile arc and functional occlusion. Numerous studies have found that normal orthodontic treatment results in flatter smiles. 16 However, it was demonstrated in this study and another one by Yunus Amin et al. that standard bracket positioning did not result in a flatter smile until post alignment stage.

ORTHODONTIST'S PERCEPTION OF SMILE ESTHETICS PARAMETERS

The smile arc is defined as the relationship between the curvature of the incisal edges of the maxillary anterior teeth and the curvature of upper border of the lower lip.[6,17,18] Their ideal relationship on smiling is considered to be parallel and is known as a consonant smile. If the

two are not parallel (with flatter maxillary incisal curvature to the upper border of lower lip), it is called a nonconsonant smile. Achieving a consonant smile as an important factor for smile esthetics was agreed by 36.8% and strongly agreed by 4.4% which was also agreed upon by several other authors like Janzen [1], Hulsey CM,[18] and Oshagh Met al[19]intheir studies. Concerning the smile line, there are six horizontal smile lines which are • Cervical line–gingival apexes. • Papillary line–papillary tips. • Contact points line–contact points. • Incisal line–incisal edges (incisal line). The upper lip line and the lower lip line. For many orthodontists, a full enamel display of the upper anterior teeth combined with 1.0 to 1.5 mm of the gingival display is the most esthetically appealing and youthful percentage for a posed smile.[20]The findings of other studies are supported by a research by Suzuki L et al21, which showed that 3.0 mm is the highest limit of gingival tissue exposure. 22,23 Therefore, gingival exposure values up to 3.0 mm are entirely normal, whereas those over 3.0 mm are rated unattractive. In this study, more than 70% of participants agreed that while placing brackets, maxillary incisor exposure during smiles should be taken into account. The placement of the upper incisor brackets should be done in accordance with the smile arc protection bracket positioning in order to preserve or improve the smile arc.

Buccal corridors (negative or black spaces) are the spaces between the facial surfaces of posterior teeth and the corners of lips when a person is smiling.[25]Roden-Johnson D et al concluded that buccal corridors have no esthetic value; others believe that visible buccal corridors are unattractive.[26]Premolar extraction's impact on the visibility of negative space was examined by Johnson and Smith, who discovered no connection between the extraction pattern and the presence of negative space.[27] Large buccal corridor spaces may need to be considered for treatment planning, according to a recent study by Moore T et al, but small buccal corridors can be left alone. [28] This is consistent with our study, which revealed that the majority of participants believed that a big buccal corridor has a detrimental impact.

This study revealed strong support for achieving symmetric gingival margins on the right and left sides for ideal orthodontic smile aesthetics. Prior research in this area by Chiche GJ et al.[29], Machado AW et al.[30], and Alrizqi A et al.[31] also demonstrated the need of establishing accurate gingival levels for individual teeth and balanced crown length and width.

In terms of the orthodontist's opinion of ratio and anteroposterior proportion, the survey revealed strong agreement on the need for clinical crowns with a W/H ratio of 75 to 85 percent for central incisors in order to provide good orthodontic smile esthetics[32].

According to the literature, laypeople are unable to recognise midline deviations that are less than 3–4 mm. [22,23] Midline deviations equal to or higher than 2.0 mm and any degree of alterations in tooth angulation, according to the 8th commandment in the literature by Andre Wilson Machado, should be corrected. [33] This is consistent with the results of our study, where more than half of respondents agreed with the statement.

In his studies,[34]Kokich VG claims that the papilla/contact ratio in central incisors is 1:1 and that papillae must cover interdental spaces up to the contacts. Interdental spaces can still persist in cases when contacts are inappropriate. In order to correct any potential black spaces, contact adjustments are therefore required. The closing of black triangles is strongly suggested to improve the treatment outcomes, according to all respondents.

CONCLUSION

The present study consisted of clinical study and a survey. In the clinical study, evaluation of the amount of intrusion or extrusion to be done is measured using smile photographs brackets were bonded according to the criteria for achieving the ideal planned smile arc. Tip was assessed using panoramic radiographs, torque was assessed using lateral cephalogram and Intercanine width was assessed using study models.

It can be concluded as follows:

1. Ideal smile arc was achieved in flat and reverse smile arc at the end of treatment by modifying the bracket positioning.
2. Intercanine width increase regardless of bracket positioning and standard bracket positioning does not lead to flatter smile.
3. In Group A, change in tip value in 13 and intercanine width were significant.
4. In Group B,tip values in relation to maxillary anteriors except 21, torque values and inter-canine width were significant.
5. In Group C,tip values, torque values and inter-canine width were significant.

The questionnaire survey which was sent to 200 members of Indian Orthodontic society was responded by 68 orthodontists (34%). The questionnaire validated the importance of smile analysis, using specific parameters in the orthodontic examination, diagnosis, and treatment planning. According to the participants' responses, it can be concluded that the different smile parameters have a great impact in enhancing the smile of an individual as well as in diagnosis and in planning a treatment process of orthodontic patients.

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