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CEPHALOMETRIC CHARACTERISTICS OF POSTORTHODONTIC PATIENTS WITH ATTRACTIVE AND LEAST ATTRACTIVE FRONTAL POSED SMILE PHOTOGRAPHS

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ABSTRACT

Aim: The aim of this study is to find facial beauty related to specific skeletofacial, dental & soft-tissue morphology between postorthodontic patients with attractive and least attractive frontal posed smiles. **Materials and Methods**: The attractiveness of close-up photographs of frontal posed smiles in 30 adult patients after conventional orthodontic treatment will be evaluated by 10 experienced orthodontist using a visual analogue scale and grouped into 15 attractive (7-Male & 8-Female; age group- 18-35years) and 15 least attractive patients (7-Male,8-Female; age group- 18-35years). The post treatment cephalograms of the same patients will be taken and compared for skeletal, dental, and soft-tissue morphology. **Results:** The statistical significant differences seen between the attractive and least attractive groups in Lower lip to E-line (p=0.01). Further, the least attractive group showed significantly larger to all parameters except Anterior facial height, Interincisal angle, convex, Upper lip Length Greater when compared with the attractive group. **Conclusion:** Cephalometric analysis revealed that postorthodontic male & female patients with least attractive frontal posed smiles are characterized by average divergent skeletal pattern with extruded maxillary incisors, accompanied by a short upper lip than patients achieving attractive posed frontal smiles.

KEYWORDS: Frontal posed smiles; Cephalometric analysis.

INTRODUCTION

Facial esthetics has been an objective of orthodontic treatment planning since the beginning of this speciality. For decades, the period of cephalometric dominance continued in which esthetics was defined primarily in terms of the profile as measured on a lateral cephalogram, and clinical examination was secondary.[1]

Physical attractiveness is an important social issue and the face is one of its key features.[2] Improvement in facial esthetics is also a powerful motivation for seeking treatment[3], therefore orthodontic treatment should carefully consider a patient's facial appearance and particularly his or her smile.

The goal of orthodontic treatment is to refine quality of life by achieving physical and mental health, including not only the functional occlusal relationship of teeth with a balanced skeletal pattern but also the improvement of facial esthetics. Among several previously proposed evaluations of frontal smile, buccal corridor,[4,5] smile line or smile arc,[4,6–10] and amount of exposure of maxillary gingiva or gummy smile[6,11] have become essential items in current orthodontic diagnosis.[3,12]

To create esthetically improved smiles for individual patients after orthodontic treatment by setting optimized treatment goals, the relationship between the evaluation results of facial esthetics and lateral cephalometric analysis has been investigated.[6,8,11]

Isiksal et al.[13] found a weak but significant negative correlation only between the smile attractiveness of postorthodontic patients in close-up photographs and the degree of labial inclination of the maxillary incisor in cephalometric analysis. In contrast, Oh et al.[14] obtained significant but relatively weak relationships between the facial attractiveness of a set of full-face photographs and some vertical and anteroposterior skeletal measurements in cephalometric analysis. Therefore, based on findings

from those previous studies, no agreement has been reached regarding the morphological characteristics needed to achieve an attractive smile after orthodontic treatment.

The purpose of the present study was to compare skeletal, dental, and soft-tissue morphologies by lateral cephalometric analysis between postorthodontic patients with attractive and leastattractive frontal posed smiles.

MATERIALS AND METHOD

Approval from the ethical committee and individual consent were obtained. The study was conducted with 30 adult patients (age group- 18-35years) after conventional orthodontic treatment will be evaluated by 10 experienced orthodontist using a visual analogue scale and grouped into 15 attractive (7-Male & 8-Female) and 15 least attractive patients (7-Male,8-Female). The post treatment cephalograms of the same patients will be taken and compared for skeletal, dental, and soft-tissue morphology.

Both lateral cephalograms and Frontal Facial photographs were taken in Natural Head Position (NHP) and frontal photographs with posed smile from standardized distance of 150cm were taken.[12]

Inclusion Criteria

- Participants aged between 18–35 years
- Participants with well-aligned arches
- Overjet of 1–5 mm
- No previous orthodontic treatment

Exclusion Criteria

- History of trauma to the dentofacial region
- Any missing or supernumerary teeth visible on smiling or prosthodontic or restorative work on any teeth visible on smiling
- Gross facial asymmetry
- Visible periodontal disease,caries, excessive dental attrition
- Lip irregularities or history of lip surgery.[15]

Cephalometric Analysis

Lateral cephalograms of orthodontic patients were taken and 21 measurements (7-skeletal, 7-dental, and 7-soft-tissue components) selected based on previous studies[11-14] were measured. Cephalograms were taken with relaxed lips and facial muscles and teeth in maximal intercuspal position. Therefore, the position of the mandible and soft-tissue morphology may have differed from those observed during posed smile. All reference points for each patient were individually translated at Sella as the origin and rotated on the Sella-Nasion (SN) line at 7^0 above the constructed horizontal plane.

Table 1: Cephalometric Measurements with Measurement Description.

Skeletal antero-posterior (figure-1)

1. SNA (^{0}) Angle formed by intersection of SN and NA lines
2. Wits appraisal (mm) The distance of the point of intersection perpendicular from the point A and the point B to occlusal plane
3. SN to mandibular plane (^{0}) Angle formed by intersection of SN line and mandibular plane (Go - Me)
4. Palatal plane to mandibular plane (^{0}) Angle formed by intersection of Palatal plane and mandibular plane
5. Anterior facial height (mm) Nasion to Menton distance (perpendicular to CHP)
6. Lower facial height (mm) ANS to Menton distance (perpendicular to CHP)
7. Lower facial height/anterior facial height (%) ANS to Menton distance/nasion to Menton distance x 100

Dental antero-posterior (figure-2)

8. U1 to SN (^{0}) Angle formed by intersection of maxillary incisor to SN line
9. IMPA (^{0}) Angle formed by intersection of mandibular incisor to mandibular plane
10. Interincisal angle (^{0}) Angle formed by intersection of maxillary incisor to mandibular incisor
11. Overjet (mm) The distance between maxillary incisor most labial and mandibular incisor edge parallel to occlusal plane.

Dental vertical (figure-2)

12. Occlusal plane to SN (^{0}) Angle formed by intersection of SN line and occlusal plane
13. Palatal plane to occlusal plane (^{0}) Angle formed by intersection of palatal plane and occlusal plane
14. U1 to palatal plane (mm) The distance between maxillary incisor edge and palatal plane

Soft tissue antero-posterior (figure-3)

15. Nasolabial angle (^{0}) Angle formed by intersection of Sn - columella line to Sn _ Ls line
16. Soft tissue convexity (^{0}) Angle formed by intersection of N' _ Tip nose and Tip nose _ Pog' lines
17. Upper lip to E-line (mm) The distance between tip nose _ Pog' and Ls
18. Lower lip to E-line (mm) The distance between tip nose _ Pog' and Li

Soft tissue and dental vertical (figure-3)

19. Lower face (%) Lower facial height (Sn – Me')/total facial height (Glabella – Me') x100
20. Upper lip length (mm) The distance between Sn and Stms
21. Upper lip superior to palatal plane (mm) The distance between Stms and palatal plane (perpendicular to palatal plane)

SNA indicates sella-nasion plane to point A; SN, sella-nasion; NA, nasion to point A; NB, nasion to point B; N-Pog, nasion-pogonion; A-Pog, point A-pogonion; Cond, condyle; ANS, anterior nasal spine; PNS, posterior nasal spine; CHP, constructed horizontal plane; U1, maxillary central incisor; IMPA, incisor mandibular plane angle; Pog, pogonion; FH, Frankfort horizontal plane; Sn,

subnasale; Li, labial inferius; Me, menton; Go, gonion; Stms, stomion superius.

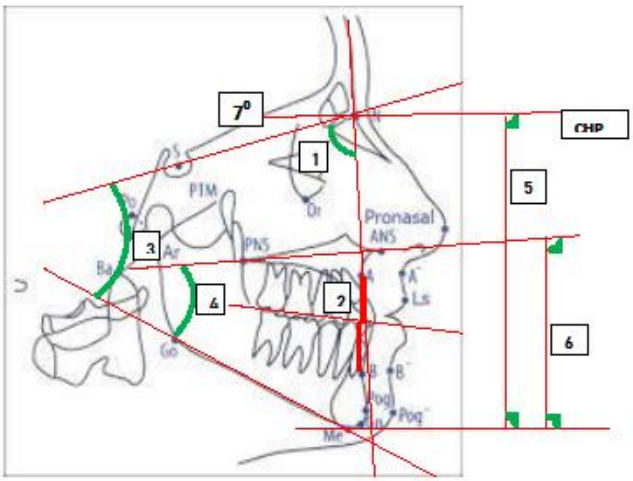


Figure 1. Cephalometric analysis, skeletal. CHP indicates constructed horizontal plane.

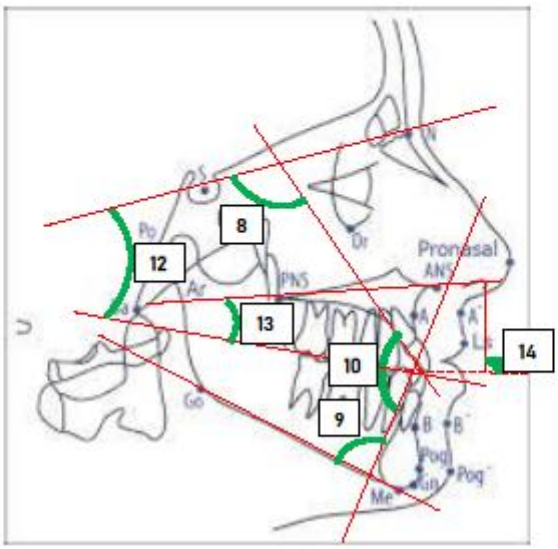


Figure 2. Cephalometric analysis, dental.

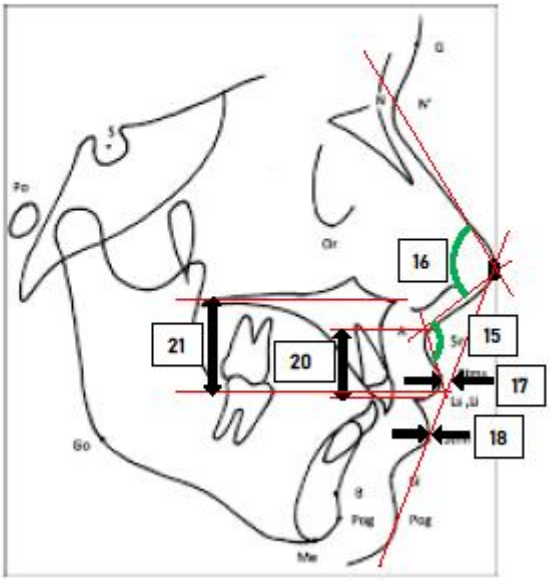


Figure 3. Cephalometric analysis, soft tissue.

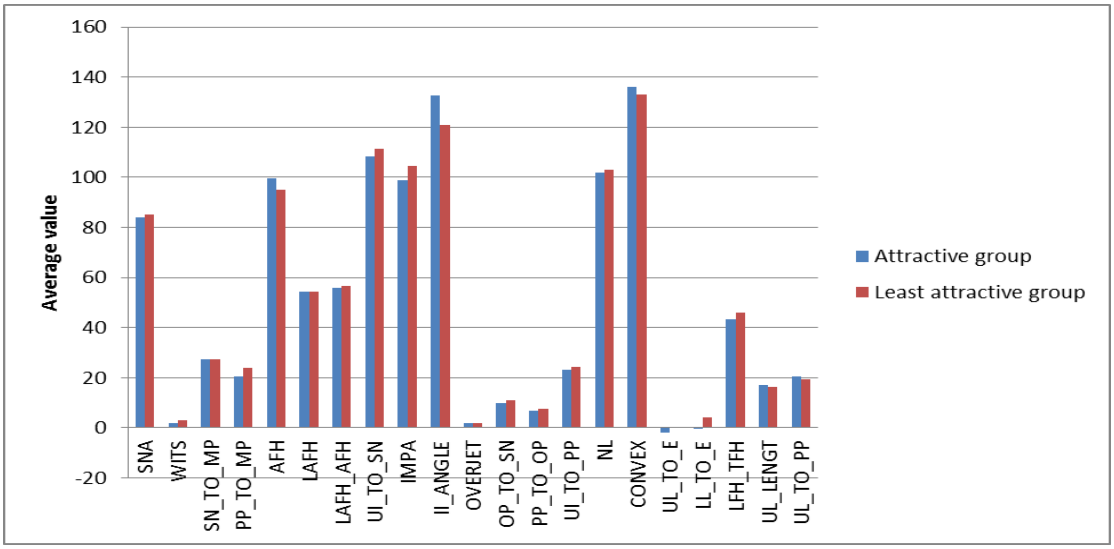
Statistical Analysis

Statistical analysis was performed using SPSS for Windows version 24.0 software. Significant differences was found between the attractive and least attractive groups in lower lip to E-line (p=0.01), so the medians and interquartile ranges (IQR) were calculated for each measurement, and the nonparametric Mann-Whitney U-test was used for comparisons between the two patient groups. The significance level was set at 5%.(table-1; graph-1)

Table 1: Comparison of skeletal parameter, dental parameters, soft-tissue parameters between attractive and least attractive.

	Attractive				Least attractive				Mann-Whitney U-value	p-value	Remarks
	Median	IQR	Mean	SD	Median	IQR	Mean	SD			
SNA	84	5.25	83.6	3.5	85	6.25	88	8.2	33	0.19	NS
WITS	2	2	1.9	1.0	3	2	3	1.2	26	0.06	NS
SN_TO_MP	27.5	8.25	26.5	4.3	27.5	9.75	28.9	7.9	41	0.50	NS
PP_TO_MP	20.5	5.5	19.5	3.1	24	8.5	23.1	4.9	28.5	0.10	NS
AFH	99.5	9.75	100.7	8.3	95	11	97.8	8.1	36.5	0.31	NS
LAFH	54.5	8.5	56.3	5.7	54 .5	8	55.7	5.2	47	0.82	NS
LAFH_ AFH	56	5	55.56	2.8	56.5	2.25	55.9	2.0	42.5	0.84	NS
UI_TO_ SN	108.5	8.5	106.4	7.3	111.5	17.75	109.5	9.9	35.5	0.27	NS
IMPA	99	12	95.7	10.4	104.5	15.5	105.3	9.1	25.5	0.06	NS
II_ ANGLE	132.5	20.25	130.3	10.4	121	17.75	123.6	10.7	33	0.20	NS
OVERJET	2	1	2.4	0.5	2	1	2.3	0.5	45	0.65	NS
OP_TO_SN	9	5.25	12.1	4.0	11	8	12	4.2	48	0.88	NS
PP_TO_OP	6	2	7	4.7	7.5	3.75	8.7	2.9	29.5	0.11	NS
UI_TO_ PP	22	5.25	22.6	3.5	24.5	3.25	24	1.6	34.5	0.24	NS
NL	102	12.25	99.4	9.6	103	15.75	102.1	8.3	41.5	0.52	NS
CONVEX	136	13.75	133.8	8.8	133	6	134.5	5.5	45	0.71	NS
UL_TO_E	-2	4.25	-1.1	2.0	0	3.25	-0.3	2.6	37.5	0.34	NS
LL_TO_E	-0.25	1.125	-0.5	1.1	4	3.5	3	2.7	13	0.01	Significant
LFH_ TFH	43.5	2.75	43.5	2.6	46	3.25	45.3	2.1	28	0.09	NS
UL_ LENGT	17	1.25	17.2	1.3	16.5	3	16.5	1.8	37.5	0.33	NS
UL_TO_PP	20.5	1.25	20.2	1.0	19.5	4.25	19.8	3.3	45	0.70	NS

IQR indicates interquartile range; SD, standard deviation; SNA, sella-nasion plane to point A; SN, sella-nasion; PP, palatal plane; NA, nasion to point A; NB, nasion to point B; N-Pog, nasion-pogonion; A-Pog, point Apogonion; ANS, anterior nasal spine; PNS, posterior nasal spine; CHP, constructed horizontal plane; U1, maxillary central incisor;L1, mandibular central incisor; IMPA, incisor mandibular plane angle; Sn, subnasale; Stms, stomion superius.
* P , .05; ** P , .01.



Graph 1: Average morphological features by cephalometric analysis in the attractive and least attractive groups.

RESULTS

Skeletal parameters

Skeletal parameters showed no statistical significant differences between the attractive and least attractive groups. Further, the least attractive group showed significantly larger to all parameters except AFH when compared with the attractive group.

Dental parameters

Dental parameters showed no statistical significant differences between the attractive and least attractive groups. Further, the least attractive group showed significantly larger to all parameters except II angle when compared with the attractive group.

Soft tissue parameters

Soft tissue parameters showed no statistical significant differences between the attractive and least attractive groups except LL to E (p=0.01). Further, the least attractive group showed significantly larger to all parameters except convex, Upper lip Length Greater when compared with the attractive group.

DISCUSSION

Lateral cephalograms and facial photographs have complementary roles in the evaluation of facial attractiveness by orthodontists. Photographs show the surface structures of the face in considerable detail, and x-ray images allow us to understand the relationship between those surface structures and the skeletal and dental armature that supports them. The photographs are much closer to the natural state of the subject than are lateral cephalograms. However, techniques for quantitative measurement of facial photographs and standardization of photographic orientation are much less well advanced in orthodontics.[16-20]

The result of this study showed statistical significant difference in attractive groups in Lower lip to E-line (p=0.01).The anterior facial height is significantly larger in attractive group compared with least attractive group, and the lower anterior facial height and anterior facial height % is average in both attractive and least attractive groups. The attractive patients present a more convex hard tissue profile. These findings are in agreement with those of Woolnoth,[21] Foster,[22] and Douglas and Turley,[23] who found that a more convex face has a younger look compared with a more straight or concave face, which looks older.[24]

In the present study, it was revealed that upper lip length (ULL) was significantly larger in attractive group then in least attractive group. ULL is one of the important factors that determine the amount of maxillary incisor and gingival exposure during speech and smiling.[24,25] Short ULL has been considered a suspect in producing gingival smile line, and controversial data exist in the literature regarding this. Although Peck et al.[11] found no difference in ULL between the gingival smile group and reference groups, Miron et al.[26] observed short ULL in participants with a high smile line.

There were only a few correlations between the skeletofacial variables and the corresponding transverse and vertical facial disproportion indices. This means that the attractiveness of a face hardly can be explained by objective parameters.[27-32] Instead, our perception of a beautiful face is affected by many nonmetric factors, eg,

face color, hair, facial expression, and cultural environment of the beholder.[33–40]

CONCLUSION

Facial beauty in the frontal view is related only to a minor degree to specific skeletofacial morphology in the lateral view. Cephalometric analysis revealed that postorthodontic male & female patients with least attractive frontal posed smiles are characterized by average divergent skeletal pattern with extruded maxillary incisors, accompanied by a short upper lip than patients achieving attractive posed frontal smiles.

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