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Perception of Facial Esthetics in Young North Indian Population- A Profilometric Study

Shukla P[1]*, Nagar A[1] and Thakral R[2]

[1]Department of Orthodontics and Dentofacial Orthopaedics, King George Medical University, India

[2]Department of Orthodontics and Dentofacial Orthopaedics, I.T.S Centre for Dental Studies and Research, India

***Corresponding author:** Dr. Priti Shukla, Department of Orthodontics and Dentofacial Orthopaedics, King George Medical University, 13/178 Indira nagar, Lucknow, Uttar Pradesh, India, Tel No: +919208135669; Email: drpritipankaj@gmail.com

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Abstract

A person's ability to recognize a beautiful face is innate, but translating this into defined treatment goals is problematic.

Aim: To determine if faces considered esthetic and pleasing in young North Indian population (both males and females) exhibit the similar cephalometric measurements as used for ideal treatment and successful results.

Materials and method: A panel of 5 judges evaluated a set containing one frontal, one frontal during smiling, and one profile photograph of 160 students (80 females and 80 males) on a 5-point attractiveness scale. For each photographic set, the mean and final scores were calculated. Once the sample was established, 60 subjects (30 females and 30 males) with the highest final facial aesthetic score were selected and cephalometric analysis was performed. All statistical analyses were performed on Statistical Package for Social Sciences (SPSS) version 19.0 Gender differences were compared by independent Student's t test.

Results: Both males and females with Class I skeletal jaw bases were found to be attractive. Females with short faces; mild facial convexity and lower lip closer to the esthetic line were found to be attractive. Males with prominent chin; straight profile; prominent nose, increased upper lip thickness, upper lip length and lower lip length were found to be attractive.

Conclusion: The faces considered attractive in this study fulfilled most of the cephalometric norms commonly used for diagnosis and treatment planning except for few inconsistencies which may be attributed to gender and demographic origin.

Keywords: Esthetic; Cephalometrics; North Indian Population

Introduction

Both photographs and cephalograms have been used as an adjunct for identifying changes required in orthodontic treatment. Improved facial esthetics is one of the prime aims of orthodontic treatment, and its correlation with the underlying skeletal and soft tissue structures is very subjective. But what makes a face attractive? [1].

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"Is beauty altogether in the eye of the beholder" [2]. Many guidelines, norms, and ideal ratios and angles dealing with attractive faces, have been proposed in the literature, mainly based on 2-dimensional measurements [3]. Few investigators however, have shown a scientific basis for their criteria; in general the choice of the criteria themselves and their assumed optimal values are arbitrary. The soft and hard tissue profile features in various ethno-racial groups often overlap with each other because of a continuous process of racial admixture. Different authors have included various parameters in their facial analysis and have given their own normal range but these norms (range) do not apply fully in the dentofacial and soft tissue relationships in all the ethnic and racial groups [4].

Orthodontists used to rely on esthetic judgments from facial photographs. Correlation between estimates of facial attractiveness made from clinical photographs and measurements from lateral cephalograms could be investigated for more understanding of beauty assessment [3]. Hence, the present study aims to determine if faces considered esthetic and pleasing in young North Indian population (both males and females) exhibit the similar cephalometric measurements as used by orthodontists to assess ideal treatment and successful results.

Materials and Method

Subjects for the present cross-sectional study included 160 volunteers (80 males & 80 females; between 18 to 25 years of age) with pleasant faces. All volunteers were screened and a brief questionnaire was completed for all subjects that included name, age, origin, history of any previous orthodontic treatment and status of permanent dentition which included their informed consent for participation.

Inclusion criteria of volunteers

- History of past two generations from North Indian ancestry.
- Age group of 18-25 years.
- No history of previous orthodontic treatment.
- No history of previous facial or dental trauma or any congenital defect.
- No missing permanent teeth except third molars.

Three photographs (Right profile, Frontal relaxed and Frontal maximum smiling) (Figure 1) of all the volunteers were taken and considered together as the triplet for facial attractiveness assessment. The same illuminations were used for photography of each volunteer. The best photographs were selected of each volunteer depending upon their picture quality.

Figure 1: Photographic Triplet: Frontal Relaxed, Frontal Maximum Smiling and Profile Photographs.

The photographs (JPEG format) were standardized using Adobe Photoshop CS version 8.0 software of size of 3.33 inches x 5 inches.

These photographs were then compiled in a folder on the computer (for male and female volunteers) with the serial number given to the volunteers during photography. Privacy & confidentiality of each volunteer was maintained. An initial sample size of 160 volunteers would constitute the primary selection. A panel of judges comprising of an orthodontist, a painter, an artist and a photographer scored the photographs (Right profile, Frontal relaxed and Frontal maximum smiling) of 160 volunteers (80 males and 80 females). Rating of facial esthetics was performed on a 5 point attractiveness scale with values from 1 (very unattractive) to 5 (very attractive) [5].

Digital photographic display (Right profile, Frontal relaxed and Frontal maximum smiling) of 160 volunteers (80 males and 80 females) considered together as the triplet was shown to each judge for 15 seconds6. Judges were asked to score the face according to his or her preference for what is more or less attractive on scale from 1 to 5 The scoring was not biased as the judges were unaware of the subject volunteers.

The mean and standard deviation (values indicating the final facial esthetic score by adding scores given by each judge for each volunteer) were calculated. 60 young volunteers (30 males and 30 females) with pleasing looking faces were shortlisted for further study. Standardized lateral head radiographs were taken and evaluated for following skeletal and soft tissue cephalometric parameters.

Skeletal Cephalometric Measurements [7]

Linear cephalometric measurements

1. Upper facial height
2. Lower facial height
3. Chin Prominence B-Pog (// to MP)

Angular cephalometric measurements

1. SNA angle
2. SNB angle ANB angle
3. Facial angle
4. Angle of convexity
5. Y-axis angle

Soft Tissue Cephalometric Measurements [7]

Linear cephalometric measurements

1. Nose Prominence
2. E-line to Lower lip
3. Upper lip length
4. Lower lip length
5. Upper lip thickness

Angular cephalometric measurements

1. Facial Angle
2. Facial Convexity
3. Nasolabial Angle

All analyses were performed on Statistical Package for Social Sciences (SPSS) version 19.0 Data were summarized as Mean ± SD with Standard error of Mean (SEM) and Confidence Interval. Gender differences were compared by independent Student's t test. Level of significance in the data of the present study was noticed at p-value < 0.5.

Results

Both skeletal and soft tissue cephalometric data as obtained from standardized lateral cephalograms was analyzed and subjected to statistical analysis.

Skeletal cephalometric measurements

Skeletal cephalometric measurements (both linear and angular) were analyzed. Mean, Standard Deviation, and Level of significance (p value) for both the genders are mentioned in Table 1.

Hard Tissue Measurements	Variables	Male (n=30)	Female (n=30)	P Value
Linear (mm)	Upper Facial height	57.91 + 4.11	58.17 + 4.54	0.859
	Lower facial height	66.90 ± 6.55	62.60 ± 4.85	0.005
	B-Pog	6.42 + 1.54	6.20 ± 1.45	0.576
Angular (degree)	SNA angle	80.40 ± 3.76	79.73 ± 3.99	0.508
	SNB angle	81.27 ± 3.67	79.00 ± 3.64	0.019
	Facial angle	88.17 ± 3.19	87.47 ± 3.13	0.305
	Y-axis angle	66.13 ± 4.54	66.47 ± 3.13	0.742
	Facial Convexity angle	2.63 ± 4.79	0.83 ± 4.44	0.137

Table 1: Skeletal cephalometric measurements (both linear and angular) for pleasing young north Indian population (both males and females) (Mean ± SD).

The mean values for Lower facial height & B-Pog distance, SNA angle, SNB angle & Facial angle were higher in males. The mean values for Upper facial height and ANB angle, Y axis angle & Facial convexity angle were higher in females. Statistically significant differences were seen for Lower facial height and SNB angle (p<.01) between genders.

Soft tissue cephalometric measurements

Soft tissue cephalometric measurements (both linear and angular) were analyzed. Mean, Standard Deviation, and Level of significance (p value) for both the genders are mentioned in Table 2.

The mean values for Nose prominence, E Line to lower lip, Upper lip length, Lower lip length, Upper lip thickness and Soft tissue facial angle were higher in males. The mean values for Facial convexity and Nasolabial angle were higher in females. Statistically high significant differences were seen for Lower lip length and Upper lip thickness (p<0.001) while significant difference was seen for Nose prominence and Upper lip length (p<0.01) between genders.

Soft Tissue Measurments	Variables	Male (n=30)	Female (n=30)	P Value
Linear (mm)	Nose Prominence	16.57 ± 2.39	15.07 ± 1.34	0.004
	E-Line to lower lip	1.17 ± 2.67	0.07 ± 2.65	0.077
	Upper lip length	23.97 ± 2.54	21.67 ± 2.47	0.001
	Lower lip length	51.47 + 4.49	44.68 + 2.81	<0.001
	Upper lip thickness	19.63 ± 2.27	15.40 ± 1.59	<0.001
Angular (degree)	Facial angle	92.60 ± 3.08	92.40 ± 4.23	0.835
	Facial convexity angle	166.47 ± 4.38	166.53 ± 3.40	0.948
	Nasolabial angle	96.77 ± 11.42	100.60 ± 7.67	0.132

Table 2: Soft tissue cephalometric measurements (both linear and angular) for pleasing young north Indian population (both males and females) (Mean ± SD).

Comparison of skeletal and soft tissue cephalometric measurements with ideal cephalometric values

Skeletal and soft tissue cephalometric measurements (both linear and angular) and their deviation from ideal cephalometric values were also compared. Mean, Standard Deviation, and Level of significance (p value) for both the genders are mentioned in Table 3, 4.

Skeletal cephalometric measurement		Male			Female		
		Study sample value	Normal Value	P value	Study sample value	Normal Value	P value
Linear (mm)	Upper facial height	57.97 ± 4.11	45.7 ± 4.9	<0.001	58.17 ± 4.54	45.3 ± 4.6	<0.001
	Lower facial height	66.90 ± 6.55	55.2 ± 5.6	<0.001	62.60 ± 4.85	56.7 ± 6.5	0.005
	B-pog	6.42 ± 1.54	8.9 ± 1.7	<0.001	6.20 ± 1.45	7.2 ± 1.7	0.042
Angular (degree)	SNA angle	80.40 ± 3.76	82 ± 2	0.877	79.73 ± 3.99	82 ± 2	0.923
	SNB angle	81.27 ± 3.67	80 ± 2	0.928	79.00 ± 3.64	80 ± 2	0.867
	ANB angle	0.80 ± 2.28	2 ± 2	0.878	0.07 ± 2.24	2 ± 2	0.899
	Facial Angle	88.47 ± 3.19	87.9 ± 3.57	0.826	87.47 ± 4.22	88.3 ± 4.11	0.893
	Y-axis angle	66.47 ± 3.13	66.5 ± 2.4	0.837	66.13 ± 4.54	66.0 ± 2.0	0.708
	Facial Convexity angle	2.63 ± 4.79	0.03 ± 5.09	0.142	0.83 ± 4.44	0.06 ± 3.61	0.57

Table 3: Comparison of skeletal cephalometric measurements (both linear and angular) for pleasing young north Indian population (both males and females) with normal cephalometric values. (Mean ± SD).

Skeletal cephalometric measurement		Male			Female		
		Study sample value	Normal Value	P value	Study sample value	Normal Value	P value
Linear (mm)	Nose prominence	16.57 ± 2.39	19 ± 5(11)	0.041	15.07 ± 1.34	17 ± 3 (11)	0.007
	E-Line to lower lip	1.17 ± 2.67	1.5 ± 2 (454)	<0.001	0.07 ± 2.65	2 ± 2 (546)	0.03
	Upper lip length	23.97 ± 2.54	24.4 ± 2.5 (20)	0.558	21.67 ± 2.47	21 ± 1.9 (20)	0.31
	Lower lip length	51.97 ± 4.49	54.3 ± 2.4 (20)	0.013	44.68 ± 2.81	46.9 ± 2.3 (20)	0.005
	Upper lip thickness	19.63 ± 2.27	16.9 ± 3.1 (9)	0.006	15.40 ± 1.59	13.2 ± 2.7 (9)	0.005
Angular (degree)	Facial angle	92.60 ± 3.08	91 ± 7 (21)	0.378	92.40 ± 4.23	90 ± 4 (21)	0.548
	Facial Convexity angle	166.47 ± 4.38	169.4 ± 3.2 (20)	0.014	166.53 ± 3.40	169.3 ± 4.4 (20)	0.016
	Nasolabial angle	96.77 ± 11.42	106.4 ± 7.7 (20)	0.002	100.60 ± 7.67	103.5 ± 6.8. (20)	0.177

Table 4: Comparison of soft tissue cephalometric measurements (both linear and angular) for pleasing young north Indian population (both males and females) with normal cephalometric values. (Mean ± SD).

In males, statistically high significant differences were found for Upper facial height, Lower facial height, Chin prominence (B-Pog) and E line to lower lip (p<0.001). Statistically significant difference were found for Lower

lip length, Upper lip thickness, Facial convexity angle and Nasolabial angle ($p<0.01$). In females, statistically high significant differences were found for Upper facial height ($p<0.001$). Statistically significant difference was found for Lower facial height, Nose prominence, Lower lip length and Upper lip thickness and Facial convexity angle ($p<0.01$).

Discussion

In contemporary orthodontic practice, greater emphasis on appearance and facial attractiveness has evolved as a part of overall treatment goal settings although the people's perceptions of attractiveness could widely vary with regard to age, gender, and demographic origin. Subjects in the present study were all above 18 years of age so as to ensure no component of growth would thereafter alter facial esthetics. Previous studies included age range from 15 to 18 years old as recommended by Hee *et al.* and Luka *et al.* who focused on adolescent subjects. The adolescent age was selected in this study matching with a peak treatment request by that age. Jen *et al.* asked 3 different groups of judges- laypersons, orthodontists and dental students to rank the attractiveness of their sample and found that all groups of judges demonstrated similar trends in ranking the profiles. Similar results were seen in our study where a professional artist, painter and photographer in conjunction with orthodontist demonstrated almost similar trends in ranking the attractiveness of the subjects [8-10].

Most of the attractiveness scales in literature ranged from 1 to some value with majority using a five-point scale however Stevens *et al.* used a scale ranged from - 4 to +4. Ranking method used in this study was a scale with 5 points from 1 (the least attractive) to 5 (the most attractive). Although quantification of facial esthetics is certainly not the main use of cephalograms in orthodontics, many cephalometric measurements have been proposed as reliable indices of facial attractiveness. Almost every proposed cephalometric analysis contained some measures of facial attractiveness, so it seemed reasonable to correlate between the "objective" angular and linear measurements of x-ray cephalometry and the "subjective" ranking of facial photographs for attractiveness [11,12].

In males, the skeletal cephalometric parameters showed an increase in lower facial height and chin prominence (B-pog) which was in concordance with Foster who found that males with straighter profile and prominent chin are considered more attractive than females. Late mandibular growth and development of chin completes earlier in females resulting in less prominent chin than males. When analyzing the face height ratio, the lower facial height was found to be more in males than in females. Similar data was observed on measuring the Y axis angle which showed a positive correlation for males and a negative correlation for females [13].

Female with short faces were found to be more attractive than long faces. This was in an agreement with the study done by Johnston *et al.*4 Also Lundstrom *et al.* found that the horizontal growth pattern corresponded to increased facial attractiveness for females. Though females presented with a decreased lower anterior facial height than males in the present study, the difference was found to be statistically insignificant. The present study concluded that SNA angle was more than the SNB angle in female subjects which was similar to the study done by Matoula *et al.*, Sforza *et al.* and Marcias Gago *et al.* who suggested a prominent maxilla related to a feature of female facial attractiveness. An increase in the facial convexity in female subjects was found in our study owing to a convex soft tissue profile in comparison to males with a straight /concave facial profile [2,14-16].

SNB angle (among angular skeletal cephalometric parameters) was increased for males resulting in prominent lower jaw base. SNB values were slightly diminished for females. This result was in agreement with Johnston *et al.* who represented low SNB values to be a feature of facial attractiveness in females. Similar data was observed on measuring the Facial angle which showed a positive correlation for males and a negative correlation for females. ANB angle in males and females subjects in our study also were within the normal cephalometric value i.e. 2±2 degree, indicative of a skeletal class I jaw base. This is in an agreement with previous research where it has been suggested that a skeletal Class I jaw bases have more attractive profile1 Soft tissue cephalometric parameters (both linear and angular) showed an increase in E-line to lower lip distance, upper lip thickness, upper lip length, lower lip length and nose prominence [4].

A negative correlation between lower lip and E-line with female attractiveness was found in agreement with the study of Pancherz [15]. Increase in upper lip length, lower lip length and upper lip thickness in males than females may be attributed to the ethnic factor or sample size, which is in agreement with the reports of Arnett *et al.* [17]. The present study reveals a prominent nose in males which is in concordance to a study by Holt et al [18]. Soft tissue cephalometric parameters (both linear and angular) showed an increase in soft tissue facial convexity angle and the nasolabial angle which is in accordance with

the hard tissue facial convexity angle which was also found to be increased in our female subjects. Results of previous studies confirm that attractive female subjects have a convex soft tissue profile16 in comparison to males with a straight /concave facial profile.

There was correlation between the skeletofacial cephalometric measurements and facial pattern considered esthetic and pleasing in a young North Indian population, but the attractiveness of a face cannot be completely explained by cephalometric variables alone. Other non-metric factors also, e.g. face color, hair, facial expression and ethnic facial pattern also influence the decision.

Conclusion

The present study on esthetic pleasing young north Indian population concluded that the faces considered attractive fulfill most of the cephalometric norms commonly used for diagnosis and treatment planning.

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