Estimation of Cephalometric Norms of Steiner's, Down's Analysis for Vidarbha Population

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ABSTRACT

Objective: The success of orthodontic treatment lies in prompt diagnosis and treatment planning. Cephalometrics is an integral part of morphological diagnostic procedure to evaluate growth and development of craniofacial region. The routine orthodontic procedures uses the caucasian norms. Indian diversity demands for the need of formulation of customized norms for the various ethnic diversity. Present study aims towards derivation of norms of Steiner's and Down's analysis for Vidarbha population.

Materials and methods: A total of 300 lateral cephalograms of patients residing in the Vidarbha region with class I skeletal and dental pattern were selected and evaluated.

Results: Significant variation in the values of Steiner's and Down's analysis were observed.

Conclusion: There is a need to develope customized norms for every ethenic group in this diverse country to justify the orthodontic treatment.

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INTRODUCTION

Orthodontics is an amalgamation of art and science and facial esthetics is the reflection of the orthodontist's artistic intuition. One of the prime goals of the orthodontic treatment is to accomplish and conserve optimal facial attractiveness. The successful treatment is dependent on careful diagnosis. Cephalometric analysis is an aid in the diagnosis of skeletal and dental problems. Radiographic cephalometry has been used extensively to study facial form and to develop norms to aid in orthodontic diagnosis and treatment planning. It is cephalometrics that assess treatment progress and craniofacial growth, to predict growth for individual patients and for other tasks in orthodontic research [1]. Commonly used cephalometric analyses are primarily designed to harmonize the position of the teeth with the existing skeletal pattern.

Everyone is not alike in the way that they grow; there is always diversity in growth pattern. Rather than categorizing people as normal or abnormal, it is more useful to think in terms of deviations from usual patterns and to express variability quantitatively. There are numerous cephalometric analyses which are routinely used to establish normal for what is ideal proportion and occlusion, this provides us clue regarding the average ranges and mean values defining their skeletal and dental patterns.

Till date the norms formulated by various authors are derived based on a different population group mostly caucasians. According to Atit B. M et al there was a significant difference observed in norms of standard caucasian values when the author compared it with Maratha ethenic population [2]. Also according to Rathore A. S. et al. difference was noticed in the norms of Mewari population when comparision was done with caucasians. Due to the paucity of research and data available on norms for Indian diversity there was a need felt for derivation of norms for Indian population, for Vidarbha region.

MATERIALS AND METHODS

A total of 300 lateral cephalograms of patients reporting to the department of orthodontics and dentofacial Orthopaedics OPD were collected. A detailed history of patient was taken and family history was obtained so as to target the Vidarbhian population. Patients with dental and skeletal class I pattern were included in the study [3].

Method of collection of data

Inclusion criteria:

- Subjects with angle's class I occlusion
- Normal overjet and overbite
- No crossbite
- Competent lips
- Subjects with history of systemic disease were excluded from the study
- Consent from the parents of each subject was taken after explaining the nature and purpose of radiograph

Manual tracing was done for all the lateral cephalograms and Steiner's and Down's analysis was carried out.

Statistical analysis

The measurements were statistically analyzed by calculating their means and Standard Deviations (SD).

Then the means of Maratha ethnic population were compared with means of caucasian population with the help of student's unpaired t-test.

RESULTS

Different races in the World have different ethnic origins. Hard and soft tissue cephalometric parameters are different for different ethnic groups. Hence, there cannot be any single standard cephalometric norms of one population which could be applied to other groups [4]. Hence, an attempt is made to establish norms for population of Vidarbha (Figures 1,2 and Tables 1,2).

Table 1: Down's analysis.

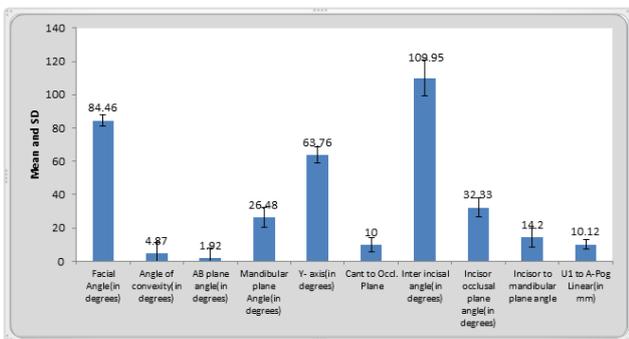| Sr. no.	Parameter	Standard value		Present study				Difference
		Range	Mean value	n	Range	Mean value	SD	
1	Facial angle (in degrees)	82.0-92.0	87.8	300	79-94	84.46	3.28	3.34
2	Angle of convexity (in degrees)	-8.5 to +10	0	300	-34	4.87	6.35	4.87
3	AB plane angle (in degrees)	-9 to +0	-4.6	300	-24	1.92	6.27	6.52
4	Mandibular plane angle (in degrees)	17 to 20	21.9	300	15-40	26.48	6.03	4.58
5	Y-axis (in degrees)	53 to 66	59.4	300	53-73	63.76	4.67	4.36
6	Cant to occl. plane	1.5 to 14	9.3	300	0-17	10	4.15	0.7
7	Inter incisal angle (in degrees)	130 to 150	135.4	300	81-136	109.95	10.85	25.45
8	Incisor occlusal plane angle (in degrees)	3.5 to 20	14.5	300	14-35	19.8	5.95	17.83
9	Incisor to mandibular plane angle	-8.5 to 7	1.4	300	43952	10.2	5.71	12.8
10	U1 to A-Pog linear (in mm)	-1 mm to 5 mm	2.7	300	42430	10.12	2.81	7.42

Figure 1: Down's analysis.

Table 2: Steiner analysis.

| Sr. no.	Parameter	Caucasian standard values (mean ± SD)	Present study				Difference
			n	Range	Mean value	SD	
1	SNA (in degrees)	82.0 ± 2.0	300	73-90	83.82	3.58	1.82
2	SNB (in degrees)	80.0 ± 2.0	300	74-88	81.1	3.74	1.1
3	SND (in degrees)	76.0 ± 2.0	300	70-85	78.19	3.61	2.19
4	ANB (in degrees)	2.0 ± 2.0	300	-10	2.9	2.44	0.9
5	Go-Gn to SN (in degrees)	32	300	14185	36.94	4.5	4.06
6	U1 to N-A (in mm)	4	300	43191	8.53	3.01	4.53
7	U1 to N-A (in degrees)	22	300	18415	30.61	9.26	8.61
8	L1 to N-B (in mm)	4	300	42036	7.62	2.68	3.62
9	L1 to N-B (in degrees)	25	300	17-45	34.96	5.84	9.96
10	L1 to U1 (in degrees)	131	300	81-136	110.58	13.01	20.42
11	Occl to S-N (in degrees)	14	300	43497	11.51	3.66	2.49
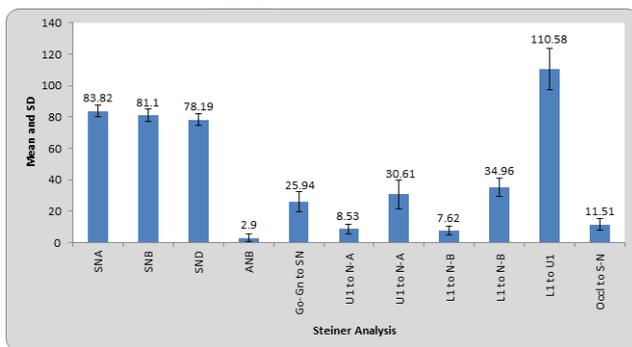
Figure 2: Steiner analysis.

The ranges of most of the dimensions of the present study were significantly different than those obtained by Steiner, although all selected individuals had a pleasant appearance and good facial harmony [5].

Facial angle

Facial angle is ideally used in down's to measure the degree of retrusion and protrusion of the lower jaw. The magnitude of this angle increases with prominent chin. In the current study the mean facial angle in the current is 84.46° which differed from caucasian population of 87°.

Angle of convexity

A positive angle suggests prominence of the maxillary denture base relative to the mandible where as a negative suggest a prognathic profile [6]. The caucasians have norm of 0 degree where as in the current study the south Indian population have +4.87°.

AB plane angle

This angle is suggestive of maxilla-mandibular relationship to the facial plane. Standard values lie in the range of -9° to 0° with mean value of -4.6°. The current study depicts Vidarbhian population showed more positive values [7]. Range of the current study ranged from -12°-0° with mean range of +1.92°.

Mandibluar plane angle

This angle is suggestive of relation between mandibular plane (Go-Me) to the FH plane. The angle provides essential information regarding growth pattern of the individual. The mean value for caucasian population is 21.9° differing from our values by 4.58°, 26.4°.

Y axis

The angle is suggestive of growth pattern in relation to the cranial base with the Frankfort horizontal plane with an average value of 59°. An increased value is suggestive of class II facial pattern and also suggests vertical growth pattern, while decreased value of this angle is seen in class III individuals indicative of horizontal growth pattern. The values of our study showed slight increase in the values by 4.3°.

Cant of occlusal plane

This angle gives a measure of slope of occlusal plane relative to the FH plane. The value increases in downward or clockwise tipped occlusal planes mostly in vertical growers, whereas the decreased value is suggestive of anticlockwise tip of the occlusal plane often appreciated in the horizontal growers [8]. Current study values for Vidarbha population shows almost equal values when compared to caucasian norms with a mild variation of 0.7.

Inter incisal angle

The by the long axis of incisors. The angle suggests proclination of incisors. Standard angle is formed caucasian values being 131° differeing from the current findings of Vidarbhian population which came to be 109.9.

Incisor to occlusal plane angle

This is the inside inferior angle formed by the intersection between the long axis of lover central incisor and the occlusal plane and is read as a plus or minus deviation from a right angle. Average value according to caucasian norms is 14.5 m (3.5 m to 20 m). An increase in this angle is suggestive of increased lower incisor proclination. Our study findings showed an increased value of 19.8° [9].

Incisor mandibular plane angle

This angel is formed by intersection of the long axis of the lower incisor and the mandibular plane. Average value being 1.4 m (-8.2 m to 7 m). An increase in this angle is suggestive of increased lower incisor proclination. Values from current findings showed 10.2° of proclination of lower incisors.

Upper incisor to A-Pog

This is a linear measurement between the incisal edge of the maxillary central incisor and the line joining point A to pogonion. This distance is on an average 2.7 mm (range-1 mm to 5 mm) of the caucasian population. The measurement is increased in patients presenting with upper incisor proclination. Current study showed an average of 10.12° of mean proclination [10-12].

Steiners analysis

SNA: The angle is formed by SN plane and point A. This angle is suggestive of relation of maxilla to cranial base. Increased angle is indicative of prognathic maxilla while reduction in the value of this angle is suggestive of retro positioned maxilla. Caucasian value is 82.2 ± 2° present study value deviated by 1.82°, mean being 83.82° which means Vidarbhian population depicts slight prognathism.

SNB: The angle is formed by SN plane and point B. This angle is suggestive of relation of mandible to cranial base [13]. Increased angle is indicative of prognathic mandible while reduction in the value of this angle is suggestive of retro positioned mandible. Caucasian value is 80.0 ± 2° present study value deviated by 1.1°, mean being 81.1° which means Vidarbhian population depicts slight prognathism.

SND: The angle is formed by SN plane and point D. This angle is suggestive of relation of chin to cranial base. Increased angle is indicative of prognathic chin while reduction in the value of this angle is suggestive of retro positioned chin. Caucasian value is 76.0 ± 2° present study value deviated by 2.19°, mean being 78.19° which means Vidarbhian population depicts slight prognathism.

ANB: The angle is formed by point A-N-B. The angle gives measure of the skeletal pattern of the individual. Increased or positive angle is suggestive of class II profile while negative angle, point B ahead of point A indicates class III skeletal profile. Caucasian population values are +2.90° suggestive of class II facial profile prevalence.

Mandibular plane (Go-Gn to Sn): This angle is suggestive of relation between mandibular plane (Go-Gn-Sn) to the Sn plane. The angle provides essential information regarding growth pattern of the individual. The mean value for caucasian population is 32° differing from our values by 4.6°, 36.4°. There was slight inclination of Vidarbhian population towards vertical growth pattern.

U1 to NA (degrees and mm): This parameter gives measure of inclination of upper incisors with respect to bony bases point N and A. Normal caucasian values are 22° of inclination and 4 mm of protrussion (linear measurement) differing from our population in study by 8.61° and 4.9 mm mean values being 30.61° and 8.53 mm showing proclination and protrusion in Vidarbhian population.

Lo1 to NB (degrees and mm): This parameter gives measure of inclination of loer incisors with respect to bony bases point N and B. Normal caucasian values are 22° of inclination and 4 mm of protrussion (linear measurement) differing from our population in study by 8.61° and 4.9 mm mean values being 30.61° and 8.53 mm showing proclination and protrusion in Vidarbhian population.

Interincisal angle (U1-L1): The angle is formed by the long axis of incisors. The angle suggests proclination of incisors. Standard caucasian values being 131°, differing from the current findings of Vidarbhian population which came to be 110.58°.

Occlusal plane to SN plane: This angle gives a measure of slope of occlusal plane relative to the SN plane. The value increases in downward or clockwise tipped occlusal planes mostly in vertical growers, whereas the decreased value is suggestive of anticlockwise tip of the occlusal plane often appreciated in the horizontal growers. Current study values for Vidarbha population shows almost equal values when compared to caucasian norms with a mild variation of 2.49°, mean value being 17.59°.

DISCUSSION

In the modern biological model, distinction is the theme and the clinician's task is to achieve the desired facial and dental outcomes within the ability of individual to adapt physiologically to the morphologic changes. India is one of the largest countries in Asia with four different zones-east, west, north and south. All four zones have different people having different facial characteristics. Over the centuries, Indian has received large groups of people of different ethnical and cultural origins. Thus, these will lead to dispersion of different ethnic groups in Indian population. Current requirements of present ability and

demand on good impressive appearance make it mandatory to study the pattern of ethnic groups.

An attempt was made to form the cephalometric norms for Vidarbhian population by studying the various facial forms and features. Most cephalometric analyses are designed for orthodontic diagnosis and treatment planning. As well established norms for specific ethnic groups are lacking, one had to rely on caucasian norms for the assessment of orthodontic patient. This seems to be logically inappropriate because any two different population groups have several dissimilarities in their dentofacial structures as is evident from the present study.

CONCLUSION

The present study was done on population of Vidarbha indicates that their facial pattern is not similar to caucasians. The positive findings includes retrussion of chin, the maxillary base was more prognathic when compared to the caucasians. The profile hence what normal was for Vidarbha population was convex profile. The growth pattern when compared to caucasian norms was more vertical. There was a clockwise tip in the occlusal plane. Both the maxillary and mandibular dentition showed an increased inclination when compared to caucasian norms, showed bimaxillary proclination.

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