

Evaluation of Soft Tissue Cephalometric Norms for Maharashtrian Population Using Holdaway Analysis

Prasad Jayvant Khot¹, Manish Agrawal², Jiwannasha Agrawal³, Lalita Nanjannawar⁴, Vishwal Kagi⁵, Monika Khot⁶

¹Post-graduate Student, Department of Orthodontics and Dentofacial Orthopaedics, Bharati Vidyapeeth Dental College and Hospital, Sangli, Maharashtra, India, ²Associate Professor, Department of Orthodontics and Dentofacial Orthopaedics, Bharati Vidyapeeth Dental College and Hospital, Sangli, Maharashtra, India, ³Professor and Head, Department of Orthodontics and Dentofacial Orthopaedics, Bharati Vidyapeeth Dental College and Hospital, Sangli, Maharashtra, India, ⁴Associate Professor, Department of Orthodontics and Dentofacial Orthopaedics, Bharati Vidyapeeth Dental College and Hospital, Sangli, Maharashtra, India, ⁵Lecturer, Department of Orthodontics and Dentofacial Orthopaedics, Bharati Vidyapeeth Dental College and Hospital, Sangli, Maharashtra, India, ⁶BDS, Dental surgeon, Private practitioner, Dr Khot Dental Clinic, Ratnagiri, Maharashtra, India

Abstract

Aim: Based on Holdaway analysis, the present study aims to evaluate soft tissue cephalometric norms for the Maharashtrian population.

Materials and Methods: The digital lateral cephalograms of 60 subjects with Maharashtrian ethnicity within the age range of 18–30 years with normal occlusion were obtained. Holdaway analysis was carried out using Dolphin Software. The obtained values were statistically analyzed to evaluate soft tissue norms for the Maharashtrian population.

Results: Statistically significant differences were observed in soft tissue norms between Maharashtrian population and Caucasian norms.

Conclusion: Ethnic differences exist between Maharashtrian population and Caucasian population which should be considered when formulating an orthodontic treatment plan.

Key words: Caucasians, Ethnic group, Holdaway, Soft tissue, Cephalometrics

INTRODUCTION

Facial esthetics in dentistry has gained great attention in recent times. The success of orthodontic treatment is frequently related to the improvement gained in patient's facial appearance, which includes soft tissue profile and since there is a considerable variations in soft tissue covering, misleading conclusions can be produced if diagnosis and treatment planning is based on dental and skeletal measurements alone; therefore, analysis of soft tissue profile is mandatory.^[1]

Various cephalometric analysis for orthodontic treatment has been designed, but these cephalometric norms were specific to 1 ethnic group-white subjects of European American ancestry. Cephalometric norms derived for Caucasian population are routinely used for investigations. As these norms show a great degree of variation when applied to different ethnic groups, it becomes necessary to establish the norms for every ethnic group with a standard method for effective orthodontic treatment.^[2-8]

One of the commonly used soft tissue analysis is Holdaway analysis given by Holdaway.^[1] Since India is a subcontinent with a large number of racial subgroups and several religious and interracial mixtures, it was proposed, therefore, to study only the individuals derived from Maharashtra origin using Holdaway analysis.^[2]

Thus, the present study was designed to derive norms for the Maharashtrian population, which would be comparable

Access this article online



www.ijss-sn.com

Month of Submission : 12-2017
Month of Peer Review : 01-2018
Month of Acceptance : 01-2018
Month of Publishing : 02-2018

Corresponding Author: Dr. Prasad Khot, Department of Orthodontics and Dentofacial Orthopaedics, Bharati Vidyapeeth Dental College and Hospital, Sangli - 416 414, Maharashtra, India. Phone: +91-8007669556/8208332275. E-mail: prasadkhot2508@gmail.com

in diagnosis and treatment planning to the Holdaway cephalometric analysis.

Aim

The aim of the study is as follows:

1. To evaluate the mean cephalometric norms for Holdaway analysis in the Maharashtrian population.

Objective

The objective of the study is as follows:

1. To evaluate the mean cephalometric norms for Holdaway analysis in the Maharashtrian population.
2. To compare standards derived with the earlier established norms for other population.

MATERIALS AND METHODS

Source of Data

The sample of 60 subjects was selected. 30 males and 30 females were included. The sample was selected based on age, sex, and straight pleasing profile. A signed informed consent form was taken in Marathi and English language.

Selection Criteria for Subjects

Inclusion criteria

The following criteria were included in this study:

1. Subject should be Maharashtrian origin traced back to two generations.
2. The age range of 18–30 years.
3. Permanent dentition.
4. Class I molar relation.
5. Class I skeletal jaw bases.
6. Normal overjet and overbite.

Exclusion criteria

The following criteria were excluded from the study:

1. Previous or current orthodontic treatment.
2. Severe crowding.
3. Missing tooth other than the third molar.
4. Obvious periodontal disease.
5. Evidence of previous trauma/surgery.
6. Facial asymmetry or deformity.
7. Presence of deciduous/retained teeth.
8. Presence of any pathological conditions.
9. Presence of deciduous or over retained teeth.

Initially, each subject was thoroughly examined clinically according to inclusion and exclusion criteria. A digital lateral cephalometric radiograph was taken of all subjects. Holdaway soft tissue cephalometric analysis was performed and studied.

Radiographic Unit Detail

The Pax-I (PCH2500), Vatech Global, digital radiographic unit from the Department of Oral Medicine and Dental

Radiology, Bharati Vidyapeeth Dental College and Hospital, Sangli, was used to take the lateral digital cephalometric radiographs of the subjects involved in the study [Figure 1].

Cephalometric Tracing

The digital radiographs obtained from Pax-I machine were then transferred to Dolphin Imaging 11.9 Software (Dolphin Imaging and Management Solutions, Chatsworth, Calif.). In our study, Holdaway soft tissue cephalometric analysis was performed and studied [Figures 2 and 3].

Statistical Analysis

- The measurements were statistically analyzed by calculating their means and standard deviations.
- Then, the means of the Maharashtrian population were compared with means of the Caucasian population with the help of unpaired *t*-test.
- A comparison was also made between males and females within the present study.

RESULTS

Descriptive statistics for the variables included in this study is provided from Tables 1-3. Table 1 compares boys versus Caucasian. Table 2 compares girls versus caucasians while Table 3 compares all subjects versus caucasian population. Mean and Standard deviation has been tabulated and based on P value following results have been drawn.

Convexity at Point A

In our study, the mean value for convexity at point A was 1.38 ± 2.44 mm while in Caucasian population it was 0.1 mm. The mean difference between two groups was 1.28 mm which was statistically significant ($P \leq 0.001$).



Figure 1: Patient position for lateral cephalogram

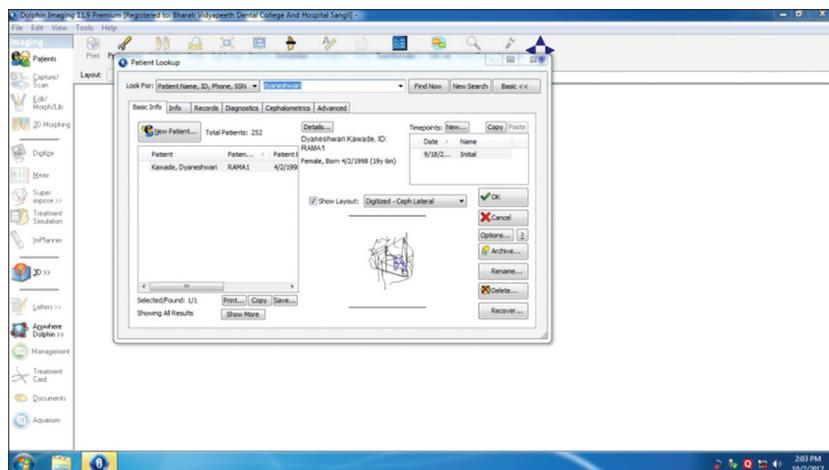


Figure 2: Dolphin imaging 11.9 software

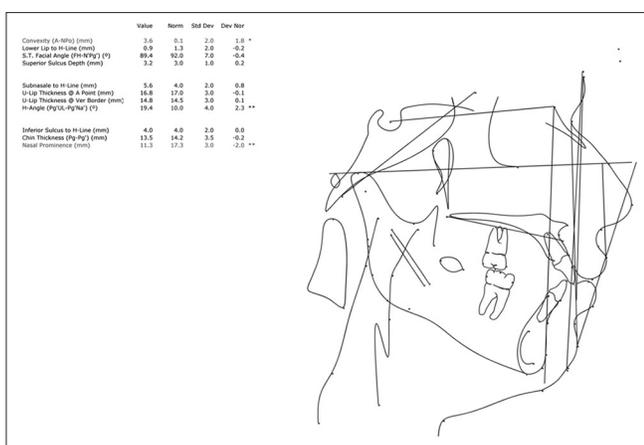


Figure 3: Holdaway analysis tracing

Superior Sulcus Depth

In our study, the mean value for superior sulcus depth was 2.42 ± 1.07 mm while in Caucasian population it was 3 mm. The mean difference between two groups was 0.57 mm which was statistically significant ($P \leq 0.001$).

Nasal Prominence

In our study, the mean value for nasal prominence was 12.14 ± 2.56 mm while in Caucasian population it was 17.3 mm. The mean difference between two groups was 5.15 mm which was statistically significant ($P \leq 0.001$).

Upper Lip Thickness

In our study, the mean value for upper lip thickness was 14.43 ± 2.45 mm while in Caucasian population it was 17 mm. The mean difference between two groups was 2.56 mm which was statistically significant ($P \leq 0.001$).

Upper Lip Thickness at Vermilion

In our study, the mean value for upper lip thickness at vermilion was 10.89 ± 2.01 mm while in Caucasian population it was 14.5 mm. The mean difference between

two groups was 3.60 mm which was statistically significant ($P \leq 0.001$).

H Angle

In our study, the mean value for H angle was $17.25^\circ \pm 3.58^\circ$ while in Caucasian population it was 10° . The mean difference between two groups was 5.72° which was statistically significant ($P \leq 0.001$).

Chin Thickness

In our study, the mean value for chin thickness was 11.74 ± 2.29 mm while in Caucasian population it was 14.2 mm. The mean difference between two groups was 2.45 mm which was statistically significant ($P \leq 0.001$).

Lower Lip to H Line

In our study, the mean value for lower lip to H line was 1.21 ± 1.22 mm while in Caucasian population it was 1.3 mm. The mean difference between two groups was 0.081 mm which was not statistically significant ($P = 0.603$).

Facial Angle

In our study, the mean value for facial angle was $90.36^\circ \pm 12.41^\circ$ while in Caucasian population it was 92° . The mean difference between two groups was 1.63° which was not statistically significant ($P = 0.309$).

Subnasale to H Line

In our study, the mean value for subnasale to H line was 3.57 ± 2.08 mm while in Caucasian population it was 4 mm. The mean difference between two groups was 0.427 mm which was not statistically significant ($P = 0.114$).

Inferior Sulcus to H Line

In our study, the mean value for inferior sulcus to H line was 3.91 ± 1.29 mm while in Caucasian population it was 4 mm. The mean difference between two groups was 0.086 mm which was not statistically significant ($P = 0.602$).

Table 1: Comparison of boys versus Caucasian

Parameter	Number of subjects	Mean±SD	Caucasian norms	Mean difference	t value	P value
Convexity at point A	30	1.33±2.54	0.1	1.23	2.527	0.018*
Lower lip to H line	30	1.24±1.36	1.3	-0.059	-0.225	0.823
Facial angle	30	88.11±18.31	92	-3.88	-1.103	0.280
Superior sulcus depth	30	2.60±0.85	3	-0.3926	-2.399	0.024*
Sn-H line	30	3.98±1.72	4	-0.011	-0.033	0.974
Upper lip thickness	30	15.47±2.54	17	-1.52	-3.110	0.005*
Upper lip thickness at vermillion	30	12.01±2.29	14.5	-2.485	-5.632	0.001*
H angle	30	16.65±3.76	10	6.65	9.182	0.001*
Inferior sulcus to H line	30	4.25±1.56	4	0.259	0.858	0.398
Chin thickness	30	12.41±2.39	14.2	-1.78	-3.877	0.001*
Nasal prominence	30	12.15±2.25	17.3	-5.14	-11.86	0.001*

One sample t test. SD: Standard deviations

Table 2: Comparison of girls versus Caucasian

Parameter	Number of subjects	Mean±SD	Caucasian norms	Mean difference	t value	P value
Convexity at point A	30	1.424±2.395	0.1	1.323	3.222	0.003*
Lower lip to H line	30	1.200±1.123	1.3	-0.100	-0.519	0.607
Facial angle	30	92.15±2.949	92	0.1588	0.314	0.756
Superior sulcus depth	30	2.27±1.214	3	-0.726	-3.487	0.001*
Sn-H line	30	3.241±2.300	4	-0.7588	-1.923	0.063
Upper lip thickness	30	13.60±2.072	17	-3.3912	-9.543	0.001*
Upper lip thickness at vermillion	30	10.006±1.175	14.5	-4.49	-22.29	0.001*
H angle	30	14.97±3.304	10	4.9765	8.781	0.001*
Inferior sulcus to H line	30	3.638±0.964	4	-0.3618	-2.188	0.036*
Chin thickness	30	11.218±2.097	14.2	-2.9824	-8.289	0.001*
Nasal prominence	30	12.126±2.82	17.3	-5.17	-10.66	0.001*

One sample t test. SD: Standard deviations

Table 3: Comparison of all subjects' versus Caucasian

Parameter	Number of subjects	Mean±SD	Caucasian norms	Mean difference	t value	P value
Convexity at point A	60	1.38±2.44	0.1	1.28	4.112	0.001*
Lower lip to H line	60	1.21±1.22	1.3	-0.081	-0.522	0.603
Facial angle	60	90.36±12.41	92	-1.63	-1.026	0.309
Superior sulcus depth	60	2.42±1.07	3	-0.57	-0.421	0.001*
Sn-H line	60	3.57±2.08	4	-0.427	-1.604	0.114
Upper lip thickness	60	14.43±2.45	17	-2.56	-8.146	0.001*
Upper lip thickness at vermillion	60	10.89±2.01	14.5	-3.60	-13.99	0.001*
H angle	60	17.25±3.58	10	5.72	12.455	0.001*
Inferior sulcus to H line	60	3.91±1.29	4	-0.086	-0.524	0.602
Chin thickness	60	11.74±2.29	14.2	-2.45	-8.352	0.001*
Nasal prominence	60	12.14±2.56	17.3	-5.15	-15.68	0.001*

One sample t test. SD: Standard deviations

DISCUSSION

Lifestyle of today's era demands the high esthetic perception. Macro-esthetics, mini-esthetics, and micro-esthetics have been emphasized, and orthodontic ethics has been linked to improving the nose, lip, and chin balance.^[9] Soft tissue analysis has been used by orthodontist and surgeon as an aid in diagnosis and treatment planning.^[10] The nature of the soft tissue profile is affected by many factors, including ethnicity, cultural origin, gender difference, and age;^[7] for this reason, facial characteristics have been studied in various ethnic groups. The thickness of soft tissues is

different in different populations, so it becomes mandatory to study soft tissue analysis along with hard tissue analysis for optimizing treatment results.

Different soft tissue analysis has been introduced by many authors such as Arnett analysis,^[10] Bergman analysis,^[11] and Holdaway analysis.^[1] In our study, we used Holdaway analysis for analyzing soft tissues of the Maharashtrian group.

In our study, we found a statistically significant increase in the value of skeletal convexity at point A than Caucasians. Increase in this value indicates more convex profile and

protrusive upper lips when compared with Caucasians. This is in accordance with a study done by Celebi *et al.* on Turkish population^[4] and Javadpour and Khanemasjedi on Iranian population.^[6]

Decreased nasal prominence increased upper lip strain reveal labial proclination of upper incisors when compared with the Caucasian group. This is in accordance with a study done by Atit *et al.* on Maratha ethnic group.^[5]

H angle value increased in Maharashtrian population shows protrusive upper lips. This is in accordance with a study done by Patel and Goyal on Rajasthani population.^[3]

Upper lip thickness and soft tissue chin thickness values are less when compared to the Caucasian group. This showed thin soft tissue drape covering the facial skeleton. Thin soft tissue immediately alters accordingly to underlying dentoalveolar and skeletal changes during orthodontic changes than thick soft tissue curtain.^[1]

No significant difference found for lower lip to H line, facial angle, Sn-H line, and inferior sulcus depth to H line indicate lower jaw positioned within normal range to cranial base when compared to the Caucasian group.

CONCLUSION

1. According to Holdaway analysis carried out in this study, Maharashtrian adults had more protruded upper lip position and more convex profile along with thin soft tissue drape than Caucasian population.

2. Females had a thin upper lip and soft tissue chin thickness than males.
3. It is legitimate and important for those undertaking orthodontic treatment for patients of the Maharashtrian population to use cephalometric norms for the Maharashtrian population.

REFERENCES

1. Holdaway RA. A soft-tissue cephalometric analysis and its use in orthodontic treatment planning. Part 1. Am J Orthod 1983;84:1-28.
2. Nanda R, Nanda RS. Cephalometric study of the dentofacial complex of north Indians. Angle Orthod 1969;39:22-8.
3. Patel B, Goyal K. Determination of soft tissue cephalometric norms of rajasthan population using hold way analysis. IOSR J Dent Med Sci 2017;16:19-22.
4. Celebi AA, Tan E, Gelgor IE, Colak T, Ayyildiz E. Comparison of soft tissue cephalometric norms between Turkish and European-American adults. Sci World J 2013;2013:806203.
5. Atit M, Deshmukh S, Rahalkar J, Subramanian V, Naik C, Darda M. Mean values of Steiner, tweed, Ricketts and McNamara analysis in Maratha ethnic population: A cephalometric study. APOS Trends Orthod 2013;3:137-51.
6. Javadpour FG, Khanemasjedi M. Soft tissue facial profile and anteroposterior lip positioning in Iranians. J Dent Sch 2014;32:90-5.
7. Aghili H, Ali Tabatabaei SM, Moghadam MG, Jafarzadeh M, Samei R. Soft tissue cephalometric norms in Iranian normal subjects. Int J Med Res Health Sci 2016;5:149-55.
8. Chhajed S, Kodumuru S, Gurmukh S, Arun AV, Kumar S. Facial soft tissue cephalometric norms in a central Indian ethnic population. J Indian Orthod Soc 2014;48:7-13.
9. Asad S, Kazmi F, Mumtaz M, Malik A, Baig RR. Assessment of antero-posterior position of lips: E-Line- S-Line. Pak Oral Dent J 2011;31:84-7.
10. Arnett GW, Jelic JS, Kim J, Cummings DR, Beress A. Soft tissue cephalometric analysis: Diagnosis and treatment planning of dentofacial deformity. Am J Orthod Dentofac Orthop 1999;116:239-53.
11. Bergman RT. Cephalometric soft tissue facial analysis. Am J Orthod Dentofac Orthop 1999;116:373-89.

How to cite this article: Khot PJ, Agrawal M, Agrawal J, Samgir R, Shirkande A, Khot M. Evaluation of Soft Tissue Cephalometric Norms for Maharashtrian Population Using Holdaway Analysis. Int J Sci Stud 2018;5(11):29-33.

Source of Support: Nil, **Conflict of Interest:** None declared.