Acta Scientific Dental Sciences (ISSN: 2581-4893)

Volume 5 Issue 3 March 2021

Research Article

Soft tissue Cephalometric norms for Orthognathic Surgery in Nepalese Adults

Joshi Sandhya[1]*, Baliga Mohan[2] and Philip Pramod[3]

[1]Associate Professor, Department of Oral and Maxillofacial Surgery,National Trauma Center, National Academy of Medical Sciences, Kathmandu, Nepal

[2]Professor, Department of Oral and Maxillofacial Surgery, Manipal College of Dental Surgery, Manipal Academy of Higher Sciences, Karnataka, India

[3]Assistant Professor, Department of Orthodontics, School of Dental Medicine, University at Buffalo, New York, USA

***Corresponding Author:** Joshi Sandhya, Associate Professor, Department of Oral and Maxillofacial Surgery,National Trauma Center, National Academy of Medical Sciences, Kathmandu, Nepal

Received: February 05, 2021

Published: FebruRy 16, 2021

Abstract

Introduction: Normative cephalometric data based on one population group does not represent all other groups. Therefore, accurate and comprehensive set of soft tissue cephalometric reference parameters are required for particular population seeking surgical procedures.

Purpose of the Study: The purpose of this study was to establish normative values of soft tissue profiles in Nepalese adults, to compare the data obtained with those of caucasian adults using Cephalometric for orthognathic surgery (COGS) analysis (Legan - Burstone); also to identify possible sex differences between Nepalese young men and women.

Methodology: The subject consisted of 72 Nepalese students (38 females and 32 males) studying at Kasturba Medical College and Manipal College of Dental Sciences. The selection process was initiated, according to inclusion criteria. Out of 72, twenty seven persons were included in the study. Then the lateral cephalogram was studied using COGS.

Results: The following results were observed in case of Nepalese group - mild convex profile, Large lower face throat angle and increased lower vertical height to depth ratio, Increased upper and lower lip protrusion, Increased maxillary incisor exposure, Less interlabial gap, Deep mentolabial sulcus.

Conclusion: The norms obtained for Caucasians should not be used for other groups and thus confirms the existence of significant differences in the soft tissue variables in Nepalese.

Keywords: Cephalometry; Orthognathic Surgery; Nepalese; Caucasian; Cephalogram; Soft Tissue

Abbreviation

COGS: Cephalometric for Orthognathic Surgery

Introduction

The concept of beauty has changed over in due course of time and differs from one population to another. Many studies indicated that normal measurements for one group should not be considered normal for every other race or ethnic group. Different racial groups must be treated according to their own characteristics. The predictability of treatment depends on the relationship between the hard and soft tissues. Facial esthetics does not rely solely on hard tissue. Soft tissue dimensions vary as the result of the thickness of

the tissue, the lip length, and the postural tone. Therefore, it is of utmost importance to study the soft tissue contour to adequately assess facial harmony [1-8].

In the modern era, variation is the key, and the clinician's task is to achieve the desired facial and dental outcomes within the ability of the individual to adapt physiologically to the morphologic changes. The desired outcomes have both functional and esthetic components both of which are strongly influenced by the soft tissues of the head and neck. It is only recently that a soft tissue paradigm, focusing the treatment of dentofacial problems on the soft tissues of the face, has emerged in orthodontics and orthognathic surgery [4,9-14].

Currently, a significant number of Nepalese adults are seeking orthodontic treatment that requires orthognathic surgery. Therefore, a need has arisen for a more accurate and comprehensive set of soft tissue cephalometric reference parameters for this population.

Aim of the Study

The aim of this investigation was to study in detail the cephalometric analysis (Legan- Burstone) of soft tissue facial profile in selected sample of Nepalese (males and females), to compare with the caucasians and to formulate soft tissue guidelines for use with such patients seeking Orthognathic surgery for dentofacial disharmonies.

Materials and Methods

The subjects consisted of 72 Nepalese young adults (34 Nepalese males and 38 Nepalese females) studying at Kasturba Medical College and Manipal College of Dental Sciences, Mangalore. After screening all the subjects, those satisfying all the inclusion criteria only were included in this study which consisted of 15 females and 12 males. Ethical committee clearance was obtained prior to the study. A letter of informed consent was obtained from all participants after explaining the nature and purpose of the radiograph.

Inclusion criteria were:

1. Nepalese with Nepalese citizenship.
2. Young adults (20 - 30) years of age.
3. Angle's Class I occlusion or malocclusion with mild to moderate crowding (3 - 5 mm).
4. Well balanced faces with harmonious profile.

Exclusion criteria were:

1. Presence of any craniofacial syndromes or dentofacial deformity such as cleft lip and palate.
2. Significant history of maxillofacial trauma.
3. History of previous orthodontic, maxillofacial or prosthodontic treatment.
4. Presence of anterior segmental cross bite.
5. Gross sagittal/vertical skeletal disproportions.

The initial step of the selection process was a preliminary clinical examination which was carried out to determine the status of the occlusion; those subjects who were judged to have Class I normal occlusion were selected. The second step was to obtain a lateral cephalogram (68 Kvp, 12mA and 2.5 sec). The patient was positioned so that the mid sagittal plane was parallel to plane of the film in cassette holder and head was stabilized by using a cephalostat. The central beam was perpendicular to the midsagittal plane of the patient and the plane of the image receptor which was centered over the external auditory meatus. The radiograph cassette was placed as low as possible to include the neck chin area and also far enough to cover the nose. The source to object distance was 60 inches. The radiograph was taken with facial muscles relaxed. The subjects were asked to bite in centric occlusion with lips in repose.

The lateral cephalogram was traced on lead acetate tracing paper (matte). An angular correction of 7° to SN plane formed Horizontal reference plane for COGS analysis. To eliminate the interexaminer variability, a single investigator traced all radiographs. Two weeks after the first measurements all radiographs were retraced. The first and second measurements were analyzed using Kendal's coefficient of concurrence, it was found that all the variables were significantly related.

A total number of 27 subjects included in the study had age of 27.4 years. Out of 27, fifteen were females and twelve males**.** The data were subjected to statistical evaluation. The statistical analysis was done using SPSS computer software. Mostly descriptive statistics were used. For each variable, the arithmetic mean and standard deviation were calculated. The comparison between Nepalese men and women, Caucasians and Nepalese was done using student unpaired 'T' test and Mann Whitney test.

Cephalometric landmarks:

1. Glabella (G)
2. Sella (S)
3. Columella Point (Cm)
4. Subnasale (Sn)
5. Nasion (N)
6. Labrale superius (Ls)
7. Stomion superius (Stm_s)
8. Stomion inferius (Stm_i)
9. Labrale inferius (Li)
10. Mentolabial sulcus (Si)
11. Soft tissue pogonion (Pg′)
12. Pogonion (Pg)
13. Soft tissue gnathion (Gn′)
14. Menton (Me)
15. Soft tissue menton (Me′)
16. Cervical Point (C)
17. Horizontal reference plane (HP).

Results and Discussion

The Average norms and standard deviation were calculated for Nepalese Adults (Table 1).

Separate norms for males and females were also calculated and the comparison was made.

The data obtained for Nepalese was compared with those of established norms developed for Caucasians by Burstone- Legan.

The results were interpreted as: $P < 0.001$ being very highly significant and $P < 0.01$ being highly significant. $P < 0.05$ being significant.

In the Nepalese group, the facial convexity angle (12.4°) showed similar measurement corresponding to Caucasian group (12.0°) suggesting mild convexity.

The maxillary sagittal position in Nepalese group (5.66 mm) demonstrated a slightly retruded position as compared to Caucasians (6 mm) which was evident more in males. Though the difference of 0.4 mm was statistically significant, the clinical significance of 0.4 mm is dubious.

Measurement	Landmarks	Mean (Nepalese)	Standard Deviation
Facial form			
1. Facial convexity angle	G-Sn -Pg’	12.40	5.38
2. Maxillary Prognathism	G-Sn	5.66	4.83
3. Mandibular Prognathism	G-Pg’	-2.5	8.01
4. Vertical height ratio	G-Sn/Sn - Me’	1.12	0.16
5. Lower Face Throat Angle	Sn - Gn’ - C	112.88	9.56°
6. Lower vertical height depth ratio	Sn - Gn’/ C- Gn’	1.32	0.263
Lip position and form			
7. Nasolabial angle	Cm- Sn - Ls	99.8	8.94
8. Upper Lip Protrusion	Ls to Sn - Pg’	3.9	2.65
9. Lower Lip Protrusion	Li to Sn - Pg’	2.1	2.91
10. Mentolabial sulcus	Si to Li- Pg’	6.37	1.88
11. Vertical Lip - chin ratio	Sn - Stm_s/ Stm_s - Me’	0.47	0.065
12. Maxillary incisor Exposure	Stm_s - 1	2.92	1.66
13. Interlabial Gap	Stm_s - Stm_i	0.75	1.50

Table 1: Average norms of Nepalese adults.

The mandibular sagittal position showed a more retruded position (-2.5 mm) in case of Nepalese group. This was more so in case of Nepalese females. The reasons for soft tissue pogonion to be placed posteriorly could be due to small hard tissue chin, small mandible, average sized mandible positioned posteriorly, thin soft tissue chin, or a combination of these.

The results suggested that Nepalese population with normal occlusion and well balanced facial profile had mild convex profile concomitant to that of Caucasians with slightly retro positioned maxilla and mandible.

Measurement	Mean males	Mean females	T / Z value	P value
FACIAL FORM				
Facial convexity angle	12.9	12.0	0.432	0.66
Maxillary Prognathism	7.25	4.4	1.46	0.143
Mandibular Prognathism	0.16	-4.7	1.51	0.139
Vertical height ratio	1.07	1.16	1.59	0.124
Lower Face Throat Angle	117.4	109.26	2.39	0.025
Lower vertical/depth height ratio	1.39	1.32	0.65	0.52
LIP POSITION AND FORM				
Nasolabial angle	100.8	99	0.52	0.606
Upper Lip Protrusion	3.66	-3	1.29	0.194
Lower Lip Protrusion	1.70	2.5	1.49	0.136
Mentolabial sulcus	7.3	5.56	2.77	0.01
Vertical Lip - chin ratio	0.46	0.49	1.02	0.317
Maxillary incisor Exposure	2.5	3.25	1.18	0.246
Interlabial Gap	0.41	1.03	0.99	0.32

Table 2: Comparison between nepalese males and females.

In the vertical dimension, vertical height ratio was slightly more (1.12) as compared to Caucasian (1: 1) connoting a smaller lower third of face. The lower face- throat angle was found to be obtuse (112.8˚) in the present study when compared to Caucasian (100˚). An obtuse lower face throat angle should always warn the clinician not to use procedures that reduce the prominence of the chin. A significant difference was noted between men and women with men having larger lower face- throat angle compared to women. The larger lower face- throat angle in our subjects could be due to extra adipose tissue extending from submental region to the thyroid cartilage; improper positioning of subject during the process of taking lateral cephalogram; the swallowing mechanism itself causing positional changes of the hyoid bone bringing it high and more anterior which in turn changes the position of 'C' (cervical point).

Measurement	Mean (White)	Mean Nepalese	T value	P value
Facial form				
1. Facial convexity angle	12˚	12.40	0.35	0.72
2. Maxillary Prognathism	6	5.66	5.106	< 0.001
3. Mandibular Prognathism	0	-2.5	2.46	0.016
4. Vertical height ratio	1	1.12	3.99	< 0.001
5. Lower Face Throat Angle	100˚	112.88	6.37	< 0.001
6. Lower vertical height depth ratio	1.2	1.32	2.67	0.0096
Lip position and form				
7. Nasolabial angle	102˚	99.8	1.045	0.299
8. Upper Lip Protrusion	3	3.9	4.939	<0.001
9. Lower Lip Protrusion	2	2.1	5.64	<0.001
10. Mentolabial sulcus	4	6.37	4.86	<0.001
11. Vertical Lip - chin ratio	0.5	0.47	1.5	0.133
12. Maxillary incisor Exposure	2	2.92	1.97	0.052
13. Interlabial Gap	2	0.75	2.7	0.008

Table 3: Comparison between Caucasian-Nepalese.

The assessment of lower face vertical height to depth proportionality was carried out which was slightly more in Nepalese group as compared to Caucasian which could signify that Nepalese have relatively short neck and the surgical procedures causing reduction in anterior projection of the chin should be done with caution. There was no significant gender differences noted.

The nasolabial angle was found to be acute in case of Nepalese but when compared to Caucasian this difference wasn't statistically significant. The nasolabial angle in this regard fails to adequately describe contour in the subnasal profile. It fails to explain whether the angle is excessive because the lip slants back or because the nose turns up or both. The large standard deviation with this finding was also seen in Caucasian which reveals that these measurements show a great degree of individual variability and suggest that comparisons should be made with the range of normal values rather than with the mean.

Further comparison of the results showed that the Nepalese group had significantly more protruded lip positions (both upper and lower) than Caucasians. The mentolabial sulcus value showed considerable difference. The deep mentolabial sulcus in Nepalese could be due to either flaccid lower lip or inclination of lower lip itself which was evident in males as compared to females. However, the interlabial gap was found to be significantly less and this was statistically significant. The reason for interlabial gap to be less when distance between maxillary incisor to the upper lip was more could be due to inherent shortness of upper lip and which was overcompensated by the lower lip. This is in fact shown by the measurement of vertical lip chin ratio which was also increased. If the upper lip is very short, it might not be possible or desirable to change the level or can't of the entire occlusal plane so that a normal relationship of the incisors to the upper lip would exist.

Conclusion

The Nepalese group exhibited differences in variables which is clinically significant:

- Mild convex profile.
- Increased lower face throat angle.
- Increased lower vertical height to depth ratio.
- Increased upper and lower lip protrusion.
- Increased maxillary incisor exposure.
- Reduced interlabial gap.
- Deep mentolabial sulcus.

Sexual dimorphism wasn't observed in most of the variables except in lower face throat angle, mentolabial sulcus, basic upper lip thickness and H angle. As the metropolitan areas in the present world tend to have people from diverse racial or ethnic groups, it is therefore important to have that treatment plans based on racial or ethnic specific norms.

Conflict of Interest

The authors have no conflict of interests to declare.

Bibliography

1. Erbay EF and Canikliog˘ CM. "Soft tissue profile in Anatolian Turkish adults: Part II. Comparison of different soft tissue analyses in the evaluation of beauty". *American Journal of Orthodontics and Dentofacial Orthopedics* 121 (200): 65-72.
2. Eckhardt CE and Cunningham SJ. "How predictable is orthognathic surgery?" *European Journal of Orthodontics* 26 (2004): 303-309.
3. Chewa MT., *et al*. "Outcome of Orthognathic Surgery in Chinese Patients". *A Subjective and Objective Evaluation The Angle Orthodontis* 77 (2007): 845- 850.
4. Behbehani F and Hicks EP. "Racial variations in Cephalometric Analysis between Whites and Kuwaitis". *The Angle Orthodontis* 76 (2006): 406-411.
5. Burstone CJ., *et al*. "Cephalometrics for Orthognathic Surgery". *Journal of Oral and Maxillofacial Surgery* 36 (1980): 269-277.
6. Legan HL and Burstone CJ. "Soft tissue cephalometric analysis for orthognathic surgery". *Journal of Oral and Maxillofacial Surgery* 38 (1980): 744-751.
7. Hwang HS., *et al*. "Ethnic differences in the soft tissue profile of Korean and European-American adults with normal occlusions and well-balanced faces". *The Angle Orthodontist* 72 (2002): 72-80.
8. Bhattarai P. "Steiner's cephalometric analysis of Nepalese adults aged 18 to 30 years". *Journal of Nepal Dental Association* 7 (2005): 1-9.
9. Rajbhandari A. "A Cephalometric evaluation of the Nepalese Adults (aged 17 – 30 years) using Downs' analysis". *Journal of Nepal Dental Association* 7 (2005): 15-26.
10. Helio Scavone Jr., *et al*. "Facial profile evaluation in Japanese – Brazilian adults with normal occlusions and well balanced faces". *American Journal of Orthodontics and Dentofacial Orthopedics* 129 (2006): 721e1-721.e5.
11. Kolokitha OE. "Validity of a manual soft tissue profile prediction method following mandibular setback osteotomy". *European Journal of Dentistry* 1 (2007): 202-211.

12. Loi H., *et al*. "Comparison of Cephalometric Norms between Japanese and Caucasian adults in A- P and vertical dimension". *European Journal of Orthodontics* 29 (2007): 493-499.

13. Altug-Atac AT., *et al*. "Facial soft tissue profile following bi-maxillary orthognathic surgery". *The Angle Orthodontist* 78 (2008): 50-57.

14. Kalha AS., *et al*. "Soft-tissue cephalometric norms in a South Indian ethnic population". *American Journal of Orthodontics and Dentofacial Orthopedics* 133 (2008): 876-881.