ORIGINAL RESEARCH

Evaluation of Soft Tissue Measurements in Various Skeletal Malocclusions of Kurnool Population- A Cephalometric Study

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ABSTRACT

Aim: The purpose of this study was to measure and compare the soft tissue cephalometric values in various skeletal malocclusions of adult Kurnool population that can provide us a guideline in diagnosis and treatment planning. **Methods**: 75 lateral cephalograms divided into 3 groups (Class I, Class II, Class III skeletal malocclusions) of each 25 sample were traced, and soft tissue values obtained were compared. **Results**: Class II malocclusions showed a marked increase in facial contour angle, upper and lower lip protrusion, increased mentolabial sulcus depth and lower face throat angle. Class III malocclusions exhibited decreased nasolabial angle and facial contour angle. Lower face throat angle was increased in class I skeletal malocclusions. **Conclusion**: When formulating a treatment plan for Kurnool population, careful consideration should be given to facial contour angle, upper and lower lip protrusion, nasolabial angle, mentolabial sulcus depth and lower face throat angle

KEYWORDS: Kurnool population, skeletal class, Soft tissue paradigm

INTRODUCTION

Harmonious facial aesthetics have long been recognized as the most important goal of orthodontic treatment. Knowledge of the facial skeleton and its overlying soft tissue in determining facial harmony is essential.[1] An assumption was made that the soft tissue profile configuration was predominantly related to the underlying skeletal configuration. A lot of research showed that the soft tissues have a significant factor in determining a patient's final facial profile.[2-5] Many investigations have highlighted the importance of the soft tissue in the determining the facial aesthetics on the basis that soft tissue behaves independently from the underlying skeleton.[6] Due to the increasing acceptance of shift in paradigm, the diagnosis and orthodontic treatment planning are established predominantly by soft tissue considerations than skeletal/ dental relationships. Hence, the need for soft tissue consideration is of significant use in orthodontics. The aim of the current study is to measure and compare the soft tissue cephalometric values in various skeletal malocclusions of adult Kurnool population that can provide us a holistic guideline in diagnosis and treatment planning.

MATERIALS AND METHODS

The present study was carried out on standardized lateral cephalograms of 75 Kurnool subjects, classified into Class I, II and III malocclusions, based on sagittal skeletal relationship. The sample was divided into 3 groups. Each group comprised of a sample of 25 subjects.

- Group I – Class I
- Group II – Class II
- Group III – Class III

Inclusion Criteria:

- Males and Females of 20-25 years of age.
- A full complement of permanent dentition present (excluding the third molar).

Exclusion Criteria:

- Subjects with history of orthodontic treatment or orthognathic surgery.
- Previous history of trauma to maxillofacial structures.
- Congenital deformities like Cleft lip and palate.
- Compromised periodontal condition.

All the lateral cephalograms were obtained in centric occlusion with lips in a relaxed position. Landmark identification and tracings were carried out manually on 0.003' thickness acetate film. Ten soft tissue parameters from Legan and Burstone analysis[5] and Arnett's soft

How to cite this article:
Asif SM, Reddy YM, Sreekanth C, Reddy BV, Raj GKP, Reddy BR. Evaluation of Soft Tissue Measurements in Various Skeletal Malocclusions of Kurnool Population- A Cephalometric Study. Int J Oral Health Med Res 2016;2(6):41-44.

tissue analysis[7] were calculated and recorded (fig 1 and 2), which include

1. Nasolabial angle (Cm-Sn-Ls)
2. Facial contour angle (G-Sn-Pog')
3. Upper lip protrusion [Ls-(Sn-Pog')]
4. Lower lip protrusion [Li-(Sn-Pog')]
5. Mentolabial sulcus depth
6. Lower face –throat angle (Sn-Gn'-C)
7. Lower vertical height- depth ratio (Sn-Gn'/C-Gn')
8. Upper lip thickness
9. Lower lip thickness
10. Soft tissue chin thickness.

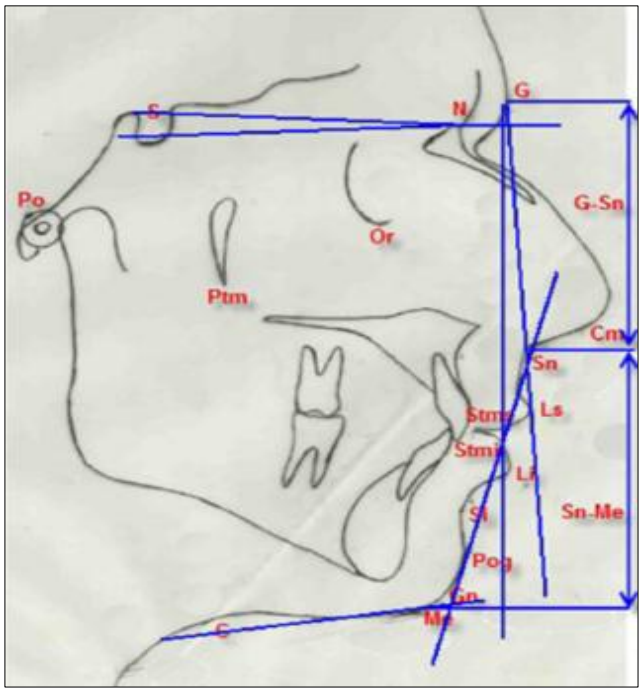

Fig 1

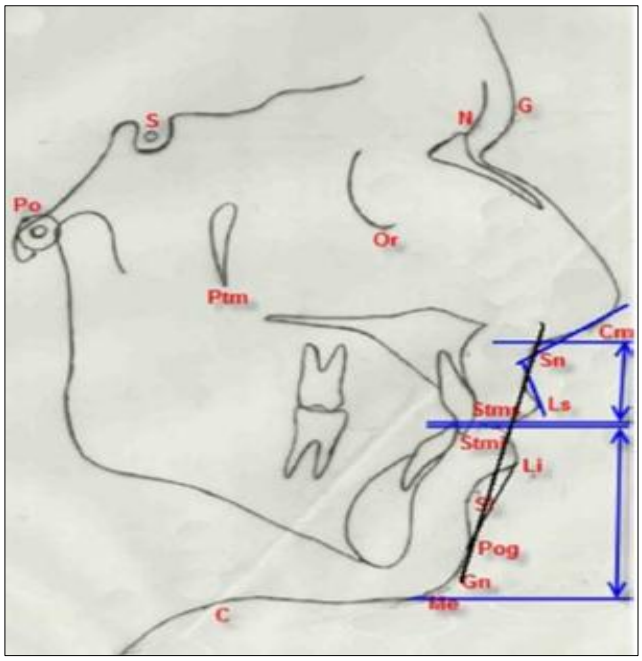

Fig 2

All the statistical analysis was done using SPSS version 18. A p-value of <0.05 was considered statistically significant. Comparison of mean values was made using ANOVA with post-hoc Tukey's test and ANOVA with post-hoc Games-Howell test.

RESULTS

Table 1 shows the statistical analysis along with the mean and standard deviation of soft tissue measurements of skeletal class I, class II and class III groups. Nasolabial angle showed a significant decrease in group III, when compared to other groups. However, no significant variation was seen in the nasolabial angle between group I and II (Table 2). There was a significant decrease in facial contour angle in group III than other groups(Table 1). Intergroup comparison showed statistically significant difference among all the groups. Comparing the upper lip protrusion showed significant differences among all the groups (Table 2). A significant increase was seen in group II, when compared to group I. Group III showed a significant increase in lower lip protrusion values when compared to group I. However no significant difference was seen in group II and III (Table 3).

Sl no	Parameter	Group I	Group II	Group III	'p' value	Post-hoc test
1	Nasolabial angle	93.6±9.04	91.27±7.07	82.53±8.68	0.002; Sig	1,2>3
2	Facial contour angle	10.87±3.09	17.20±5.57	1.87±3.85	<0.001; Sig	2>1>3
3	Upper Lip Protrusion	4.07±1.33	6.43±1.74	5.27±1.62	0.001; Sig	2>1
4	Lower lip Protrusion	3.60±2.92	6.17±3.49	7.50±2.05	0.002; Sig	2,3>1
5	Mento Labial Sulcus depth	5.73±0.80	7.57±2.35	5.83±1.54	0.032; Sig	2>1
6	Lower Face Throat angle	111.87±4.19	123.13±4.58	101.93±3.15	<0.001; Sig	2>1>3
7	Lower Vertical Height Depth Ratio	1.30±0.20	1.43±0.25	1.25±0.17	0.06; NS	-
8	Upper lip thickness	12.40±1.84	15±2.20	14.60±2.26	0.003; Sig	2,3>1
9	Lower lip thickness	14.13±2.03	17.53±2.39	15.33±1.29	0.001; Sig	2>1,3
10	Soft tissue Chin thickness	12.73±1.53	13.63±2.12	12.93±1.71	0.366; NS	-

Table 1 - The mean and standard deviation values of soft tissue measurements for the Group I, group II and group III.

Group II showed a significant difference in mentolabial sulcus depth among all the groups, whereas there was no significant difference in values of group I and III (Table 4). Lower face throat angle showed a marked difference in all the 3 groups, with group II showing significant increase than other groups (Table 1). No significant difference was seen in all the 3 groups for lower vertical height depth ratio (Table 1). Intergroup comparison between group I and II and between group II and III showed a significant difference. All the 3 groups showed

no significant difference in values of soft tissue chin thickness (Table 1). Both the upper lip thickness and lower lip thickness showed a significant difference in all the 3 groups.

Sl no	Parameter	Group I	Group II	'p' value
1	Nasolabial angle	93.6±9.04	91.27±7.07	0.315 NS
2	Facial contour angle	10.87±3.09	17.20±5.57	<0.0001 sig
3	Upper Lip Protrusion	4.07±1.33	6.43±1.74	<0.0001 sig
4	Lower lip Protrusion	3.60±2.92	6.17±3.49	0.0069 sig
5	Mento Labial Sulcus depth	5.73±0.80	7.57±2.35	0.0005 sig
6	Lower Face Throat angle	111.87±4.19	123.13±4.58	<0.0001 sig
7	Lower Vertical Height Depth Ratio	1.30±0.20	1.43±0.25	0.049 sig
8	Upper lip thickness	12.40±1.84	15±2.20	<0.0001 sig
9	Lower lip thickness	14.13±2.03	17.53±2.39	<0.0001 sig
10	Soft tissue Chin thickness	12.73±1.53	13.63±2.12	0.091 NS

Table 2 - Intergroup comparison between group I, group II

Sl no	Parameter	Group II	Group III	'p' value
1	Nasolabial angle	91.27±7.07	82.53± 8.68	0.0003 sig
2	Facial contour angle	17.20±5.57	1.87±3.85	<0.0001 sig
3	Upper Lip Protrusion	6.43±1.74	5.27±1.62	0.0184 sig
4	Lower lip Protrusion	6.17±3.49	7.50±2.05	0.106 NS
5	Mento Labial Sulcus depth	7.57±2.35	5.83± 1.54	0.003 sig
6	Lower Face Throat angle	123.13±4.58	101.93±3.15	<0.0001 sig
7	Lower Vertical Height Depth Ratio	1.43±0.25	1.25±0.17	0.0046 sig
8	Upper lip thickness	15±2.20	14.60±2.26	0.529 NS
9	Lower lip thickness	17.53±2.39	15.33±1.29	0.0002 sig
10	Soft tissue Chin thickness	13.63±2.12	12.93±1.71	0.205 NS

Table 3- Intergroup comparison between group II, group III

Sl no	Parameter	Group I	Group III	'p' value
1	Nasolabial angle	93.6±9.04	82.53± 8.68	<0.0001 sig
2	Facial contour angle	10.87±3.09	1.87±3.85	<0.0001 sig
3	Upper Lip Protrusion	4.07±1.33	5.27±1.62	0.0062 sig
4	Lower lip Protrusion	3.60±2.92	7.50±2.05	<0.0001 sig
5	Mento Labial Sulcus depth	5.73±0.80	5.83± 1.54	0.774 NS
6	Lower Face Throat angle	111.87±4.19	101.93±3.15	<0.0001 sig
7	Lower Vertical Height Depth Ratio	1.30±0.20	1.25±0.17	0.345 NS
8	Upper lip thickness	12.40±1.84	14.60±2.26	0.0004 sig
9	Lower lip thickness	14.13±2.03	15.33±1.29	0.0161 sig
10	Soft tissue Chin thickness	12.73±1.53	12.93±1.71	0.664 NS

Table 4- Intergroup comparison between group I, group III

DISCUSSION

Soft tissue cephalometric values are as important as hard tissue values when assessing the success of treatment. One of the predominant goals of orthodontic treatment is to improve facial esthetics. Sometimes the esthetic result is more important to the patient than the occlusal changes. Hence, good occlusion and improved facial appearance are distinct yet parallel objectives of orthodontic treatment.[8]

Nasolabial angle (Cm-Sn-Ls) is an important measurement in assessing anteroposterior maxillary dysplasia.[9] The present study showed a significant decrease in nasolabial angle for group III (82.53± 8.68) when compared with the group I, III and norms (90-110˚). This decrease in nasolabial angle may be attributed to compensatory proclination of upper incisors and downward incination of columella of the nose in class III malocclusion.[10]

Facial contour (G-Sn-Pog' angle) describes the overall vertical soft tissue profile of the patient.[7] Statistically, significant results for facial contour angle were obtained for group II (17.20±5.57) and group III (1.87±3.85) when compared with the Burstone norms (12±4). This increase in facial contour angle in group II is because of retrognathic mandible/prognathic maxilla whereas a decrease in group III is due to prognathic mandible/ retrognathic maxilla for the Kurnool population.

Upper lip protrusion [Ls-(Sn-Pog')] and lower lip protrusion [Li-(Sn-Pog')] is used to determine the anteroposterior lip position. There are many factors involved in lip protrusion and it is obvious that the amount of protrusion can be controlled by various orthodontic and surgical procedures. Statistically, significant increase in upper lip protrusion was obtained for group II when compared with burstone norms and group I and group III of Kurnool population. This is in agreement with the study conducted by Rana Pratap Maurya et al.[11] Similarly, a marked increase in lower lip protrusion was seen in group II and group III when compared with that of group I and burstone norms which can be attributed to proclination of lower incisors.

In our present study, group II (7.57±2.35) of Kurnool population had significantly deeper mentolabial sulcus when compared with the group I, Group II and Burstone norms (4±2). This might be attributed to lower lip protrusion which might compensate for a retruded mandible during lip closure.[1] Flared lower incisors, extruded upper incisors that roll out the lower lip, flaccid lower lip tone and abnormal morphology of lip itself are all factors that can affect the inclination of the lower lip and deepen the sulcus. So uprighting the lower incisors, intruding the maxillary incisors and cheiloplasty to retract the lower lip all can help in reducing a deep sulcus.[12]

Lower face throat angle (Sn-Gn'-C) is critical in planning treatment to correct antero-posterior facial dysplasias.[5] In

our present study, statistically significant results for lower face throat angle were obtained for the group I (111.87±4.19) and group II (123.13±4.58) of Kurnool population when compared with the Burstone norms (100±7). Legan and Burstone suggested that consideration of lower face-throat angle is crucial in planning treatment for anteroposterior facial dysphasias. Hence, in subjects with obtuse lower face-throat angle, procedures that reduce prominence of chin are strictly contraindicated.

The lower vertical height to depth ratio (Sn-Gn'/C-Gn') is useful in determining the feasibility of reducing or increasing the prominence of the chin. The ratio of distances from subnasale to gnathion and from cervical point to gnathion is normally a little larger than one. In other words, if this ratio becomes larger than one, the patient has relatively short neck, and the anterior projection of the chin should not be reduced.[9] In the current study, statistically insignificant results for lower vertical height depth ratio were obtained for all the 3 groups.

Statistically significant results for upper lip thickness were obtained for group II and group III for Kurnool population when compared with the Arnetts norms. Statistically significant results for lower lip thickness were obtained for group III when compared with group I and II. Statistically, insignificant results for soft tissue chin thickness were obtained for all the 3 groups of the Kurnool population. These are correlating with the study of Hasan Kamak et al.[13]

CONCLUSION

From the results of this study, the following may be concluded:

- Class III skeletal malocclusions of Kurnool population exhibited decreased nasolabial angle and facial contour angle.
- Class II skeletal malocclusions of the Kurnool population showed a marked increase in facial contour angle, upper and lower lip protrusion, increased mentolabial sulcus depth and lower face throat angle.
- Lower face throat angle was also increased in class I skeletal malocclusions.
- No significant changes in lower vertical height depth ratio and soft tissue chin thickness were seen in Kurnool population.

When formulating a treatment plan for Kurnool population, careful consideration should be given to facial contour angle, upper and lower lip protrusion, nasolabial angle, mentolabial sulcus depth and lower face throat angle. Further clinical studies with much larger samples should be undertaken which will help to obtain more accurate results and confirm the present hypothesis.

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Source of Support: Nil
Conflict of Interest: Nil