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

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Abstract

Aim: The purpose of this study was to measure and relate the soft tissue cephalometric values in various skeletal malocclusions of adult Chennai population that can help us in proper diagnosis and treatment planning of different cases.

Methods: Soft tissue thickness measurements taken were traced on lateral cephalometric radiographs of 75 healthy orthodontic patients that had different skeletal malocclusions (Class I: 25 subjects, Class II: 25 subjects, Class III: 25 subjects) 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.The Lower face throat angle was increased in class II skeletal malocclusions

Conclusion: When framing a treatment plan for Chennai 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: Chennai Population, Skeletal Class, Soft Tissue Paradigm

Introduction

Assessment of the soft tissues in patients undergoing orthodontics or patients undergoing corrective jaw surgery plays an important role in both analysis and the treatment planning. Both the hard and soft tissue values must be taken into consideration in forming a harmonious facial aesthetics and an optimal functional occlusion.[1,].Harmonious facial aesthetics is the most significant goal of orthodontic treatment. Awareness of the facial skeleton and its overlying soft tissue in defining facial harmony is essential.[2] A supposition was made that the soft tissue profile outline was primarily related to the underlying skeletal configuration. A lot of studies showed that the soft tissues have a significant factor in defining a patient's final facial profile.[3-4]Many studies have emphasized on the importance of the soft tissue in the purpose of the facial aesthetics on the source that soft tissue behaves independently from the underlying skeleton.[5] Due to the collective recognition of shift in paradigm, the diagnosis and orthodontic treatment planning are recognized predominantly by soft tissue considerations than skeletal/ dental relationships. Hence,

the requirement for soft tissue consideration is of importance in orthodontics. The purpose of the current study is to measure and compare the soft tissue cephalometric values in various skeletal malocclusions of adult chennai population that can deliver us a complete guideline in diagnosis and treatment planning.

Materials and Methods

The present study was carried out on standardized lateral cephalograms of 75 Chennai 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.
- Permanent dentition present (without 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 analysis5 and Arnett's soft tissue analysis[6] 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

Results

Table 1 displays the statistical analysis alongside with the mean and standard deviation of soft tissue measurements of skeletal class I, class II and class III groups. Nasolabial angle displayed a significant increase in group II, when compared to group III. There was a substantial decrease in facial contour angle in group III than other groups. Comparing the upper lip protrusion showed significant differences among all the groups (Table 2). A significant increase was seen in group II, when related to group III. A significant increase was seen in group II, when compared to group I. Lower lip protrusion showed a substantial decrease in group I, when related to group III and group II. There was No significant variation seen in the Mento labial sulcus depth between the all 3groups. Lower vertical height ratio showed a significant increase in group II, when compared to group III. Lower face throat angle showed a substantial increase in group II, when related to group I. All the 3 groups showed no substantial difference in values of soft tissue chin thickness. Both the upper lip thickness and lower lip thickness did not show any significant difference in all the 3 groups.

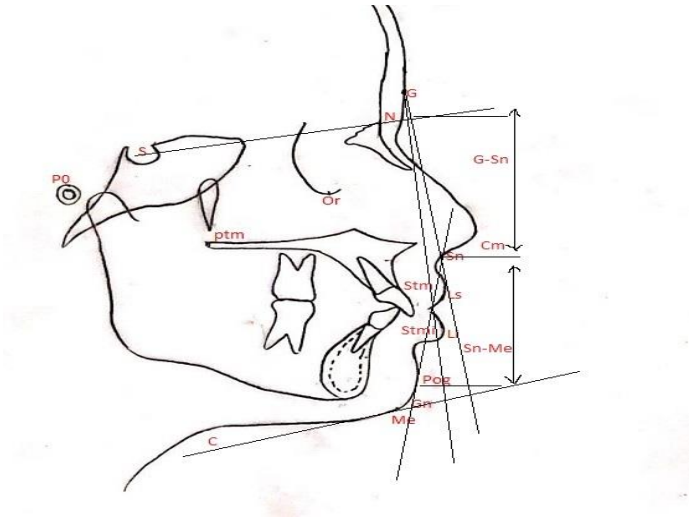

Fig. 1:

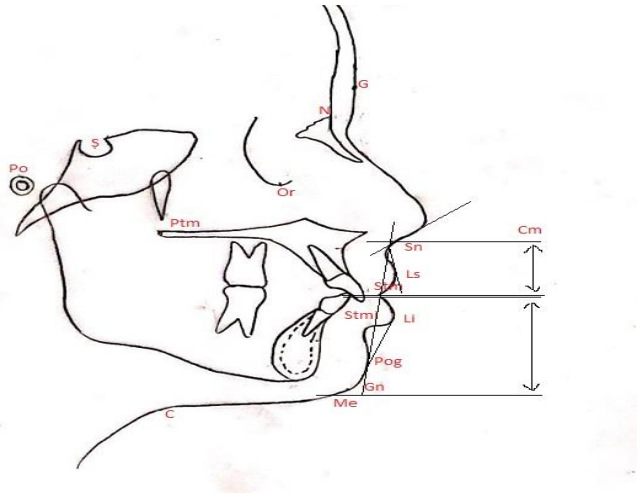

Fig. 2:

S.No	Parameters	Group I	Group II	Group III	P Value	Post – hoc test
1	Nasolabial angle	91.60±6.837	96.96±11.581	86.00±16.855	0.011 S	2 > 3
2	Facial contour angle	13.56±2.931	20.96±4.800	7.28±4.016	0.000 S	2 > 1 >3
3	Upper lip protrusion	6.12±0.881	7.08±1.891	5.80±2.273	0.036 S	2 > 3
4	Lower lip protrusion	6.12±1.590	10.64±2.722	8.20±2.517	0.000 S	2 > 3 >1
5	Mento labial sulcus depth	6.12±1.201	7.08±1.656	6.60±2.179	0.152 NS	-
6	Lower face throat angle	104.00±20.648	114.56±6.397	109.20±9.323	0.028 S	2 > 1
7	Lower vertical height ratio	1.458±0.1558	1.584±0.3680	1.384±0.2944	0.049 S	2 > 3
8	Upper lip thickness	11.44±1.660	11.52±2.383	12.44±2.709	0.237 NS	-
9	Lower lip thickness	13.08±1.498	14.16±2.444	14.52±2.434	0.057 NS	-
10	Soft tissue chin thickness	10.36±2.378	9.68±2.673	10.48±2.383	0.473 NS	-

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

Parameters	Groups	Mean	Std. Deviation	t - Value	P - Value
Nasolabial angle	Group I	91.6000	6.83740	-1.993	0.052 S
	Group II	96.9600	11.58116		
Facial contour angle	Group I	13.5600	2.93087	-6.579	0.000 S
	Group II	20.9600	4.80000		
Upper lip protrusion	Group I	6.1200	0.88129	-2.301	0.026 S
	Group II	7.0800	1.89121		
Lower lip protrusion	Group I	6.1200	1.58955	-7.171	0.000 S
	Group II	10.6400	2.72152		

Mentolabialsulcusdepth	Group I	6.1200	1.20139	-2.346	0.023 S
	Group II	7.0800	1.65630		
Lowerfacethroatangle	Group I	104.0000	20.64784	-2.443	0.018 S
	Group II	114.5600	6.39713		
Lowerverticalheightratio	Group I	1.4576	0.15581	-1.586	0.119 NS
	Group II	1.5844	0.36802		
Upperlipthickness	Group I	11.4400	1.66032	-0.138	0.891 NS
	Group II	11.5200	2.38258		
Lowerlipthickness	Group I	13.0800	1.49778	-1.884	0.066 NS
	Group II	14.1600	2.44404		
Softtissuechinthickness	Group I	10.3600	2.37837	0.950	0.347 NS
	Group II	9.6800	2.67270		

Table 2: Intergroup comparison between group I, group II

Parameters	Groups	Mean	Std. Deviation	t - Value	P - Value
Nasolabialangle	Group II	96.96	11.581	2.680	0.010 S
	Group III	86.00	16.855		
Facialcontourangle	Group II	20.96	4.800	10.929	0.000 S
	Group III	7.28	4.016		
Upperlipprotrusion	Group II	7.08	1.891	2.164	0.035 S
	Group III	5.80	2.273		
Lowerlipprotrusion	Group II	10.64	2.722	3.291	0.002 S
	Group III	8.20	2.517		
Mentolabialsulcusdepth	Group II	7.08	1.656	0.877	0.385 NS
	Group III	6.60	2.179		
Lowerfacethroatangle	Group II	114.56	6.397	2.370	0.022 S
	Group III	109.20	9.323		
Lowerverticalheightratio	Group II	1.584	.3680	2130	0.038 S
	Group III	1.384	.2944		
Upperlipthickness	Group II	11.52	2.383	-1.275	0.208 NS
	Group III	12.44	2.709		
Lowerlipthickness	Group II	14.16	2.444	-0.522	0.604 NS
	Group III	14.52	2.434		
Softtissuechinthickness	Group II	9.68	2.673	-1.117	0.269 NS
	Group III	10.48	2.383		

Table 3: Intergroup comparison between group II, group III

Parameters	Groups	Mean	Std. Deviation	t - Value	P - Value
Nasolabialangle	Group III	86.00	16.855	-1539	0.130 NS
	Group I	91.60	6.837		
Facialcontourangle	Group III	7.28	4.016	-6316	0.000S
	Group I	13.56	2.931		
Upperlipprotrusion	Group III	5.80	2.273	-0.656	0.515 NS
	Group I	6.12	0.881		
Lowerlipprotrusion	Group III	8.20	2.517	3.494	0.001 S
	Group I	6.12	1.590		
Mentolabialsulcusdepth	Group III	6.60	2.179	0.964	0.340 NS
	Group I	6.12	1.201		
Lowerfacethroatangle	Group III	109.20	9.323	1.148	0.257 NS
	Group I	104.00	20.648		
Lowerverticalheightratio	Group III	1.384	0.2944	-1.111	0.272 NS
	Group I	1.458	0.1558		
Upperlipthickness	Group III	12.44	2.709	1.574	0.122 NS
	Group I	11.44	1.660		
Lowerlipthickness	Group III	14.52	2.434	2.519	0.015 S
	Group I	13.08	1.498		
Softtissuechinthickness	Group III	10.48	2.383	0.178	0.859 NS
	Group I	10.36	2.378		

Table 4: Intergroup comparison between group I, group III

Discussion

Soft tissue cephalometric values are as essential as hard tissue values when evaluating 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.

Nasolabial angle (Cm-Sn-Ls) is an significant measurement in assessing anteroposterior maxillary dysplasia. The present study showed a significant increase in group II (96.96±11.58), when compared to group III (86.00±16.85). 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.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.

Facial contour (G-Sn-Pog' angle) describes the overall vertical soft tissue profile of the patient.Statistically, There was a significant decrease in facial contour angle in group III (7.28±4.01) than other groups. 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 chennai 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 (7.08±1.89) when compared group III (5.80±2.27) of chennai 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 (10.64±2.72) and group III (8.20±2.51) when compared with that of group I (6.12±1.59) which can be attributed to proclination of lower incisors.

In our present study there is no significant variation was seen in the Mento labial sulcus depth between the all 3groups.Deeper mentolabial sulcus might be recognized to lower lip protrusion which might recompense for a retruded mandible during lip closure. 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.

Lower face throat angle (Sn-Gn'-C) is crucial in planning treatment to correct antero-posterior facial dysplasias. In our present study, statistically significant results for lower face throat angle were obtained for the group II (114.56±6.39) of chennai population. 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 defining the possibility 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, the patient has relatively short neck,if this ratio becomes larger than one, and the anterior projection of the chin should not be reduced. In the current study, Lower vertical height ratio showed a significant increase in group II (1.584±0.36), when compared to group III (1.384±0.29).

Statistically insignificant results for upper lip thickness and lower lip thickness were obtained for all the 3 groups for chennai population when associated with the Arnetts norms. Statistically, insignificant results for soft tissue chin thickness were obtained for all the 3 groups of the chennai 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 chennai population exhibited decreased nasolabial angle and facial contour angle.
- Class II skeletal malocclusions of the chennai population showed a marked increase in facial contour angle, upper and lower lip protrusion, lower face throat angle.
- No significant changes in lower vertical height depth ratio,soft tissue chin thickness,Upper lip thickness and lower lip thickness were seen in chennai population.

When framing a treatment plan for chennai 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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